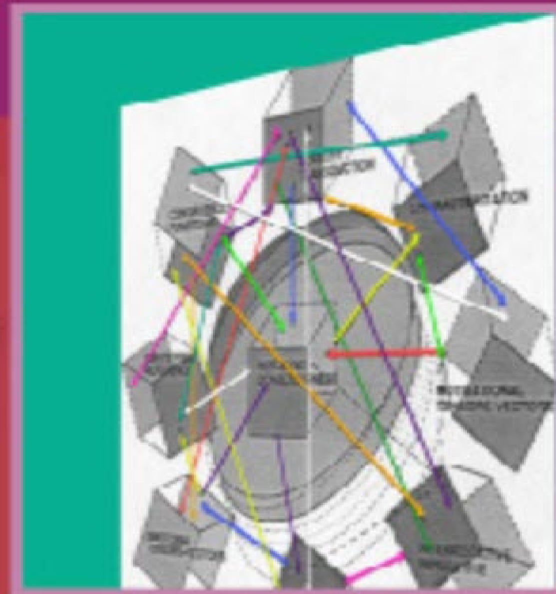
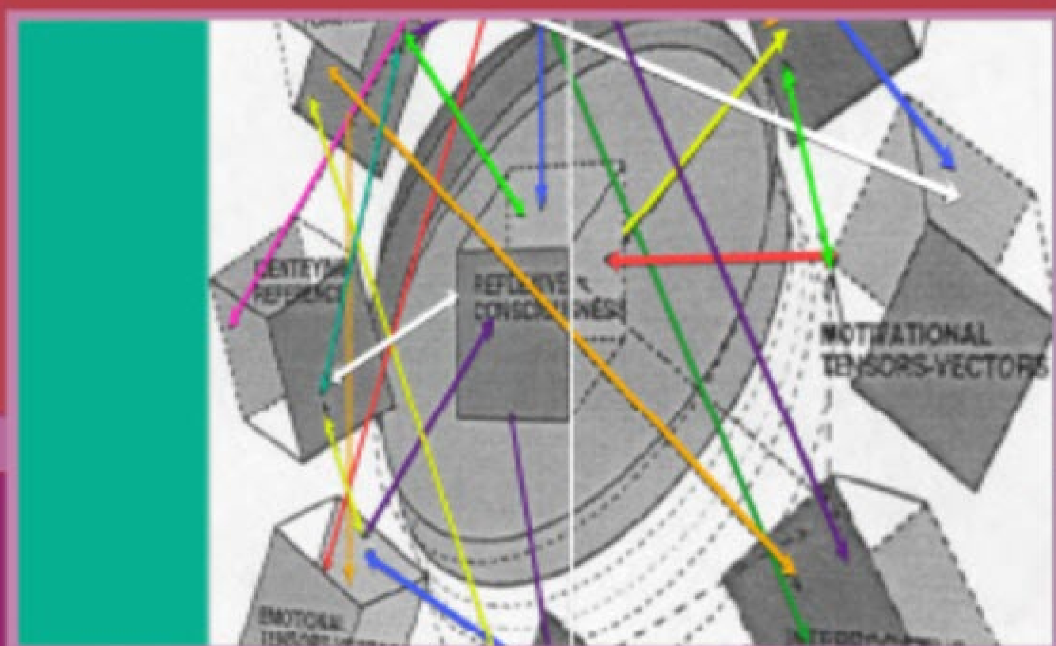
VARIETIES OF PSYCHOLOGICAL INQUIRY

Volume II





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In memory of Robert White who displayed a seemingly boundless supply of kindness, patience and encouragement while listening to my thoughts, ideas and reflections concerning psychology -- as well as life in general -- when I was an undergraduate.

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Preface

The twenty-five essays contained in the two volumes of *Varieties of Psychological Inquiry* venture into various facets of psychology – ranging from: Freud, Jung and Sullivan, to: Piaget, Sheldrake, and beyond. While no particular theory of psychology is espoused during the pages of these two volumes, a variety of theoretical and empirical issues are explored and critically reflected upon in considerable detail during the course of the following pages.

In a sense, the direction in which the essays contained in the two volumes of *Varieties of Psychological Inquiry* point is toward epistemological horizons where what is known (possibly) merges with what is not known ... and perhaps not even imagined. Nonetheless, each of the essays seeks to take a step of determinate nature in order to help constructively shape – hopefully – an increasingly informed journey toward a constantly receding horizon of psychological possibilities.

The essays can be read in any order since they are all, to a greater or lesser extent, independent of one another. However, some of the chapters are more technical and demanding than others are.

I have attempted to simplify, as much as possible, many ideas throughout the two volumes of *Varieties of Psychological Inquiry*. Unfortunately, some ideas are somewhat inherently complex and, therefore, on occasion there is a limit to how far one can simplify issues and still retain sufficient accuracy to avoid distorting issues in problematic ways.

Despite the disparate nature of the chapters and despite the fact that I am not seeking to delineate any particular theory of psychology through the various topical explorations, nevertheless, I feel the chapters actually complement one another and collectively give expression to a nuanced set of understandings concerning psychology. Obviously, there is nothing definitive in this work, but rather what one will find are the psychological musings of a fellow sojourner along the path of life.

Some of the material is quite theoretical, if not reflectively exploratory, and seeks to journey toward experiential horizons in a manner that is somewhat different than what might be considered to be normal psychological pursuits and, yet, does so in a way that I feel carries a variety of ramifications for psychological modes and methods that seek to engage – and, perhaps, 'capture' (to varying degrees) – reality in some sense of the word. Other material has a more clinical ambience to it and, perhaps as a result, might appear to be somewhat more practically and traditionally oriented.

Although arriving at answers is always nice, the character of the trip one undertakes while working toward those places of arrival can be very important as well. As with all things, while perusing the following pagers, take what you find to be of value for your own journey, and leave the rest.

Chapter 15: Ceding and Leveraging 'Agency'

The social psychologist, Stanley Milgram, ran a controversial experiment at Yale in the early 1960s. The nature of the experiment was such that if that experiment had been proposed within the context of the research environment of the last thirty years, Professor Milgram's idea probably would not have secured the necessary approval by the ethics committees that have oversight with respect to the sorts of experimental projects that are permitted to be conducted in the world of academia.

I didn't know Professor Milgram, but my time as a student at Harvard overlapped with some of the time when he was at Harvard seeking tenure. Unknowingly, I might have crossed paths with him in the hallways or in the library of the Department of Social Relations, or ridden with him on the elevators of the recently – at the time -- completed William James Hall that housed the Department of Social Relations.

I did have at least three different forms of one-degree of separation with Professor Milgram. For instance, my undergraduate thesis advisor was Robert White who was one of the faculty members at Harvard who strongly opposed Professor Milgram's gaining tenure at the university. Secondly, one of the members of my thesis examination committee was Robert Rosenthal who was awarded tenure in preference to Stanley Milgram even though Professor Rosenthal wasn't actually seeking tenure at the time. Thirdly, I took a course with Paul Hollander who was one of Professor Milgram's closest friends at Harvard.

All of the foregoing pieces of information are really not apropos with respect to much of anything except, perhaps, as historical detritus that has been sloughed off by my life. The fact of the matter is – and, even though, I did take a course in social psychology -- I don't recall that Stanley Milgram's name ever came up in class … although that was more than 50 years ago and my memory might have incurred some gaps during the interim period.

During the 1980s, when I taught various courses in psychology at a community college in Canada, I began to introduce my students to the Milgram 'learning' experiment. In addition to providing them with the actual details of the experiment, I also showed a dramatized version (*The Tenth Level* – 1975) of Professor Milgram's project that starred William Shatner, Ossie Davis, and Estelle Parsons, as well as featured the television debuts of Stephen Macht, Lindsay Crouse and John Travolta.

When I later taught psychology at a university in the United States, I continued to introduce students to Professor Milgram's 'learning' experiment. However, I substituted the educational-documentary film: 'Obedience,' that was done in conjunction with Professor Milgram, rather than use the aforementioned docudrama *The Tenth Level.*

The reason I made the switch was due to several factors. First, for whatever reason, *The Tenth Level* film is very difficult to acquire … although a multi-part edition of it has surfaced on YouTube. In addition, the '*Obedience*' film is shorter by nearly an hour – which makes it easier to fit into class time -- and, since Stanley Milgram introduces the documentary and does the voice-overs, the '*Obedience*' film is more authentic than *The Tenth Level* documentary.

One of the criticisms that have been directed at Professor Milgram's 'learning/memory' experiment is that it wasn't based on a specific hypothesis that might be proved or disproved by the data generated from such an experiment. Instead, he had an idea for an experiment and wanted to see where it would lead.

Professor Milgram did write a 1963 article concerning the experiment that was published in the *Journal of Abnormal and Social Psychology*. Moreover, 11 years late he wrote a book entitled: *Obedience to Authority*, that sought to provide a more in-depth look at his research.

However, the foregoing written efforts were more of a post-experimental attempt to rationalize his experiment within the framework of social psychology. He came up with his theory concerning the role that he believed the psychological phenomenon of obedience played in his 'learning' experiment after the fact of the experiment rather than before his research began.

Prior to his experiment, Professor Milgram was interested in certain political and ethical questions … e.g., he wondered what went on, morally and socially speaking, with people like Adolf Eichmann and the others who helped bring about the Holocaust. Nonetheless, while those sorts of questions might have shaped the structural character of his experiment to varying degrees, the nature of the relationship between his moral/political/social interests and the outcome of his experiment was rather diffuse and amorphous.

Professor Milgram didn't have a prediction concerning how his experiment would turn out. In other words, he didn't have a particular thesis that he was trying to prove, but he hoped his experiment would shed light on some of the questions he had concerning ethical and social issues that, along with other times and places, arose during the Second World War in Germany.

Later in this chapter, I will come back to Professor Milgram's theory that the mechanism at work in his experiment had to do with 'obedience'. I think he was wrong on that count, but the reasons why I believe this will have to wait until after an outline of his learning experiment is provided.

The initial 'learning' experiments began in July of 1961 and were run on the campus of Yale University. He placed advertisements in a newspaper inviting people from the general public in the New Haven area to participate in a study on memory and learning, and, as well, the public announcement was sent directly to people whose names had been taken from an area phone book.

The announcement indicated that participants would receive $4.50 (50 cents of the total was for carfare) for one hour of their time and that no special training or knowledge was necessary to qualify for the proposed learning/memory project. Furthermore, the advertisement indicated that Professor Milgram was looking for people who were between the ages of 20 and 50 and who represented a variety of economic backgrounds, ranging from: construction workers and barbers, to: clerks and city workers.

Once people began responding to the public announcement/advertisement, people were selected to provide a somewhat randomized sample with respect to age, educational background, and occupation. Because not enough people were attracted through the newspaper announcement, the participant pool for the experiment had to be supplemented with individuals who had been contacted through a direct mailing.

One at a time, interested individuals were given directions to the Interaction Laboratory at Yale University. A time for the learning/memory experiment was set for each participant.

When a person showed up at the appointed time, the individual would be met by two individuals. One of the latter two individuals would be introduced as a fellow participant in the experiment, while the other individual introduced himself as the individual who would be conducting the experiment.

The experimenter would, then, proceed to give a standard, prepared overview of the experiment. This introduction indicated there were several theories about learning and memory that were detailed in an official looking textbook concerning those topics that was showed to the two participants.

Furthermore, the individual conducting the experiment went on to indicate that not much was known about the impact that punishment had on learning and, therefore, the current experiment had been designed to investigate that issue. Consequently, the two participants would take on the role of either a learner or teacher.

Words like: 'Teacher' or "Learner,' were written on two pieces of paper and each of the experimental subjects would select one of the pieces of paper. Once the identity had been established concerning who would be the teacher and who would be the learner, the experimenter took them through the general structure of the experiment.

First, the three individuals went into the 'learning' room. An electric-chair-like apparatus was in the room, and before the 'learner' was strapped into the chair, the person who would be doing the 'teaching' was given an opportunity to feel what a relatively low level shock felt like.

The level of the shock was always 45 volts. This was the third lowest shock possible among the 30 levels of voltage.

Afterwards, the 'learner' was secured in the chair, and the 'learner' and 'teacher' were informed that the straps were to ensure that there was no excessive movement by the 'learner' when shocks were delivered in relation to incorrect responses. Conducting paste was applied to the electrode attached to the wrist of the 'learner' with the comment that the paste was necessary "to avoid blisters and burns" if, or when, shocks were delivered by the 'teacher.'

In response to questions from the 'learner' concerning the strength of the shocks that might be received, the two participants were told that: "Although the shocks can be extremely painful, they cause no permanent tissue damage."

Next, the person conducting the experiment would explain the nature of the learning/memory task. It was a paired-word-association test.

More specifically, the 'teacher' would first read off a list of four paired word items – such as: 'blue/box,' 'nice/day,' 'wild/duck,' 'bright/light.' During the testing phase, one of the foregoing words would be given by the 'teacher,' and the 'learner' would be required to produce the appropriate paired word from the original list of four groups of pairs … thus, if the 'teacher' said "wild," the 'learner' should respond with 'duck'.

If the 'learner's response was correct, the 'teacher' would move on to the next group of four word pairings. If the 'learner's' response was incorrect, the 'teacher' would deliver a shock through the console apparatus that was in the 'teacher's' room.

The console apparatus consisted of 30 toggle switches set at 15 volt increments. Therefore, the toggle switch on the left most side of the console was set at 15 volts, while the toggle switch on the far right side of the console indicated a charge of 450 volts.

In addition, there were various word-descriptors paired with some of the different levels of voltage charge. Running from left to right, these word descriptions went from: 'slight shock' up to: 'severe shock' and 'XXX.

When one of the toggle switches was depressed, a number of things would happen. First, a small bulb above the switch would turn red, then an electrical-like buzzing sound would be heard, followed by: The flashing of a slightly larger blue light that was centered above the toggle switches and their accompanying bulbs and was labeled 'voltage energizer'; a voltage meter indicator would swing to the right; and, finally, various relay-switching sounds would be heard.

When the 'learner' gave an incorrect response to the word-pairing association test, the 'teacher' was instructed to read out the level of the voltage that was being administered. The purpose of this instruction was to remind the 'teacher' what the level of the shock was that was being administered.

'Teachers' were told that if 'learners' were to make a sufficient number of mistakes, the 'teacher' should continue on through the 30 increments of shock to the final level of 450 volts – 'XXX.' If additional mistakes were made beyond the 450 volt level, then the 'teacher' would again depress the 450 volt toggle switch for each successive mistake, and this latter protocol would stay in effect for three more rounds of punishment at which point the experimental run would be terminated by the experimenter.

Whenever the 'teacher' displayed any reluctance – verbally or otherwise – to continue on with the experiment, the person conducting the experiment would issue verbal prompts to the 'teacher' to return to the experiment. For instance, the experimenter might say: (1) "Please go on;" Or, (2) "The experiment requires that you continue;" Or, (3) "It is absolutely essential that you continue;" Or, finally, (4) "You have no other choice, you must go on."

The foregoing prompts would be used in sequence. The first prompt noted earlier would continue to be used as necessary until it no longer seemed to work. At that point, the second prompt would be employed until it no longer appeared to work at which point the third prompt would be used, and so on.

If, at some point, the 'teacher' stated words to the effect that the 'learner' did not seem to want to go on with the experiment, the individual conducting the experiment would respond with: "Whether the learner likes it or not, you must go on until he has learned all the word pairs correctly. So please go on."

During early pilot studies for Milgram's learning experiment, no sounds could be heard from the 'learner's room. Under such circumstances, Milgram discovered that almost all of the participants were prepared to run through the entire array of 30 toggle switches with little, if any, hesitation.

When some sort of feedback came from the 'learner's' room after a given level of shock was administered, the situation changed. When the 'teachers' heard grunts, cries, pounding, or protests from the 'learner's' room, the 'teachers' would often begin to exhibit signs of reluctance with respect to continuing on giving progressively higher levels of shocks.

Nothing would be heard from the 'learner's' room until the fifth round of shocks – 75 volts. At this point, a grunt of sorts could be heard.

Similar sounds could be heard from the 'learner's' room at 90 and 115 volts after mistakes were made and the appropriate toggle switch was depressed. However, when the level of punishment reached 120 volts, the 'learner' could be heard to yell out that the shocks were painful.

Painful groans would emanate from the 'learner's' room at 135 volts. At the tenth level – 150 volts – the 'learner' would be heard to say: "Experimenter, get me out of here! I won't be in the experiment anymore!"

As the volt level rose, the intensity of the protests coming from the 'learner's' room also increased. At 180 volts, the 'learner' would be heard to say: "I can't stand the pain," and as the level of voltage works its way to 270 volts, there are screams of pain coming from the 'learner's' room.

In addition, from 150 volts onward, the 'learner' indicates that he no longer wished to participate in the experiment. Finally, at 300 volts, the 'learner' would state that he will not answer any further questions.

When the 'learner' stopped responding to the word-pairing task, the 'teacher' would be informed by the person conducting the experiment that the absence of a response must be treated in the same way as if it were an incorrect answer. Therefore, if no word-pairing response were heard within a period of 20 to 30 seconds, the 'teacher' would be required to depress the next appropriate voltage switch when there was no response to a given word-pairing prompt.

Even when there was no response from the learner with respect to a given word-pairing task, sounds of pain would still be heard from the 'learner's' room following the depressing of a toggle switch. This continued up to the 315 volt level when the 'learner' would scream out in pain and, then, once again indicated that he no longer wanted to participate in the experiment.

When volt levels above 330 volts were reached, the 'learner' would not be heard from again. This was true both with respect to the word-pairing prompts, as well as in relation to either screams of agony or protests of one sort or another.

Between 150 volts and 330 volts, if a 'teacher' asked whether, or not, the administering of shocks might lead to significant damage in the 'learner', such inquiries would be met with a standard reply by the person conducting the experiment. More specifically, the experimenter would say: "Although the shocks may be painful, there is no permanent tissue damage, so please go on."

The primary measure for the 'learning/memory' experiment was the level of shocks that any given subject – 'teacher' -- was prepared to give before discontinuing with the experiment. Thus, the possibilities ranged from: 'zero' --when a person was not prepared to administer even one shock – to: 450 volts, when a person was prepared to continue depressing 30 successive toggle switches and deliver shocks until the experiment was concluded by the experimenter.

Three groups of individuals – namely, psychiatrists, college students, as well as middle-class adults who were from different occupational backgrounds – were asked to predict how they might have reacted if they had participated in the experiment as 'teachers.' This question was asked after they had been provided with an overview of the 'learning/memory' experiment.

The mean maximum shock level that the psychiatrists believed they might administer was 8.20, or a little over 120 volts. The college students and the middle-class adult group both indicated that they might have been ready to discontinue the experiment somewhere near the 135 volt level.

The foregoing three groups, along with several other groups (e.g., graduate students and faculty members from various departments of behavioral science) were asked to predict how any given sample of 'teachers' might react to the 'learning/memory' experiment. On the one hand, these groups of individuals tended to indicate that they thought most 'teachers' would not venture beyond the 150 volt or tenth level of shocks, and, on the other hand, the same groups indicated that they believed that only one or two individuals from any sample might be prepared to carry out the experiment through to the 450 volt level.

Although a number of different versions of the 'learning/memory' experiment were run at different times in order to study one or another variable (e.g., the physical proximity of the 'teacher' to the 'learner and what, if any, impact such proximity might have on the actions of the 'teacher.'), the basic experiment that has been outlined in the previous pages showed that, on average, 24 individuals out of a sample of 40 people (roughly 65 %) were prepared to continue the experiment until the 450-volt level and beyond. This result occurred again and again across differences of: gender, age, educational background and variation in occupations.

The individuals who continued on with the experiment until the very end often – but not always -- exhibited signs of: concern; uncertainty; agony; resistance, and anxiety during the course of the experiment. In addition, these same individuals often – but not always -- showed signs of relief, and, as a result, displayed indicators of releasing tension in a variety of ways (e.g., sighs, fumbling with cigarettes, and/or mopping their brows) once the experiment had been concluded.

However, there were some individuals within any given sample who would remain relatively calm both during the experiment and after the experiment concluded. These individuals showed little, or no, discomfort throughout the entire process.

Four versions of the foregoing experiment were run by Professor Milgram to study the manner in which varying degrees of proximity might affect the actions of 'teachers'. In general, Professor Milgram found that the more proximate the relationship between the 'learner' and the 'teacher' was, the more likely it was that 'teachers' were prepared to discontinue the experiment prior to its conclusion.

However, even in the most physically proximate of these experimental variations – that is, in the case when a 'teacher' was required to forcibly hold the hand of the 'learner' on a metal plate as a shock was administered – nonetheless, there were still 30 percent of the individuals (12 people) in different samples of 40 individuals who were prepared to see the experiment through until the experiment was brought to a halt by the individual conducting the experiment. Moreover, 16 of the 40 individuals in these proximity experiments were willing to administer shocks by holding a 'learner's' hand to a plate through to the 150 volt level, while 11 others were, to varying degrees, willing to continue on above the 150-volt threshold despite cries of agony and protests from the 'learner.'

The foregoing results have been replicated in a number of other countries. In other words, the Milgram experiment is not merely a reflection of American society, but, rather, the experiment seems to given expression to behavior that is common in a variety of different societies.

The people – whether psychiatrists, undergraduates, graduate students, faculty members in departments of behavioral science, or middle-class adults – who had been asked to estimate how 'teachers' would respond in the 'learning/memory' experiment were all wrong … substantially so. Almost all of the aforementioned groups of individuals had indicated that the 'teachers' likely would be prepared to break off from the experiment somewhere in the vicinity between 120 and 150 volts, or slightly higher, and almost all of them indicated that only 1 or 2 individuals across a set of samples might be prepared to continue on with the experiment until the 450-volt level.

Shockingly, when the 'learner' was in a separate room, nearly two-thirds of the 'teachers' were prepared to carry on with the experiment until the bitter end. Furthermore, even in the experimental variation in which 'teachers' were required to hold a 'learner's' hand down on a metal plate in order to deliver a shock, 30 percent of the 'teachers' were prepared to continue on with the experiment until its conclusion, and nearly two-thirds of the subjects – i.e., teachers – were ready to carry on with the experiment until the 150-volt level (the tenth level) despite the fact that the 'learners' had been giving indications of pain since the 75-volt level (the fifth level).

When the 'learning/memory' experiment was conducted in Bridgeport with no discernible connection to Yale University, the results were somewhat different than the experimental outcomes in the Yale laboratory. Approximately 48 % of the 'teachers' (about 19 people) were prepared to carry on with the experiment through to the 450-volt level, compared with 26 people in the experiments conducted at Yale.

There were additional variations of the 'learning/memory' experiment. 'Teachers' responded somewhat differently across such variations.

At the end of the experiment – irrespective of whether a subject opted out of the experiment at some point or carried on with it until the end – there was a debriefing period. During this phase of the research project, the subjects were let in on the actual nature of the experiment.

Among the things that the subjects were told was that the 'learner' never actually received any shocks. The only person to receive a shock during the experiment was the 'subject' when he or she was allowed to experience what a 45-volt – third level -- shock felt like prior to the point when the 'learner' was strapped into the 'electric chair.'

In addition, subjects were told that they did not become the 'teacher' by chance. The process of determining who would be the 'teacher' and who would be the 'learner' had been rigged to make sure that the 'subject' – the one whose behavior was being studied during the experiment – would always be the 'teacher' … the one who administered the 'shocks'.

During the debriefing process, subjects were also told that the 'learner' was a confederate of the experiment. That is, the learner was someone who was made to appear as if he were one of the experimental subjects, when, in fact, he was merely playing a role.

If a given subject had decided to opt out of the experiment before it reached its conclusion, that person was debriefed in a way that would lend support to that person's decision to defy the experimental process. On the other hand, if a subject happened to be one of the individuals who went all the way to 450 volts, that individual was told that such behavior was 'normal.'

While, statistically speaking, what the latter sorts of subjects were told might be true -- given that two-thirds of the subjects in the basic 'learning/memory' experiment continued on with the experiment to the 450-volt level -- Professor Milgram was continuing to manipulate the situation because at the time he ran the experiment he really didn't know why subjects were doing what they were doing. The 'obedience' theory arose after the experiment had been completed.

Consequently, Professor Milgram not only had deceived the subjects prior to and during the experiment. He continued to deceive them – and, perhaps, himself – once the experiment had been concluded because he was feeding those subjects a story rooted not in understanding but in ignorance.

Is it really 'normal' for people to be willing to continue to administer what they are led to believe are very painful shocks? Is it really 'normal' for a psychologist to induce people to believe that they are administering such shocks and that they are being permitted by psychologists and a prestigious university to continue on with such a process?

Is it 'normal' for subjects to be told that they have been betrayed by a someone who operates from within a prestigious university and, then, told – by implication – that it is perfectly normal for those acts of betrayal to be perpetrated in relation to people outside the university? Is it really 'normal' for psychologists to induce people to behave in a pathological way and, then, for those people to be told that the behavior that has been manipulated into existence is a reflection of the subject's behavior rather than a collaboration among the university, the psychologist, and the subjects in which the former two participants were fully informed, whereas the subjects were kept in the dark?

Whose behavior was really being reflected in the experiment? Was it primarily that of the subjects whose trust had been betrayed by the experimenters, or was it primarily the behavior of the experimenters who were engaged in deception, manipulation, and inducing people to commit pathological acts?

Irrespective of the results from any given variation on the basic 'learning/memory' experiment, Professor Milgram sought to explain the experimental outcomes from the same perspective. More specifically, Professor Milgram believed that the phenomenon manifested during the 'learning/memory' experiment was one of: 'obedience.'

To explain the mechanism of 'obedience,' Professor Milgram refers to the idea of an 'agentic shift' that, according to him, occurs when people enter into an authority system. The phenomenological character of this shift involves a psychological/emotional journey from: viewing oneself as the source of the purposive agency of one's acts, to: viewing oneself as serving the interests of another agent – the individual who represents authority or hierarchy of some kind.

Notwithstanding the foregoing considerations, it is not clear that the aforementioned shift in attitudes concerning agency is a function of a desire to be obedient due to the presence of a system of authority. One could acknowledge that some form of 'agentic shift' in attitude might be taking place as one switches from one situation (in which an individual acts as his or her own agent) to another situation (one in which the same individual serves the interests of some form of authority or hierarchy), but such a shift in agency might give expression to something other than a desire to be obedient in the presence of hierarchy and authority.

When someone defers to another individual's perceived understanding, knowledge, or wisdom, the act of deferring is not necessarily a matter of displaying obedience. Rather, the individual who is doing the deferring is willing to cede his or her intellectual and/or moral agency to someone who the former person believes has relevant, superior knowledge in relation to a given situation.

The deference is not a matter of a person indicating that he or she will be obedient to the wishes of another individual. The deference is a matter of setting aside one's own ideas with respect to how to go about engaging a certain situation and, as a result, being prepared to go along with the understanding of the individual whom one believes to have competency in a given matter.

There is a difference between 'authoritativeness' and 'authority' … although we are often taught to consider the latter to be a sign of the former. Ceding intellectual and moral agency to the perceived authoritativeness of another individual is not about the phenomenon of 'obedience' or 'compliance' but, instead, such a ceding process is a 'coping strategy' intended to produce the best moral and intellectual outcome with respect to a given set of circumstances.

In various articles, as well as in his book: *Obedience to Authority*, Professor Milgram argued that there is an evolutionary advantage to being obedient to authority and hierarchy. Actually, if there is any sort of evolutionary advantage to be considered, it is one in which 'competency' prevails in a situation and not, necessarily, authority or hierarchy per se.

One is inclined to suppose that historical evidence is likely to indicate that actual competency in any given situation might stand a better chance of leading to a survival advantage than does authority or hierarchy considered in and of themselves. Ceding moral and/or intellectual agency to another person is an epistemological process in which one is weighing one's options with respect to attempting to successfully navigate a certain existential terrain with which one is confronted, whereas the issue of 'obedience' and 'compliance' has to do with someone's belief that one is obligated to surrender one's agency to the agenda of the person or persons who present themselves as authorities or who are representative of some sort of powerful hierarchy.

What is the relationship of an 'average' individual and a prestigious university like Yale with respect to the issue of taking part in a psychological experiment? Is Yale prestigious because it represents authority and hierarchy, or is Yale prestigious because people have come to believe – rightly or wrongly (and I state this latter possibility from the perspective of a Harvard graduate) – that people at Yale actually know something about the universe.

If someone at Yale says words to the effect that 'although the shocks delivered will be painful, nonetheless, there will be no serious tissue damage that will result from such shocks', does a subject exhibit obedience to such a statement because the experimenter is perceived to be an authority figure and a representative of a powerful hierarchy, or does a subject defer to such a statement because the subject believes that the experimenter knows what he or she is talking about, and, therefore, such presumed competence takes one off the moral and intellectual hook, so to speak, with respect to what constitutes appropriate behavior? Isn't a subject weighing the likely competency of the experimenter and deferring to that, rather than becoming obedient to authority per se?

When a double-blind experiment is set-up in order to eliminate the possibility that either the expectations of the experimenter and/or the subjects will prejudice or bias the nature of the experimental outcomes, the purpose of taking such precautions does not necessarily have anything to do with issues of authority figures or hierarchies (although in some cases this might be so). Instead, those precautions are taken due to the fact that experimenters and subjects engage any given experimental setup through an epistemological or hermeneutical perspective and, as a result, epistemic or hermeneutical expectations concerning the nature of an experiment can distort or bias those understandings in a manner that taints experimental outcomes.

When I was an undergraduate, I participated in quite a few psychological experiments in exchange for much needed money. I don't ever recall thinking that the experiments were being run by authority figures or members of a powerful hierarchy, and I don't recall ever perceiving those people to be authority figures or members of a powerful hierarchy.

I do recall trusting those people to know what they were trying to accomplish. I do recall considering those individuals to be intelligent individuals who were trying to find out whether, or not, certain things were true.

When I participated in those experiments, I might have conceded some facet of my intellectual and moral agency to the experiment because I perceived the individuals running them to be competent researchers, but I had no idea where those people fit into the scheme of things with respect to issues of authority or hierarchy at Harvard.

I remember one experiment in which I participated as an undergraduate, and, to this day, I'm not really sure what those people were up to. There were two people, a man a woman, who introduced themselves as researchers of some kind … I forget what their credentials were – if they offered any at all.

I found out about the experiment from the same bulletin board that I found out about all the other experiments in which I took part. However, the 'experiment' was run in a private home in Cambridge rather than in a laboratory on the Harvard campus.

The nature of the experiment had a certain resonance with the Milgram experiment. Essentially, I was given a small device that delivered shocks, and I can assure you that the shocks were quite real.

Although the shocks were delivered by one of the two individuals present who were conducting the experiment, I was the one who was put in control of the level at which shocks could be administered. Once I had experienced one level of shock, I was asked if I would be willing to 'advance' to the next level.

The foregoing process went on for a number of rounds. I don't know what the actual level of voltage was when I terminated the process, but it was strong enough to cause spasms in my hand where the shocks were administered.

Once I indicated that I had had enough, the 'experiment' was over. I was paid and went on my way.

Many years later I learned about the psychological experiments that the 'Unibomber, Ted Kaczynski, had allegedly been involved in when he attended Harvard. Given the mysterious nature of the experiment outlined above, I wonder if I dodged a bullet of some kind since it is possible that Kaczynski was 'recruited' for the diabolical sorts of experiments that he subsequently endured by, first, volunteering for an experiment similar to the experiment that I encountered and that has been outlined above.

Whatever the actual intentions of the two individuals who conducted the foregoing experiment, I didn't look at those people as authority figures or as individuals who were part of some sort of powerful hierarchy to whom I owed obedience. I had a strange job for which I was being paid, and I trusted that the two individuals would not place me in harm's way … although there really was no reason for me to trust them other than the fact that they presented themselves as researchers, operated out of a very nice home, and I found out about them through a bulletin board at Harvard.

A public announcement concerning an experiment appears in a newspaper or such an announcement is received in the mail. The names: 'Stanley Milgram' and the 'Department of Psychology' at 'Yale' are mentioned in the announcement.

Why should anyone feel that she or he should be obedient in relation to any of those names? Stanley Milgram might have been projecting onto his subjects when he supposed that visions of authority and hierarchy would be dancing through the minds of those individuals when they responded to the announcement concerning the 'learning/memory' experiment.

When a subject shows up for the arranged experiment, he or she is not necessarily met by Stanley Milgram. Rather, the subjects are greeted by some 'underling' – who, unknown to the subjects, is actually a biology teacher from an area high school.

Is wearing a white lab coat at Yale University and carrying a clip board enough to induce someone to become obedient? Not necessarily, but it might be enough to induce a given 'subject' to be prepared to cede a certain amount of intellectual and moral agency to such a person who is likely to be perceived as possessing an understanding of the experiment being run and that when that person says 'no serious tissue damage will result from the shocks' being delivered during the experiment, one defers to such a statement because one believes (or hopes) the individual knows what he is talking about … and not because that person is an authority figure or the representative of a powerful hierarchy.

For example, Professor Milgram attempts to explain the difference in results (48 % versus 65 % of the subjects went to the 450-volt level) between the Bridgeport edition of the 'learning/memory' experiment and the Yale version of the same experiment as being due to the fact that one would expect that subjects would be less likely to be willing to be obedient to, or compliant with, a company – namely, Research Associates of Bridgeport – than they would be willing to be obedient to Yale University, a powerful institution. Alternatively, one also could explain the differences in experimental results between the two editions of the 'learning/memory' experiment by supposing that subjects might consider the members of Research Associates of Bridgeport to be less competent or knowledgeable (or less trustworthy) than researchers at Yale and, therefore, those subjects might be less willing to cede their intellectual and moral agency to the Bridgeport group than the Yale group, and, therefore, more willing to discontinue the experiment in the former case rather than in the latter instance.

Research Associates of Bridgeport – a complete unknown to subjects – might be considered to be willing to let people be injured during the course of an experiment … after all there are all too many businesses that will hurt people for the sake of profit. On the other hand, Yale University – a much better known entity – might be seen as an organization that would not be willing to let such things occur … or, so, the thinking might go.

None of the foregoing considerations necessarily has anything to do with issues of authority, hierarchy, or obedience. The foregoing issues have more to do with what is known or believed or trusted and, whether, or not, one believes that one can cede one's intellectual or moral agency to someone without that ceding process being betrayed.

Throughout the Milgram 'learning/experiment,' subjects are assured that no harm will come to the 'learners.' Yes, the 'learners' might experience some painful shocks, but the subjects are always led to believe – whether implicitly or explicitly – that the 'learners' will be okay.

The issue is not 'obedience' but 'trust'. People are more likely to be willing to cede their intellectual and moral agency when, in some manner, they trust the individual to whom that agency is being ceded.

The researchers at Yale were trusted because they were perceived to have competency with respect to the 'learning/memory' experiment, and this included such matters as whether, or not, anyone might be seriously harmed through that kind of an experiment. However, the point at which someone will retrieve the ceded intellectual and moral agency will vary from person to person.

Some people in the 'learning/memory' experiment were not prepared to let the experiment run very far before they decided that they – rather than the researchers at Yale University – should be the agents who decided how much pain was enough irrespective of what the experiment required. Other individuals were prepared to cede their moral and intellectual agency for a longer period of time … and some of these individuals were ready to continue ceding their moral and intellectual agency until the experiment was called off by the experimenters.

When subjects began to question whether, or not, it was wise to continue to cede their moral and intellectual agency to the researchers as a result of the feedback the 'teachers' were receiving from the 'learners' concerning the pain that was caused when the toggle switches were depressed, the person conducting the experiment was always present to reassure the subject in a calm, non-threatening manner, that the subjects needed to continue on with the experiment and, thereby, the experimenter sent the implicit message that everything was okay despite the reports of pain and protest from the 'learner.' Furthermore, when the 'teachers' mentioned the fact that the 'learners' were indicating that they did not want to participate in the experiment any longer, the person running the experiment indicated that the 'learner's' wishes were irrelevant to the process, thereby, once again, sending a message to the 'teacher' that despite the pain and protests, it was okay to continue on with things since, implicitly, the experimenter was communicating the message that no one would be, hurt in any serious fashion, despite the cries and protests of the 'learner'.

The struggle that 'subjects' went through in the Milgram 'learning/memory' experiment was not one of whether, or not, to remain obedient to an authority figure or to the representative of a powerful hierarchy. The struggle was about whether, or not, to continue ceding one's moral and intellectual agency to someone who might not necessarily know what they were doing or to someone who might not be trustworthy with respect to protecting everyone's interests.

The more that 'learners' howled with pain and protested the situation, the more 'teachers' were reminded of the nature of the problem with which the latter individuals were faced. Should they continue to cede their moral and intellectual authority to an individual who seemed indifferent to the pain being experienced by the 'learner?'

Did it make sense to continue to trust that kind of an individual – i.e., the experimenter -- to be the keeper of the 'teacher's' moral and intellectual agency? If, and when, an individual broke from the experiment and refused to continue on with the shocks, that person had reached the point where she or he had made the decision to reclaim the moral and intellectual agency that had been ceded to the experimenter at the beginning of the experiment.

Many of the subjects never reached that point. There might have been many reasons for their failure to reclaim their intellectual and moral agency.

For instance, a subject might be experiencing difficulties with: 'self-image;' or, not wanting to have to deal with the possible embarrassment that might be experienced because one chose to opt out of the experiment; or, not wanting to disappoint another individual; or, lack of assertiveness; or, the possibility that by opting out, one might be interfering with the acquisition of knowledge; or, the belief that one should finish a job for which one was being paid; or, not wanting to waste the time of the experimenter by failing to complete the experiment; or, not wanting to have to deal with the possible unpleasantness that might ensue from the conflict or hard feelings that might arise from not continuing on with the experiment. None of the foregoing factors necessarily has anything to do with issues of 'obedience,' 'authority,' or 'hierarchy.'

When the biology teacher who played the 'role' of the experimenter witnessed the distress he was causing the 'teachers' by continually prompting the latter individuals to continue on in the experiment despite their obvious anguish and uncertainty with respect to causing the 'learners' pain, did that biology teacher continue on with what he was doing out of a sense of obedience to Stanley Milgram and Yale University? Surely, the whole experimental set-up would have been explained to him prior to the running of the experiment, and irrespective of whether, or not, the high school biology teacher was being paid for his participation or he was volunteering his services, he probably did not accept the job out of a sense of obedience to either Milgram or the university but did so for other reasons … reasons (such as curiosity, friendship, wanting a challenge, and so on) to which he conceded his intellectual and moral authority.

Even more to the point, Stanley Milgram did not continue on with witnessing the pain of the 'teachers' as they struggled with their moral and intellectual dilemma out of a sense of obedience to Yale University.

He was pursuing his own research interests quite apart from issues of authority and hierarchy relative to Yale University.

Professor Milgram continued to shock his subjects in experiment after experiment after experiment via the moral and intellectual struggle to which he subjected them in the 'learning/memory' research project. He did so because he had conceded his intellectual and moral agency to pursuing a certain kind of research project, and this was done quite apart from issues of obedience, authority, or hierarchy.

What implications, if any, follow from the Milgram 'learning/memory' experiment with respect to the present book? I believe the implications are many and quite direct.

Like the Milgram experiment, the American people have been deceived about and manipulated with respect to the nature of the allegedly democratic experiment that was given expression through the Philadelphia Constitution … and evidence supporting such a contention has been presented in the first seven chapters of this book. More specifically, the American people have been told that the constitutional process is an exercise in self-governance when nothing could be further from the truth since the ones conducting the experiment have near total control over what transpires within the framework of that experiment.

The reality of the situation is that the Philadelphia Constitution and its concomitant ratification process are an exercise in inducing the subjects in the democratic experiment (i.e., the people) to cede their moral and intellectual authority to the experimenters – that is, the individuals who are conducting the experiment (i.e., the government authorities). Once ceded, the experimenters make use of an elaborate console apparatus that has been constructed by the experimenters (the process of governance) to allow the people to deliver shocks to one another by flipping this or that switch of governance and constitutionally permitted legal maneuvering.

Like Milgram, the individuals conducting the American experiment in democracy, have – after the fact -- put forth the idea that the whole set up of governance is a function of the obedience and sense of obligation that people should feel in the presence of what has been described as “legitimate” authority and hierarchy. Moreover, like Milgram, the ones conducting the experiment in democracy, debrief the citizens in a way that is intended to persuade the latter individuals that being willing to depress toggle switches that those individuals believe will harm other people is quite ‘normal’ and that it is perfectly ‘normal’ for the ones conducting the experiment to permit this to happen and that it is perfectly ‘normal’ for the organizational framework within which this all transpires (Yale University in the case of Milgram and the Philadelphia Constitution in the case of the ones conducting the experiment in democracy) to permit that kind of pathology to continue.

Although the subjects in the Milgram experiment never actually administered any shocks – except to themselves – Milgram, himself administered all manner of emotional and psychological shocks to the individuals he had manipulated to participate in his experiment. Undoubtedly, Professor Milgram believed that the purposes for which the experiment was being conducted were noble ones … even if he didn’t actually understand what was going on while he was running his experiments.

Similarly, the individuals – e.g., Madison, Washington, Hamilton, and 53 other individuals who concocted the Philadelphia Constitution – believed that their purposes were noble ones – even if they – like Milgram -- didn’t necessarily understand what they were doing. Furthermore, like Milgram, the Founders/Framers were the ones who established a framework that would deliver shocks of various levels of severity to individuals (e.g., Blacks, women, Indians, the poor, the disenfranchised) and, like Professor Milgram, those Founders/Framers (along with their subsequent apologists) sought to rationalize such a set up by pointing to the noble intentions with which their project was supposedly undertaken.

Like the administrators at Yale University in the 1960s, the members of the Continental Congress, looked the other way and permitted something unethical to take place. In other words, just as the members of the Continental Congress permitted the provisions of the Articles of Confederation to be violated by illegitimately transferring the issues surrounding the Philadelphia Constitution over to the ratification process, the Yale University administrators permitted provisions of common, moral decency to be violated through the manner in which the Milgram experiment was allowed to deceive and manipulate people, as well as the manner in which those experiments put their subjects through emotional and psychological turmoil.

The subjects involved in the experiment set in motion through the Philadelphia Convention (i.e., 'We the People') have the same choice that the subjects had in the Milgram experiment. They can continue to cede their moral and intellectual authority to people who do not have their best interests at heart, or those subjects can defy the ones conducting the experiment and opt out of that process.

As is the case in the Milgram experiment, whenever subjects (i.e., citizens) exhibit doubts about the pain that is being inflicted on people via the experiment in democracy, those subjects are 'handled' through the presence of a representative of the experiment (in the form of: government officials, the educational system, the media, and/or the court system). Whenever subjects begin to harbor doubts and are considering the possibility of retrieving the moral and intellectual agency that they ceded at the beginning of the experiment, such handlers, like the biology teacher in the Milgram experiment, say: (1) 'Please continue on;' or, (2) 'The experiment requires that you continue;' or, (3) It is absolutely essential, that you continue;' or, (4) 'You have no other choice, you must go on;' or, (5) 'Although the shocks may be painful, there is no permanent tissue damage, so please go on;' or (6) 'Whether the learner likes it or not, you must go on until he has learned all the word pairs [of democracy] correctly.'

Like the biology teacher in the Milgram experiment, such 'handlers' of democracy use the foregoing prompts – as well as other similar ones -- in a calculated sequence of increasingly rationalized responses that are designed to prevent subjects from retrieving the moral and intellectual agency that such subjects ceded at the beginning of the experiment. The foregoing 'handlers' of democracy are like the sirens of *The Odyssey*, singing seductive songs of vested interests, responsibility, and duty in order to lure unsuspecting sailors (subjects, citizens) to serve the agenda of the ones who are conducting the experiment.

There are, of course, some differences between the Milgram experiment and the experiment in democracy being run through the console of the Philadelphia Constitution. In the Milgram experiment, nothing more than words were used to attempt to induce subjects to continue ceding their moral and intellectual agency to the experimenters. Once subjects understood that the only thing preventing them from retrieving the moral and intellectual agency they had ceded to the experimenters were nothing other than the beliefs and trust of the subjects, themselves, then the subjects were free to disengage themselves from the experiment … although nearly two-thirds of those individuals were never able to reach this point of realization.

However, in the case of the experiment in democracy that was designed by the Founders/Framers (and continued on by their ideological heirs), realizing that one can retrieve one's moral and intellectual agency (as I did when I was on the bus going to Charlestown Naval Base for purposes of taking a physical to determine my readiness to serve the military during the Vietnam War), is not the end of the story. There are very real extra-linguistic consequences that will be inflicted on any of the subjects participating in the experiment in democracy who have an epiphany concerning the issue of ceding or not ceding one's moral and intellectual agency to the experimenters – that is, the ones who are conducting the experiment in democracy.

Economic sanctions, career sanctions, being socially ostracized, legal sanctions, police action, military intervention, and, of course, being demonized through the media all await anyone who seeks to defy the 'credibility' of the individuals conducting the experiment in democracy by trying to reclaim their moral and intellectual agency. Oftentimes – but not always -- verbal warnings of one kind or another will be given first, and then, when deemed to be necessary, sanctions of one sort or another will be applied in order to discourage the subjects in the experiment from reclaiming their moral and intellectual agency.

Another difference between the Milgram project and the experiment in democracy that was unleashed upon society through the Philadelphia Constitution concerns the size of the 'reward' that is associated with the respective experiments. $4.50 per hour in the

Milgram experiment pales in comparison to the thousands and millions of dollars that will be given to individuals who are willing to continue to cede their moral and intellectual authority to the people who are conducting the experiment.

In the Milgram experiment, only words were used to prevent people from reclaiming their moral and intellectual agency. Under those circumstances, nearly two-thirds of the subjects were willing to continue to cede their agency to the experimenters.

When money and other 'perks' enter the picture and are used to subsidize the experiment in democracy, many more than two-thirds of the subjects are likely to be willing to forgo their own moral and intellectual agency in order to continue benefitting, financially and materially, from the experimental set-up. When the punishments that can be brought to bear on individuals who seek to reclaim their moral and intellectual agency are factored in, one should not be surprised that very few of the subjects in the experiment in democracy ever arrive at the point of either wanting to opt out of such a project or to actively follow through on that kind of a desire.

One might venture to hypothesize that one of the reasons why nearly two-thirds of the subjects in certain versions of the Milgram experiment were willing to continue ceding their moral and intellectual authority to the individuals conducting the experiment is because in many societies – including America – people are conditioned from a very early age to cede their moral and intellectual agency to others -- whether these others are: parents, family, peers, teachers, religious figures, politicians, leaders, the military, or the media – who we are told are 'trustworthy.' The presence of a sense of duty in those cases is a function of the conditioning process that is used to induce people to continue on ceding their moral and intellectual agency to those who wish, for whatever reason, to control things by manipulating our sense of – possibly -- misplaced trust concerning them.

In August of 1971, Philip Zimbardo conducted an experiment known as the Stanford Prison Experiment. Apparently, Zimbardo didn't have any deeper insight into his 'prison' experiment than Milgram had with respect to his own 'learning/memory' experiment, and the reason I suspect that the foregoing claim is true is because Professor Zimbardo had to stop his experiment less than six days into a scheduled two week experiment due to serious, unforeseen consequences, and Milgram didn't come up with a theory that purported to explain his experiment (incorrectly I believe) until well after the experiment had ended.

As pointed out previously, the Milgram study is, I believe, an exploration into the realm of ceding and reclaiming moral and intellectual agency in relation to individuals who are (rightly or wrongly) trusted -- and, therefore, it is not (as Professor Milgram claimed) a study concerning the issue of 'obedience.' On the other hand, I believe that the Zimbardo experiment explores (although Professor Zimbardo does not understand his experiment in this way) what happens when people are ceded authority and, then, proceed to try to leverage what has been ceded to them in order to control other people.

Certain subjects in the Stanford experiment – namely, those who were referred to as 'guards' – were ceded moral and intellectual agency by Professor Zimbardo. What I mean by the foregoing statement is that although Professor Zimbardo was conducting the experiment, his experimental design required him to cede some of his own moral and intellectual authority to those who were playing the role of 'guards' so that the experimenters would be able to observe how, or if, such ceded agency would be used by the 'guards.'

For six days, Professor Zimbardo didn't understand the nature of the forces that he had set loose in his experiment. Finally, it dawned on him – and someone else had to bring him to such a realization – that he had to stop the experiment because what was taking place in the experiment was abusive.

Just as Professor Milgram was an active perpetrator of abuse in his 'learning/memory' experiment – although the 'dirty work' was carried out by the biology teacher who was the face of the experiment – so too, Professor Zimbardo was an active perpetrator of abuse in his experiment – even though the 'guards' in his experiment were the ones who were doing the actual 'dirty work.' I believe the foregoing contention is justified because Professor Zimbardo was the individual who had enabled some of the guards to do the abusive things they did since, as the individual who was responsible for starting and stopping the experiment, he was the one who ceded to the experimental subjects some of his own moral and intellectual agency in order to permit it to occur.

While Professor Zimbardo would not have understood what he was doing in the following terms, nonetheless, in effect, when he stopped the experiment, he was reclaiming his moral and intellectual agency. Professor Zimbardo, of course, did not see his actions – either at the start of the prison project or in relation to the termination of that experiment -- through the lens of ceding and reclaiming moral agency since he had a quite different theory that will be discussed and critiqued a little later on in the current chapter … but, first, let's take a look at the structural character of the Stanford Prison Experiment.

Like the Milgram experiment, the Stanford Prison Experiment begins with the placing of an advertisement in a number of newspapers. The ads are directed at college students (this is a different target subject pool than was the case in the Milgram 'learning/memory' experiment that wanted to study the actions of people from the general public), and the Zimbardo ad indicates that the proposed study involves some sort of prison experiment.

Those who choose to participate in the experiment will be paid $15.00 a day. Given that the subjects in the Milgram experiment were paid $4.50 for an hour of their time and given that nearly ten years have passed since that experiment had drawn to a close, obviously the value of a student's time is not considered to be worth much … except to those (i.e., the experimenters) who hoped to leverage the situation to gain empirical data that might be of value to them.

The experimental budget totaled just over $5,000 dollars. The money was provided by the Office of Naval Research.

The 14-day experiment is to take place in the basement of the Department of Psychology as Stanford University. A prison-like structure had been built in that location.

Approximately a hundred men respond to the newspaper ads. The potential candidates are interviewed extensively, and they also are administered a variety of psychological tests.

Based on the results of the foregoing interviews and tests, the larger pool of individuals is, then, whittled down to 24 individuals – the experimental sample group. The experimenters have attempted to eliminate anyone who they thought might skew the experiment … such as individuals who have medical or psychological problems, or people with a prior record of arrest.

As far as possible, the experimenters were trying to select average, normal, and healthy individuals. The experimenters were looking for subjects who, in a variety of ways, are fairly representative of middle-class students in general.

Not all of the subjects are full-time students at Stanford. Most of the subjects came from elsewhere in North America and were attending summer school in the Bay area.

The individuals who are finally selected for the experiment are divided into two groups – 'prisoners' and 'guards.' Assigning people to one or the other group is done by flipping a coin … heads and a student becomes a 'guard', while tails lands a student in the 'prisoner' group.

The 'guards' are not provided with any training. However, those assigned to that group do go through a relatively brief orientation process.

During the latter process, the 'guards' are told that while violence of any kind against the 'prisoners' will not be permitted, nonetheless, the 'guards' are tasked with maintaining law and order, and this includes not permitting any of the prisoners to escape.

There is one further point made to the 'guards' in the orientation process. The experimenters want the 'guards' to create a sense of powerless in the 'prisoners.'

According to Professor Zimbardo, the purpose of his project is to try to develop an insight into the sorts of changes that might take place within an individual – whether a 'prisoner' or 'guard' -- during the course of the experiment. However, the alleged 'purpose' of the experiment is just another way of saying that the experimenters are on a fishing expedition for data and have no clear understanding of what actually will transpire during the experiment … just as had been the case in the Milgram experiment.

Professor Zimbardo claims that he wanted to determine if it was possible, within the space of two weeks, for subjects – whether 'guards' or 'prisoners' – to assume new identities as a result of the circumstances in which they were embedded. The foregoing intention assumes that Professor Zimbardo understands the nature of identity to begin with – which I don't believe he did any more than most researchers do – and, in addition, Professor Zimbardo seems to have failed to consider the possibility that whatever changes in behavior that might be manifested during the two week period, such changes could be more a reflection of how various social and psychological dynamics can induce different dimensions of one and the same identity to manifest themselves rather than constituting changes in actual identity ... moreover, there is also the possibility that choice – that is, personal agency – could determine which dimension of identity is, or is not, manifested under those circumstances.

After signing release forms, the students who are assigned to the 'prisoner' group are told to be ready and available for the study beginning on Sunday, August 14, 1971. They are not informed about the nature of the means through which they would enter the experiment.

The way in which the experiment starts is, more or less, the same for each of the individuals who have been assigned to the 'prisoner' group. A police car arrives at the 'prisoner's' places of residence, and uniformed police officers wearing mirrored, aviator glasses bang on the door of the residence.

'Arrests' are made. Handcuffs and blindfolds are applied to the 'prisoners' – the blindfolds are used to disorient the 'prisoners' and prevent them from knowing where they are going.

The 'prisoners' are placed in the back seat of the cruiser. They are, then, transported to the basement of the Department of Psychology at Stanford University.

Once the 'prisoners' are led down a stairway to the 'prison area,' they are ordered to take off all their clothes. After this is done, the prisoners are told to stand with their arms against the wall with their legs spread apart.

A powder of some kind is thrown on the prisoners. They are told that it is a delousing agent.

Some of the 'guards' begin to make remarks about the size – or lack thereof – of the genitals of the 'prisoners.' Attempts by the guards to humiliate, embarrass, ridicule, and disempower the 'prisoners' have begun.

Eventually -- after a lengthy wait while remaining naked -- the 'prisoners' are given hospital-like, tan gowns to wear. Different numbers are printed across the front of the gowns of each of the 'prisoners.'

The 'prisoners' are not permitted to wear underwear. Consequently, whenever they bend over in their hospital-like gowns, their rear ends are exposed to whoever is nearby.

In addition, the 'prisoners' hair is covered with a nylon stocking. This particular part of the 'prisoner's' attire is intended to serve as the equivalent of the shearing of hair that prisoners experience when processed into actual prisons.

The 'prisoners' are given rubber clogs to wear on their feet. Moreover, a chain is placed around one ankle and locked as a constant reminded of the individual's status as a prisoner.

Once the 'prisoners' have been outfitted in the foregoing manner, their blindfolds are removed. Mirrors have been place against the wall opposite to the 'prisoners' so that they can view the transformation in appearance that has taken place.

'Prisoners' are told they must only refer to one another by the 'numbers' that appear on their hospital-like gowns. Furthermore, 'prisoners' are instructed to address the 'guards' as 'Mr. Correctional Officer.'

Events occurring in certain portions of the prison area outside the cells can be videotaped. The camera is hidden.

There is a camouflaged viewing area near the video camera. However, what can be seen and taped is restricted to the area in front of, and near, the location of the viewing area and camera.

Due to considerations of expense, the video camera does not run continuously. It will be turned on only in relation to certain occasions – e.g., during: 'prisoner' count-offs, some meal times, anomalous events of various kinds (such as 'prisoner' disturbances), and a few, scheduled family visits.

The cells of the 'prisoners' are bugged with microphones hidden in the indirect lighting assemblies for each cell. Many – but not necessarily all -- of their verbal comments are capable of being recorded in this way, but the hidden video camera is not able to provide a visual record of what takes place in those cells.

The 'prisoners' are presented with a list of 17 rules. In addition to the already mentioned requirements to refer to the 'prisoners' only by number and to address the 'guards' as 'Mr. Correctional Officer,' the 'prisoners' are also instructed to follow such rules as: Remaining silent during meals, rest periods, and at night, once 'lights out' has been announced; being required to participate in all prison activities; refraining from tampering with or damaging any of the private property in the prison area; reporting all violations of the rules to the guards; obeying all orders that are given by the 'guards; and standing whenever the 'prison' warden or superintendent visits a 'prisoner's' cell.

The 'prisoners' are informed that activities such as smoking or receiving mail and visitors are privileges that can be suspended. Moreover, in any one hour period, the prisoners are only allowed one, five minute visit to the bathroom and those visits will be regulated by the 'guards.'

Finally, the 'prisoners' are told that any failure to comply with the 'prison' rules could be followed by some sort of 'punishment.' Whether, or not, that punishment will occur and the nature of the punishment will be up to the 'guards.'

During the course of the experiment, one of the usual forms of punishment is to order 'prisoners' to do x-number of push-ups for their failure to observe one, or another, of the foregoing 17 rules.

However, an isolation box (a small closet in the wall opposite the row of small offices that have been converted to cells) also is available to punish 'prisoners' if the usual methods of punishment prove to be ineffective.

The isolation room is completely dark. It is only big enough to permit an occupant to stand, sit, or squat.

At the 'guards' discretion, the 'prisoners' can be ordered to gather together and commanded to voice, one at a time, the number on the front of their hospital-like gown. These 'prisoner' count-offs are done at certain times – such as in the morning and at night – to determine that all 'prisoners' are present and accounted for, but, eventually, the count-offs will develop a punitive character through which the 'guards' demonstrate to the 'prisoners' that the latter are completely powerless while the 'guards' are all-powerful.

'Prisoners' are told prior to the experiment that they are free to leave the 'prison' at any time. However, whether this rule will actually be honored is another matter, for like the Milgram experiment, there are certain procedures designed to induce 'subjects' to continue on with the experiment.

For instance, as previously indicated, one of the instructions given to the 'guards' is to prevent 'prisoners' from escaping. Presumably, escaping could be understood to be an indication that a 'prisoner' does not want to continue on with the experiment, and, yet, the guards have been instructed to stop the 'prisoners' from escaping ... so how free the 'prisoners' are to disengage from the experiment is a somewhat ambiguous issue.

The 'guards' are divided into three groups. Each group takes a different shift.

The 'guards are outfitted with: Uniforms, sunglasses, whistles, handcuffs and nightsticks. The 'guards' are required to keep a log that is supposed to contain a running summary of what takes place during each shift.

There is 'prison' warden and a 'prison' superintendent. The former individual is played by a psychology student working with Professor Zimbardo, while the 'superintendent' is played by Professor Zimbardo himself.

The foregoing two individuals – along with some other individuals -- are intended to serve in a 'prop'-like or supporting-role capacity in the experiment. They are not considered to be subjects in the experiment.

During the first day, the 'prison' warden informs the 'prisoners' that there will be a 'Visiting Night' in the near future. Subject to the discretion of the 'guards,' 'prisoners' will be permitted to invite members of their family or close friend to visit with them in the 'prison.'

The method of invitation will be through the writing of letters. The warden provides the 'prisoners' with pens for this purpose, but indicates that whether, or not, the letters will be sent will be up to the 'guards.'

The structural character of the 'prison' experiment is designed to induce the subjects who are 'prisoners' to cede their sense of agency much more than is the case with respect to the subjects who are 'guards.' Maintaining law and order through non-violent means is about the only requirement that the 'guards' are required to observe, whereas the 'prisoners' have been assigned a prison identity that is shaped by: 17 rules, plus confinement, and a humiliating dress code.

On the one hand, a sense of agency has not only been taken away from the 'prisoners', but the message is communicated that such 'agency' is not relevant to the experiment. On the other hand, the sense of agency of the guards has been enhanced because the 'guards' have been enabled by the experimenters to do whatever the 'guards' like in relation to the 'prisoners' as long as what is done is of a non-violent nature.

Unlike 'prisoners', 'guards' are implicitly informed -- through the structural character of the experiment -- that their sense of agency does matter to the experiment. The 'guards' are the ones who are to act upon the 'prisoners.'

The 'prisoners' are, in effect, told that in order for them to receive their $15.00 dollars a day, they must give up their sense of agency. The model 'prisoner' is one who has no sense of agency at all.

However, the 'guards' are, in effect, told that in order for them to be able to receive their $15.00 dollars a day, they can do whatever they like as long as they: Do not transgress the guidelines on violence, take their shifts, and help keep a log book. The model 'guard' is one who will 'run' with the sense of 'enhanced agency' that they have been given by the experimenters ... after all, the 'guards' have been provided with no sort of 'moral' or intellectual training to suggest that they should do otherwise.

The 'guards' are implicitly, if not explicitly, informed by the experimenters that their task is not necessarily to be moral 'guards' or 'decent people.' Instead, the 'guards' have been told that a central part of their job will be to make the 'prisoners' feel as powerless as possible and that such a sense of 'powerlessness' is the 'proper' mind-set for a prisoner.

The character of the experiment is heavily skewed toward reinforcing the sense of personal agency of the 'guards', while discouraging the sense of agency among the 'prisoners.' This is not about role playing within a defined social situational context or a matter of how the behavior of individuals will be a function of the situation or the role being played, but, rather, it is a matter of what happens to people when their sense of personal agency is manipulated.

If a person is successfully induced to cede his or her intellectual and moral authority – as is the case with respect to the 'prisoners' in the Stanford Prison Experiment -- then the agency of that sort of an individual will be impaired and, as a result, become dysfunctional. Under those circumstances, an individual is likely to become vulnerable to the whims of those who have retained agency in some fashion within that social framework.

If, on the other hand, a person is successfully induced to believe that his or her agency has been enhanced through the support of a system – for example, the people conducting the prison experiment – and that the only restriction on such an enhanced sense of agency involves avoiding violence, then this sort of individual has been freed or enabled to invest the situation with whatever aspects of his or her imagination or fantasy life that she or he likes ... as long as those investments are deemed to be consonant with the issue of non-violence. Therefore, the ‘role’ of the guard is ill-defined and open to the interpretation of the individual who is playing the role, while the ‘role’ of the ‘prisoner’ is defined in considerable detail and very little room, if any, is left to the interpretive discretion of the individual.

Consequently, the situation or social roles, per se, are not necessarily the determining factor with respect to the behavior of the guards. Rather, what shapes behavior is, in part, a function of what has happened to the realm of personal agency, and whether, or not, that sense of agency has been either undermined in dysfunctional ways or enabled to explore various psychological and emotional possibilities that have not been clearly defined by the experimental situation.

For example, within the first day of the experiment, there is struggle for dominance among some of the ‘guards’ with respect to how abusive (in a supposedly non-violent way) ‘guards’ should be toward the ‘prisoners.’ At least one of the ‘guards’ already has begun to be quite creative in the ways in which he is prepared to abuse the ‘prisoners,’ while some of the other ‘guards’ question whether those sorts of tactics are necessary.

Professor Zimbardo refers to the foregoing process as one of adapting to the role of being a ‘guard.’ However, since there is nothing in the ‘role’ of being a ‘guard’ that says one must seek to dominate other ‘guards’ or that one must be ‘abusive’ in creative ways with respect to the prisoner, then this is more a matter of ‘guards’ inventing that role in the image of their own personalities rather than of ‘guards’ adapting to some sort of situational role.

Furthermore, when ‘guards’ are observed to begin taking pleasure in relation to the abuse that they can inflict on other human beings, that pleasure is not a matter of adapting to the role of being a ‘guard.’ Rather, this dimension of pathology is something that some of the subjects brought with them to the experiment and chose to cede their moral and intellectual agency to during the course of the ‘prison’ project.

The foregoing facet of things indicates that whatever psychological tests and in-depth interviews have been conducted by Professor Zimbardo, they were not sufficiently sophisticated to provide insight into the pathological potential that can be present in the dynamics of ‘normalcy.’ Although the tests and interviews being alluded to above were able to eliminate a variety of people from consideration for the experiment, nonetheless, those same tests and interviews permitted a number of other individuals to slip through the interstitial cracks that were inherent in those evaluation procedures, and these latter individuals were part of the reason why the experiment had to be terminated earlier than scheduled – although, perhaps, the primary reason for the early termination of the experiment might have more to do with the conduct of the experimenters than with the conduct of the 'guards' since the former enabled the latter to transgress certain limits that had been contractually established prior to the experiment being run.

There is also a problem of ambiguity surrounding the meaning of non-violence in the Zimbardo experiment. For example, how does one address the question of: What is the difference between physically assaulting someone and emotionally, verbally, and psychologically assaulting that same individual?

To be sure, physical assault can cause pain, but pain can also be created through verbal and emotional assaults. Physical assaults can leave scars, but this is also true in the case of verbal and emotional assaults. Physical assaults can lead to post traumatic stress disorder, but a great deal of clinical data indicates that verbal and emotional assaults – if sufficiently persistent --can lead to the same sorts of problems.

Abuse is not just about the physical blows that are rained down on an individual. Just as importantly – and, perhaps, more so – is the emotional, psychological and verbal abuse that is directed toward a person.

Perhaps somewhat counter-intuitively, it is the emotional/psychological abuse within, say, a domestic relationship that induces a person to give up their personal agency and remain in a physically abusive environment. Consequently, I find it interesting that the 'guards' in the Stanford Prison Experiment were instructed to do, in a non-violent way, whatever they could to make the 'prisoners' feel completely powerless, and yet, the 'prisoners' were not instructed to do, in a non-violent way, whatever they could to hold onto their sense of personal agency.

There is also a certain amount of inconsistency in the Stanford Prison Experiment with respect to the rule that allegedly prohibits the use of physical violence in relation to the 'prisoners.' During a change of shift in the first day, or so, of the experiment, one of the 'guards' who is leaving the facility yells out to the 'prisoners' and asks them whether, or not, they enjoyed their 'count-offs' during that the 'prisoners' were forced to do all kinds of push-ups and jumping jacks when they didn't count off their 'prisoner' numbers in a way that was pleasing to some of the guards.

One of the 'prisoners' replies from within his cell that he did not enjoy the counts. In addition, the defiant 'prisoner' gives a raised, closed fisted salute and says: "All power to the people!"

Immediately, a number of 'guards:' Storm the cell of the 'lippy' prisoner, physically drag the 'prisoner' to the isolation room (i.e., storage closet), force the 'prisoner' into the closet, and lock the door. How is this not an act of physical violence?

Yet, there is no indication in his book, *The Lucifer Effect*, that Professor Zimbardo intervened in any way and informed the guards that they were not permitted to physically drag 'prisoners' out of their cells or force prisoners into closets. Therefore, while there was a purported rule on the 'books' that said that the 'guards' could not use physical violence, ambiguity was generated – both in the 'guards' as well as the 'prisoners' -- when the rule concerning non-violence was not strictly enforced by the people conducting the experiment.

Another one of the rules imposed on the 'prisoners' concerns the time limit for taking bathroom breaks. The 'prisoners' are only permitted five minutes to finish their business.

Some of the 'prisoners' complain. They claim they are too tense to finish things within the allotted five minute period, but the 'guards' insist on ensuring that the time-limit is observed.

Having experienced the pain of needing to urinate but, for whatever reason, not being able to, I can empathize with the dilemma of the prisoners. Consequently, intentionally inflicting this kind of pain on someone really is a form of physical violence, and, yet, nothing is said about the situation by the experimenters ... further enabling the 'guards' to physically impose a form of violence on the 'prisoners' despite the presence of the alleged 'no violence' rule.

During an overnight shift, the 'guards' -- in conjunction with the 'prison warden' (who is not an experimental subject ... although, perhaps, he should have been) – come up with a plan for greeting the 'prisoners' during the change in shift that is to take place at 2:30 a.m.. The 'guards' will stand near to the cells of the 'prisoners' and blow their whistles loudly.

The possibility that physically assaulting the ears of sleeping 'prisoners' at 2:30 in the morning might be considered by some to constitute a form of violence seems to escape the 'guards' and, even more inexplicably, the 'warden'. On the other hand, the experimenters already have looked the other way with respect to several forms of physical violence (e.g., dragging a 'prisoner' out of his cell and forcing him into an isolation closet or forcing 'prisoners' to urinate on command), and, therefore, permitting the 'guards' to push the envelope a little more in this direction is allowed to pass by the wayside without comment.

The rude awakening of loud whistles at 2:30 in the morning is followed by a series of physical punishments in the form of forced push-ups and jumping jacks when the 'prisoners' don't perform the count-offs of their numbers to the satisfaction of one, or more, of the guards. The possibility of being dragged off to the isolation room by the 'guards' silently haunts the horizons of the sleepy consciousness of the 'prisoners,' and, therefore, the push-ups and jumping jacks are performed under the threat of physical violence -- of a kind – for any acts of non-compliance ... another 'degree of freedom' extended to the understanding of the 'guards' with respect to the rule concerning no physical violence.

At another point during the first couple of days of the experiment, one of the 'guards' is startled by something that one of the 'prisoners' does and, as a result, pushes the 'prisoner' and, then, uses his fist to hit the 'prisoner' in the chest. Apparently, nothing is said to the 'guard' indicating that such an act is a violation of the 'no physical violence' rule.

On another occasion, a 'prisoner' narrowly misses having his hands – which are extended between the bars of the cell – struck by a nightstick wielded by one of the 'guards' who dislikes how and where the hands of the 'prisoner' have been placed. This is another show of physical violence that is ignored by the people running the experiment.

Again, within a day, or so, of the experiment's beginning, one of the 'guards' takes a cylinder of extremely cold carbon dioxide and sprays it into the cell of several prisoners in an attempt to force the latter individuals to move toward the back of their cell. This would seem to be an act of physical violence – and a potentially dangerous one -- but, apparently, the people running the experiment have labeled it as being something other than what it appears to be.

During another incident, three 'prisoners' are stripped naked and their beds are taken away. I am having difficulty envisioning how forcibly stripping three 'prisoners' naked would not involve acts of physical violence.

Another 'prisoner' has been complaining of a headache. According to Professor Zimbardo's own account of the situation, the 'prisoner' appears to be losing contact with reality and, as well, is expressing a desire to get out of the experiment.

The desire to withdraw from the experiment is ignored. Instead, when the 'prisoner' suddenly jumps up from the dinner table, runs, and, then, rips down the screen that is covering the video camera, he is dragged to the isolation closet, and once inside, the 'guards' continue to bang on the door of the closet with their nightsticks despite the prisoner claiming that the sounds are making his headache worse.

The foregoing incident fully displays the abusiveness and betrayal that permeates the experiment. Despite the fact that the 'prisoner' seems to be losing touch with reality, is behaving strangely, complaining of a headache, and expressing a desire to withdraw from the program, the guards are – without interruption by the people conducting the experiment -- permitted to manhandle the prisoner and commit physical violence against him (and his headache) by pounding their nightsticks on the door of the isolation closet.

To justify their behavior in the foregoing case, the guards go to the rule book that allegedly governs the behavior of the 'subjects' in the experiment. They point to the section involving the rule against 'prisoners' destroying private property in the prison area. However, they seem to be oblivious to the section of the rule book that prohibits the use of physical violence by the guards ... and, in part, they do this because the people running the experiment have enabled the 'guards' to violate those rules with impunity.

During another incident, one of the 'prisoners' refuses to do push-ups. A guard forces the 'prisoner' to go to the ground and, then, presses on the back of the 'prisoner' with a nightstick, telling the 'prisoner to do his push-up.

How is this not an act of physical violence in several ways? Yet, the people conducting the experiment let it go.

The individuals conducting the experiment might wish to object to the foregoing characterizations -- which depicts 'guards' as being permitted to use some forms of 'physical violence' despite the presence of the supposed rule about no physical violence. However, such objections – if they were voiced –tend to resonate with the arguments of those who have attempted to claim that the abuses at: Guantánamo, Abu Ghraib, Bagram Air Force Base, and any number of secret CIA facilities, do not constitute torture because the ones perpetrating the abuses don't agree with how other people define the idea of 'torture'.

In his book, *The Lucifer Effect*, Philip Zimbardo claimed that he made it abundantly clear to everyone that no physical punishment would be permitted during the experiment. Nevertheless, at almost every turn of his project there were forms of physical abuse and punishment that were taking place ... and the examples given here are but a small sample of the sorts of acts of violence that were permitted by the individuals conducting the experiment despite Professor Zimbardo's proclaimed policy of no physical violence or punishments ... apparently one, or more, individuals was in deep denial about the nature of what was transpiring in the experiment.

To be sure, being dragged out of a cell, or being required to urinate within a five minute period, or being forced into an isolation closet, or being forced to do push-ups and jumping jacks, or having loud whistles blown close to one while one is asleep, or nearly having one's hand's crushed by a nightstick, or being sprayed with pressurized carbon dioxide, or having nightsticks pounded against an enclosed space where a person, who seems to be detached from reality, has a headache, might pale in comparison with being gang-raped, killed, and the like, but all of the foregoing acts are points on a continuum of physical violence, and, therefore, to try to argue that because certain kinds of violence are not present that no violence is present at all is, I think, an exercise in sophistry.

At the very least, the individuals conducting the experiment left the 'guards' considerably in the dark with respect to the meaning of 'violence.' As a result, the 'guards' were enabled, if not encouraged, by people running the experiment to shade the possible meaning of 'violence' with various forms of creative abuse of their own – as long as those acts are not ruled out of order (and the people conducting the experiment, like the perpetrators of abuse or torture elsewhere – are serving as the judges in their own cause here). Despite a variety of considerations that might tend to indicate otherwise, Professor Zimbardo appears to believe that such acts are not of a physically violent nature.

If anything, the Stanford Prisoner Experiment suggests just how vulnerable and fragile human beings are when it comes to any sort of violence being perpetrated against them. One doesn't have to use extreme measures of physical violence in order to affect people's sense of personal agency.

Professor Zimbardo claimed that one of the research questions that his experiment sought to address was: What, if anything, would 'prisoners' do to reclaim their sense of personal agency? Unfortunately, the individuals running the experiment did everything they could to structure the character of the experimental situation in a way that was intended to convince the 'prisoners' that they had no right to a sense of personal agency ... that being able to have a sense of personal agency was not part of the experiment as far as the 'prisoners' were concerned... that in order to collect their pay, the only option that the 'prisoners' had was to play the role of a 'prisoner' as defined by the system.

Like the Milgram experiment involving 'learning/memory,' Professor Zimbardo had sought – unknowingly perhaps -- to manipulate subjects into believing that if they 'trusted' the people conducting the experiment, everything would be okay ... there would be no need to reclaim their sense of personal agency. Like the subjects in the Milgram experiment, the 'prisoner' subjects in the Zimbardo experiment have been led to believe that they should just continue to trust the people conducting the experiment and that nothing of an abusive nature would take place.

The subjects in the Milgram experiment were given the impression that they could discontinue any time they liked, and, yet, subtle steps were taken to prevent people from disengaging from the experiment. Similarly, in the prisoner experiment, the 'prisoners' were given the impression that they could withdraw from the experiment any time they liked, and, yet, subtle – and not so subtle -- steps were taken to prevent the 'prisoners' from remembering that they had such freedom ... for instance, even though the 'guards' were specifically instructed to make sure that the 'prisoners' had no sense of 'personal agency; nevertheless, there were no comparable attempts made prior to the actual running of the experiment to instruct the 'prisoners' that their duty was to assert themselves and defy the guards.

In the foregoing respect, the behavior of the 'guards' was shaped in part by the <u>presence</u> of instructions concerning how they were to engage the experiment. However, the behavior of the 'prisoners' was shaped, in part, by the <u>absence</u> of instruction with respect to the issue of personal agency ... instead they were given 17 rules that were intended to induce the 'prisoners' to forget that they could, if they wish, either discontinue the experiment or seek to reclaim their sense of personal agency by defying the 'guards' in a variety of non-violent ways.

Professor Zimbardo expresses surprise in his book that the 'prisoners' never used the threat of leaving the experiment as a bargaining tool in relation to the abusive treatment they were receiving at the hands of the guards. However, the foregoing perspective does not necessarily correctly describe certain aspects of the prisoner experiment (as will be discussed shortly), and, moreover, even in those facets of the experiment when his observation might be applicable, he never seems to ask himself about the reasons why the 'prisoners' appeared to forget that they supposedly had direct access to such a resource.

The ‘prisoners’ were attempting to be: ‘good,’ experimental subjects and meet the expectations of the experimenters by attempting to complete the experiment. They were assuming that the people conducting the experiment would not ‘hurt’ them, and when that trust was betrayed -- and there can be no question that that trust was betrayed in many different ways, not the least of which was for the experimenters to, on the one hand, proclaim a rule of no-violence and, then, on the other hand, to repeatedly allow that rule to be violated by the guards -- it already was too late because the ‘prisoners’ felt duty-bound to see the experiment through to the end, just as many of the subjects in the Milgram experiment had struggled to see their experiment through to the end -- despite the anguish, anxiety, and uncertainty they were experiencing – because the ‘subjects’ trusted the experimenters not to put anyone in harm’s way and because the subjects felt a sense of obligation to meet the expectations of the experimenters with respect to the completion of the experiment.

As noted previously, Professor Zimbardo claimed that one of the research questions that was to be addressed by the prisoner experiment was whether, or not, the ‘prisoners’ would try to reclaim their sense of personal agency and, if they did, then how would they attempt to do this? Why wasn’t a similar research question directed toward determining whether, or not, any of the ‘guards’ would attempt to reclaim their sense of personal agency and, if so, how would they attempt to do so?

Professor Zimbardo’s interest in the behavior of the guards arose only after the experiment began. Even then, that interest was shaped by his belief that the ‘guards’ had fallen under the influence of the powerful gravitational pull of the situation rather than being a function of the way in which people cede their personal agency to this or that force/individual and, thereby, allow their behavior to become influenced by the gravitational pull of a given situation.

Things don’t just happen. We make choices about whether, or not, to cede our personal agency to situations, forces, and other individuals ... although on many occasions, those decisions are made so quickly and in the midst of so many different sorts of ‘pulls’ and ‘pushes’ that the point of actual transition from: having control over personal agency, to: ceding that agency to a situation, set of forces, or group of individuals, is often only a diffuse, chaotic blur in our memory.

The 'guards' were encouraged to believe that they had considerable degrees of freedom with respect to their own sense of personal agency – a sense of agency that was augmented in a manipulative manner by the people conducting the experiment. Yet, given such an allegedly enhanced sense of personal agency, why didn't any of the guards remove themselves from the experiment – as one-third of the subjects in Milgram experiment had done – due to the abuse that was taking place during that experiment?

The fact of the matter is that both the 'guards' and the 'prisoners' were shackled to the same set of restraints, but in slightly different ways. The sense of personal agency of the 'guards' was manipulated by the researchers to induce the 'guards' to believe that it was okay to be abusive to the 'prisoners,' while the sense of personal agency of the 'prisoners' was manipulated by the researchers to induce the 'prisoners' to believe that it was 'normal' for them to be abused and it was 'normal' to be willing to stay within an abusive system.

Perhaps there are a number of questions here. Why do people stay in abusive relationships? Why are some people willing to abuse other human beings when they are enabled to do so? Why do people continue to stay within a framework that is abusive even if they choose not to directly participate in such abuse and, yet, do not do anything to stop that abuse either? ... something that occurred in relation to some of the 'guards', as well as in relation to most of those who helped conduct the experiment.

With respect to the second question above – that is: Why do people stay in an abusive environment if they do not wish to participate in the abuse but are not willing to do anything to curb the abuse? -- one possible, partial answer does suggest itself. For example, consider the following incident.

One of the guards is showing signs of wanting to disengage from the abuses that are being perpetrated by the 'guards.' The body language of the 'guard' involves hanging his head a lot and walking around the 'prison' with drooping shoulders – suggesting that he is feeling considerable shame.

This 'guard' is constantly volunteering to do things outside of the 'prison' ... such as going for food and coffee. Both his body posture and his interest in spending time away from the 'prison' during his shift indicate that he does not want to be a part of what is transpiring there.

Superintendent Zimbardo tells the warden – one of his students – to talk to the 'guard' and remind the 'subject' that he is getting paid to do a job. The 'guard' is told that in order for the experiment to work, the 'guards' must play their role in a certain way ... that is, with toughness.

Taking a 'guard' aside and telling him what his role is supposed to be is not a matter of a subject adapting to a certain role due to the structural character of the social situation or context. An active intervention of experimenter agency had to take place, and during this intervention the subject had to be provided with instructions concerning the nature of his role.

Interestingly, there were no such interventions in relation to the 'prisoners.' No one took them aside and told them that they should attempt to resist the abuses of the guards ... in fact precisely the opposite sort of intervention took place when Superintendent Zimbardo told the 'prisoners' on the grievance committee that met with him that they were responsible for their own troubles.

Consequently, the 'guards' and 'prisoners' were not necessarily individuals who automatically exhibited certain kinds of behavior because they, somehow, mysteriously adapted to a social role or to the structural features of a given social context – i.e., the prison. Instead, the behavior of the 'guards' and 'prisoners' was shaped, in many ways, through the active intervention of the people conducting the experiment – that is, through the process of personal agency that led to various acts of commission and omission by those who were conducting the experiment.

As unexpected as the results of the prisoner experiment might be with respect to the behavior of either the 'guards' or the 'prisoners,' what I find most surprising in that experimental project is the conduct of the researchers. They stood quietly by and allowed abusive behavior to be inflicted upon their subjects ... and one should not forget that individuals who are induced to commit abuses toward other people are also being helped to be abusive toward their own integrity as human beings – a reminder that applies to both the ‘guards’ and the ‘experimenters’.

Following a ‘prisoner’ revolt – which consisted of barricading their beds against the doors to their cells so that the ‘guards’ couldn’t get into the cells and which the ‘guards’ crushed within a fairly short period of time and, then, used as a rationalization to become even more abusive toward the ‘prisoners – the “prisoners’ formed a grievance committee. The grievance committee listed physical abuse among its complaints.

The committee met with Prison Superintendent Zimbardo. Their complaints are dismissed by the Superintendent who claims that the reason for a great deal of the physical hassling by the guards is due to the bad behavior of the ‘prisoners’ themselves and due to the fact that the ‘guards’ are new at their line of work.

Apparently, Superintendent Zimbardo has failed to take into consideration that the ‘prisoners’ are new to their line of work as well. Furthermore, whether knowingly doing so, or not, the Superintendent has lied to the ‘prisoners’ because if he has been watching the video and/or listening to the audio or viewing the proceedings from the hidden viewing area, he knows that the ‘guards’ have done many of the things they have done without any real provocation from the ‘prisoners’ but, instead, have done so because Superintendent Zimbardo has permitted them to do so – even to the point of continuously permitting the guards to push the envelope with respect to violating the ‘no violence’ rule.

I find it rather disingenuous of Professor Zimbardo when he claims that he is interested in seeing what steps the ‘prisoners’ will take to try to reclaim their sense of personal agency when he is simultaneously deeply involved in betraying their sense of trust by demonstrating that he personally approves of the manner in which the ‘guards’ are violating the no violence rule. The Stanford Prisoner Experiment is not a study about whether, or not, people will try to reclaim their sense of personal agency when certain aspects of their freedom are taken away. Instead, it is a study about the dysfunctional character of the psychological condition that results when individuals are betrayed and, then, subjected to continuous abuse. As a result, 'prisoners' are not really given any legitimate opportunity to regain or develop a sense of personal agency.

On another occasion, one of the 'prisoners' complains about feeling sick and wants to talk with the 'prison' warden. During the meeting, the 'prisoner' refers to the "sadistic" behavior of the guards and indicates that if things don't change, he wants out of the experiment.

The 'warden' follows the path blazed by Superintendent Zimbardo. He tells the individual that the 'prisoners' are the authors of their own misfortune.

Once again, despite the existence of a rule concerning physical violence, the various forms of physical violence being perpetrated by the "sadistic" guards are given a pass ... and the term "sadistic" is not an inappropriate descriptor under the circumstances. Moreover, despite being informed at the beginning of the experiment that the subjects are free to withdraw from the experiment at any time, the 'warden' does not ask the individual if he wishes to disengage from the experiment, but, as was the case in the Milgram experiment, steps are taken to keep the subject in the project.

The aforementioned 'prisoner' goes into an obscenity-laced rage. He demands to see the Superintendent.

The 'warden' tells Superintendent Zimbardo that the 'prisoner' seems deeply troubled by what is going on in the experiment and tells how the 'prisoner' apparently wants to discontinue the experiment. However, the 'warden' isn't sure whether the 'prisoner' is really serious about withdrawing from the experiment or is just saying that he wants out as a tactic of some kind.

Superintendent Zimbardo reports in his book that the 'prisoner' who entered his office is "sullen, defiant, angry, and confused." One of the first things the 'prisoner' says is that he can't go on with things.

The young man is told by the Superintendent – just as was the case in relation to the grievance committee meeting – that he is the author of his own misfortune. In addition, a person who had been recently released from San Quentin and who is helping out in a consulting capacity with the experiment and happened to be in the office when the 'prisoner' came in, begins to verbally abuse the prisoner indicating, among other things, that the little, white, punk sissy wouldn't last a day in a real prison.

Superintendent Zimbardo steps back into the discussion and reminds the 'prisoner' that he will not be paid for the experiment if he quits. The Superintendent asks the 'prisoner' if he needs the money, and the 'subject' indicates that he does.

The 'subject' is propositioned by the Superintendent. Why doesn't the 'prisoner' just cooperate from time to time and the Superintendent will see that the 'guards' won't hassle him.

The 'prisoner' is not sure that he wants to do that. The Superintendent responds with a further proposition that suggests that the 'prisoner' should have a good meal, reflect on the matter, and, then, if the 'prisoner' wants to quit, he can.

The foregoing process – consisting of several propositions and 'negotiations' (which are designed to induce 'prisoners' to remain part of the experiment) -- is not what the 'subjects' were told at the beginning of the experiment. They were told that if they wanted to leave they could, but as was the case in the Milgram experiment, words and warnings are used in the prisoner experiment to prevent 'subjects' from taking back their sense of personal agency.

In addition, the Superintendent seeks to manipulate the 'prisoner's' sense of personal agency in, yet, another way. Professor Zimbardo is telling the 'prisoner' that the Superintendent has the power to tell the guards to lay off the 'prisoner,' and the Superintendent further implies that if the 'prisoner' will stay with the experiment, the subject won't be hassled if the individual will just co-operate from time to time.

The foregoing exchange compromises the integrity of the experiment in several ways. On the one hand, if the 'prisoner' is under the impression that the guards won't hassle him if he co-operates a little, then, the purpose of the experiment will be tainted because it supposedly was designed to see what 'prisoners' would do if their sense of personal agency was taken away by the 'guards.' On the other hand, if the Superintendent actually were to take all of the 'guards' aside and tell them to go easy on the 'prisoner' this will also compromise the integrity of the experiment.

If the Superintendent has no intention of letting the ‘guards’ in on the proposition/negotiation process that has taken place in his office, then he is lying to the ‘subject.’ However, if the Superintendent does intend to say something to the ‘guards’ concerning the matter, then he has compromised his experiment.

Prior to meeting with Superintendent Zimbardo, the ‘prisoner’ had told the other ‘prisoners’ that he was leaving the experiment. When he comes back from the meeting, he tells the other ‘prisoners’ that the people running the experiment won’t let him leave.

Previously, the trust of the ‘prisoners’ had been betrayed by the manner in which the people running the experiment continually permitted the ‘guards’ to push the envelope in relation to physical violence despite the existence of a rule that was supposed to make such acts impermissible. Now, the people conducting the experiment have betrayed the trust of the ‘prisoners’ in another fashion – namely, apparently, despite assurances otherwise, the ‘prisoners’ were not going to be permitted to leave the experiment ... they really were ‘prisoners.’

The people conducting the experiment claim that the essential theme of their project is to discover what people will do when their sense of personal agency is degraded, if not eliminated. Nevertheless, the actual nature of the experiment is about what happens to people when their sense of trust is betrayed and, as a result, they become exposed to abusive treatment as a direct result of that betrayal.

The ‘prisoners’ answered an ad in which successful candidates would exchange some time for money. Instead, they became entangled in a nightmare ... something for which they had not signed up.

Professor Zimbardo claims that the aforementioned ‘prisoner’ who said he wanted out of the experiment and came to Zimbardo after seeing the ‘warden’ should never have agreed to become a ‘snitch. Moreover, Professor Zimbardo says that the individual should have insisted on being let out of the experiment but was cowed into backing down when harangued by the person who had recently been released from San Quentin.

I believe the foregoing explanation is not tenable and is rather self-serving. To begin with, the prisoner who complained to

Superintendent Zimbardo didn't agree to become a snitch – that is, someone who provides information about other prisoners in exchange for lenient treatment from the 'guards.

Instead, Superintendent Zimbardo was the one who proposed that if the 'prisoner' would stay in the program, co-operate a little, then the Superintendent would arrange to have the guards ease up on their hassling of the 'prisoner.' Therefore, Professor Zimbardo is seeking to re-cast his attempt to save his own experiment as an exercise in mind-games by the prisoner who Professor Zimbardo incorrectly claims made a deal to become a 'snitch.'

Secondly, Professor Zimbardo impugns the character of the 'prisoner' by claiming that the individual was cowed into silence concerning the issue of wanting out of the experiment due to the tongue lashing that the 'prisoner' got from the person who recently had been released from San Quentin and was serving as a consultant for the prisoner experiment. Again, Professor Zimbardo is re-casting events in a manner that is favorable to himself, because the reality of the situation is that the 'subject' wanted to get out of the experiment, and Professor Zimbardo wouldn't let him do so despite the subject having given clear indications that he did not want to participate in the project any further.

Another 'prisoner' becomes depressed, despondent and glassy-eyed. He lies on his cell floor coughing and asks to see the Superintendent.

Apparently, the 'prisoner' also wants out of the experiment. Although the Superintendent tells the 'subject' that he can get out if he wants to, the Superintendent also seeks to induce to 'prisoner' to continue to cede his sense of personal agency, stay in the experiment, and just co-operate with the 'guards.'

Professor Zimbardo has moved the goal posts. At the beginning of the experiment, he told the 'subjects' that they can leave the experiment at any point. Afterwards he takes steps to keep the 'subjects' in the experiment despite their wishes to do otherwise.

Later on, one of the 'prisoners' is finally allowed to withdraw from the experiment. The decision to allow the 'subject' to leave was not made by Professor Zimbardo but by a 2nd year graduate student.

According to the foregoing graduate student, the individuals conducting the experiment were never quite sure whether, or not, the 'prisoners' were faking their complaints. Moreover, because a lot of money and time had been invested in the experiment, they were reluctant to let anyone leave the experiment because of the way such actions might compromise the experimental results.

Why was a second-year graduate student making those kinds of decisions rather than Professor Zimbardo? If the people conducting the experiment couldn't tell the difference between real trauma and feigned trauma, why were they involved in the experiment at all? Why didn't Professor Zimbardo have any clinical psychologists directly affiliated with his research project? Why were the people running the experiment more concerned about the time and money that had been invested than the physical and mental welfare of their 'subjects'? And, finally, even if the complaints of the 'prisoners' were faked, why didn't the experimenters keep their word and let the 'prisoners' go when some of the latter individuals indicated that they had enough?

After the prisoner being alluded to above was released, one of the guards overheard a plot by some of the remaining 'prisoners' that allegedly involved the released prisoner coming back with a bunch of friends in order to free the 'prisoners' and destroy the 'prison.' Although the people conducting the experiment considered the alleged plot to be a somewhat unlikely possibility, credence was given to the story when the released prisoner was reported by one of the 'guards' to be skulking about in the hallways of the Psychology Department in the floors above the basement area where the 'prison' was housed.

As a result, Superintendent Zimbardo ordered the 'guards' to capture the released 'prisoner' and return that individual to the 'prison.' Superintendent Zimbardo decided that the 'prisoner' had been faking things and was not really in emotional or physical difficulty.

Despite assurances to the participants that they could leave the experiment whenever they wanted to, there now seemed to be an unwritten rider invisibly and secretly inserted into the rules governing the prison. If a 'prisoner' decides he wishes to withdraw from the experiment and is released, but later on the people running the experiment decide the person was only feigning distress, then, the experimenters reserve the right to bring that person back into the project.

Why did Superintendent Zimbardo accept the word of a 'guard' without any corroborating evidence? Was the 'guard' one of those who was abusing the 'prisoners' and, therefore, had a hidden motive to lie about or exaggerate the nature of what he reportedly witnessed? Did the former 'prisoner' have a right to be in the Psychology Department? Was the former 'prisoner' actually skulking about the halls of the psychology building or was the description of that person's behavior either a prevarication or a biased observation? And, once again, irrespective of the 'feigning' issue, why didn't the individual have a legitimate right to withdraw from the experiment.

The foregoing questions are not irrelevant to what was taking place in the prisoner experiment. Later on, Professor Zimbardo came to the conclusion that the whole plot to storm the prison is nothing but a 'rumor' and that all their elaborate arrangements – such as packing the 'prisoners' into a windowless, poorly ventilated storage room elsewhere in the psychology building for three hours – were completely unnecessary ... and, yet, such actions were taken because one of the subjects (a 'guard') had induced the experimenters to cede their sense of personal agency to the uncorroborated word of a 'guard' who might have ulterior motives for saying what he did.

Professor Zimbardo confesses that the "biggest sin" in behaving in the foregoing way is that they did not systematically collect data with respect to the events of that day. Actually, their biggest sin was, apparently, to be so completely oblivious to not only the 'abusive' system they had set in motion but to be so completely oblivious to their role in nurturing that abuse.

In later years, Professor Zimbardo will interpret the experiment as one in which the 'experimenters' as well as the subjects came under the gravitational influence of the situation. However, what Professor Zimbardo still does not seem to understand is that the process of coming under the gravitational influence of a situation is a function of people – each for different reasons – making a decision to cede their intellectual and moral agency to the forces inherent in that kind of a situation.

A situation by itself is powerless. It requires the co-operation of someone with agency ... that is, someone with the capacity to make choices about whether, or not, to cede agency to some situation, individual, or group.

At one point in *The Lucifer Effect*, Professor Zimbardo indicates that it "seems" that some of the 'guards' have been denying the 'prisoners' access to the bathroom after the order for 'lights out' has been given. One wonders why the term 'seems' is used ... how did Professor Zimbardo acquire the information to which the term "seems' is affixed?

According to Professor Zimbardo, the 'prison' area is beginning to smell like a subway washroom. Somehow, he knows that the 'guards' have been requiring the 'prisoners' to relieve themselves into buckets that are in their cells.

In the same section of his book, Professor Zimbardo discloses knowledge about how some of the 'guards' have been reported to be tripping blind-folded 'prisoners' as the latter individuals make their way down a set of stairs leading to the bathroom. In addition, these same guards apparently enjoy poking the 'prisoners.'

One of Professor Zimbardo's observations concerning the foregoing pieces of information is that some of the 'guards' have transcended mere role playing and, instead, have "internalized the hostility, negative affect, and mind-set" qualities of actual guards in real prisons. Nothing has been internalized.

The individuals displaying the pathological behavior brought that potential with them when they entered the experiment. Neither the allegedly in-depth interviews, nor the psychological tests that were given, were able to detect the presence of those pathological inclinations.

The foregoing sort of pathological inclinations were not the result of role-playing or any mechanism of internalizing the mind-set of actual guards. Those inclinations were nurtured – unknowingly perhaps – by the manner in which the people running the experiment failed, among other things, to enforce the rule requiring 'guards' not to be physically violent toward the 'prisoners.'

Some ‘subjects’ came to the Stanford Prisoner Experiment with a potential for certain kinds of abusive behavior. The individuals conducting the experiment provided that potential with the opportunity to be expressed within the context of the experiment and, then, the people running things did nothing to curb that behavior once it started to be manifested.

The prison-situation, per se, did not induce such a dispositional potential to surface. What caused that behavior to be expressed was the intervention of the experimenters through their acts of commission and omission with respect to their rule about physical violence and their failure to hold the ‘guards’ accountable for the latter’s repeated transgression of that rule.

Professor Zimbardo indicates that the ‘prison’ and the ‘prisoners’ will have to be put in a better light when the parents, friends, and girlfriends of the ‘prisoners’ visit the prison. In other words, according to Professor Zimbardo, the experiment requires not only for the ‘subjects’ to be manipulated, but, as well, he believes that the impressions of visitors will have to be managed ... after all, Professor Zimbardo is of the opinion that: “As a parent, I surely would not let my son continue in such a place if I saw such exhaustion and obvious signs of stress after only three days.”

The foregoing admission is disturbing on a number of levels. For instance, if as a parent, Professor Zimbardo would not permit his son to continue on in such a set of circumstances, why does Professor Zimbardo suppose it is okay for him to put his subjects in ‘harm’s way given that he – unlike the forthcoming visitors -- is actually somewhat cognizant of what is taking place in the ‘prison’? Secondly, knowing what he knows about the situation, apparently Professor Zimbardo feels it is okay to manipulate the impressions of the visitors so they won’t constitute a threat to the continuation of the experiment.

On the day when parents, friends, and girlfriends are supposed to visit the ‘prison,’ the facilities and the ‘prisoners’ are washed, disinfected, and spruced up. The smell of urine and feces are covered up with the scent of a deodorizer, and the ‘Isolation Room’ sign is taken down.

‘Prisoners’ are told that if they complain to the visitors during the visits, the visits will be terminated prematurely. The instructions resonate with what the Nazis used to do when the Red Cross showed up ... making threats to the prisoners in order to prevent outsiders from coming to know what actually was taking place in a given stalag.

That the people conducting the experiment apparently found it necessary to dupe the relatives and friends of their ‘prisoners,’ is extremely disconcerting. Manipulating and betraying their subjects is bad enough, but, they also felt compelled to manipulate and betray people outside the experiment, and the reason the deception is considered necessary is because – on some level -- the people running the experiment were aware that something pathological was taking place during the experiment, but, unfortunately, they weren’t ready to close down that kind of process.

Professor Zimbardo recounts how the people conducting the experiment came to the conclusion that they had to bring the visitors under situational control. This meant that the experimental staff was tasked with having to induce the visitors to believe that they – i.e., the visitors – were nothing but guests who were being extended a privilege.

The foregoing is an exercise in dissembling. The idea of bringing something under “situational control” is merely a euphemism for lying to people and misleading them, and through such a process, inducing outsiders to cede their sense of personal agency to the experimenters through the manipulation of trust.

The experimenters should not have been trusted by the visitors. Furthermore, in a number of ways, the experimenters were aware that they should not have been trusted, and this is why things had to be brought under so-called “situational control.”

Despite the experimenters’ best efforts to cover up the pathology taking place within the prison, some of the reality leaked through the attempts of the experimenters to take situational control and mislead the visitors about the nature of what was transpiring in the basement of the psychology building. Following the ‘visitor night,’ Professor Zimbardo received a note from a mother of one of the ‘prisoners.’

She remarked that she had been troubled by the appearance of her son during the visit. She also indicated that prior to the experiment neither she nor her son had contemplated that anything so 'severe' would be involved with respect to the experiment.

Several more days of experimental treatment had to take place before a decision was made by the experimenters to release her son. Apparently, they concluded that the young man was exhibiting signs of acute stress ... a diagnosis that the mother had tried, in her own words, to communicate to the experimenters a few days earlier – too bad the experimenters hadn't hired her as a consultant for she seemed to have more sense than they did.

On the fourth day of the experiment, Professor Zimbardo has arranged for a real priest to come to the 'prison' in order to interview the 'prisoners.' The priest has had experience as a prison chaplain, and Professor Zimbardo wants to get some feedback from the priest with respect to how 'realistic' he feels the experiment is.

The interviews take place in the 'prison.' One at a time, the 'prisoners' come and talk with the priest.

Many of the 'prisoners' introduce themselves by reciting the number on the front of their 'hospital-like' gown. According to Professor Zimbardo, the priest displays no indication that he finds the behavior of the guards in this respect to be odd.

Professor Zimbardo considers the priest's lack of reaction to be surprising. The professor concludes that: "Socialization into the prisoner role is clearly taking effect."

Although the section in which the foregoing quote appears is somewhat ambiguously written, apparently Professor Zimbardo is of the opinion that the priest has been socialized into the role of the prisoners by not reacting to their manner of introducing themselves by number rather than name. In other words, Professor Zimbardo is surprised by the behavior of the priest and seeks to explain it by claiming that the priest has been socialized into the mind-set of the prisoners.

The foregoing account of things is consistent with Professor Zimbardo's belief that people adapt to social situations because their natural dispositions come under the influence of situational forces. Absent from such a perspective is an explanation about how anyone – for example, the priest -- comes under the influence of those forces.

Socialization is not an automatic phenomenon. Interpretations, judgments, and choices are made concerning whether, or not, to cede one's agency to the forces of socialization.

Professor Zimbardo already has ceded his moral and intellectual agency to the prisoner experiment – which is why he is willing to let abusive behavior take place. He would only be surprised by someone else also ceding their sense of agency as well if he is inclined to ignore the nature of the process through which a person's sense of personal agency is ceded to a given situation and, instead, believes that a process of 'socialization' has somehow mysteriously taken effect sooner than anticipated.

The priest played his role to the hilt. He asked the 'prisoners' about bail conditions, whether, or not, they had lawyers or if they would like him to contact anyone on the 'outside' for them.

Professor Zimbardo assumed that the priest's offer to contact people on the 'outside' was merely a façade with respect to the role the priest was playing. When the priest is questioned by Professor Zimbardo about the offer, the experimenter is surprised to discover that the priest considers it a duty to follow through on his offer to the prisoners.

The foregoing incident demonstrates one of the differences between the priest and Professor Zimbardo. The priest has not ceded certain aspects of his moral agency to the experiment, and, therefore, unlike Professor Zimbardo, when the priest promises something, he feels obligated to follow through on the promise.

On the other hand, the priest has ceded some degree of agency to Professor Zimbardo because the priest seems to accept certain things that are going on in the prison but, presumably, believes that Professor Zimbardo is not the sort of person who would place students in harm's way ... in other words, the priest has conceded a certain amount of trust to the professor, but like the visitors the night before, the priest should not have trusted the professor because the experimenter has imprisoned the 'subjects' in a highly abusive situation.

While the priest is interviewing one of the 'prisoners,' the subject complains of a headache and indicates that he feels anxious and exhausted. Following some questions by Professor Zimbardo directed toward the 'prisoner' in order to discover the cause of the headache, the 'prisoner' breaks down in tears.

The priest speaks to the 'prisoner' and indicates that, perhaps, the prisoner is bothered by the unpleasant smell that pervades the 'prison.' He considers the smell rather toxic in nature, but he also believes that it helps lend a sense of realism to the experiment.

The priest doesn't know how that smell came to permeate the atmosphere. If he did, he might not have been so willing to merely comment on the smell and, then, move on to other things.

The priest has been asked to comment on how realistic the 'prison' experiment is relative to the real thing. He hasn't been asked to make an evaluation on whether, or not, the 'prisoners' are being treated properly.

He trusts that they have been treated properly because he believes that Professor Zimbardo is the sort of person who would not permit students or subjects to be treated in an abusive manner. Since the priest is not willing to entertain the possibility that something pathological is taking place, he misdiagnoses the breakdown of the 'prisoner' as possibly being a reaction to the unpleasant smell in the 'prison.'

After interviewing the 'prisoners,' the priest provides his overview of what he has observed. He indicates that the experimental prison seems to be operating much as a real prison does and, as a result, many of the 'prisoners' are exhibiting what he refers to as "first-offender syndrome" – that is, the 'prisoners' are exhibiting signs of: irritability, if not rage, as well as depression and confusion.

The priest indicates that the symptoms are likely to dissipate after a week, or so. He refers to the behavior as being effeminate in nature and comments that inmates in real prisons learn that such conduct is not conducive to long-term survival.

What the priest does not suspect is that what he refers to as "first-offender syndrome" is actually a function of another kind of phenomenon altogether. The priest is looking at the behavior of the 'prisoners' through the lenses of actual prison life – and the priest has been induced to do so due to the manner in which the experimental situation has been presented to him by Professor Zimbardo.

The professor believed he had to take situational control of the visitors the night before because he knew that the parents would never approve of what was taking place in the prisoner experiment if they were to come to know the truth of what was transpiring in the 'prison.' Obviously, if Professor Zimbardo knew that what was going on in the prison was sufficiently problematic for it to be necessary to manipulate the impressions of the visitors, then he is not likely to be willing to confess to the priest concerning the pathological character of what has been happening in the basement of the psychology building ... the impressions of the priest have to be managed just as the impressions of the visitors had to be handled through the process of taking situational control and, thereby, using disinformation and misinformation to shape people's understanding of the situation.

If the priest knew about the actual nature of the betrayal, and ensuing abuse, that was entailed by the prisoner experiment, would he continue to say that the behavior of the 'prisoners' was merely a reflection of the "first-offender syndrome" that takes place in actual prisons, or would he be prepared to state that what was going on in the experiment was abusive and pathological. One would like to hope that the priest would have been willing to change his opinion about what was transpiring in the 'prisoner' experiment, but in the light of what has taken place in the Catholic Church concerning the issue of sexual abuse, one is not entirely sure what the priest might have done.

According to Professor Zimbardo, the priest's visit helped demonstrate the progressive nature of the conflation and confusion that is occurring with respect to the character of the relationship between reality and delusion during the prisoner experiment. He claims that the priest played his role of prison chaplain so well that the performance has helped transform the fiction of an experiment into a reality of its own.

Like the 'prisoners' and the 'guards', Professor Zimbardo had ceded his moral and intellectual agency to the delusional pathology that had taken over the experiment. The priest, on the other hand, was merely fulfilling a request by Professor Zimbardo to assess what was going on in the 'prison' and whether, or not, those conditions reflected actual prison life.

In order to gather the data necessary to make such an assessment, the priest played a role. As soon as the priest walked away from the role, he provided Professor Zimbardo with a comparative analysis of the situation.

The priest might have been operating under a misunderstanding with respect to what actually was going on in the 'prison' experiment, but he had not confused delusion with reality. With the exception of the issue of trusting Professor Zimbardo when, perhaps, the priest should not have done so – although such acts of ceding agency through trusting others often takes place in society every minute and hour of the day -- the priest had not ceded his sense of personal agency to the prison experiment except to the extent of temporarily playing a role that he knew was just a role.

The foregoing cannot be said with respect to Professor Zimbardo. He had ceded away his sense of personal agency to the experiment and, as a result, he permitted events to take place in the experiment that might not have occurred if he had not ceded such agency and, thereby, permitted himself to become entangled in a delusional world.

To be fair, there were times during the experiment when Professor Zimbardo reclaimed some degree of his sense of personal agency and disengaged from the delusional world of the prison experiment. For instance, on one occasion he found a 'prisoner' -- who previously had been exhibiting signs of acute stress – in a condition of hysterical meltdown, and Professor Zimbardo reminded the 'prisoner' that he was a student with a name and not just a number and that the 'prisoner' should withdraw from the experiment and go home. Professor Zimbardo wants to take the individual to see a doctor on campus.

The 'prisoner' stops crying and trembling. He stands up and insists on going back into the experimental prison.

The 'prisoner' says that he does not want to leave under circumstances in which he is being labeled by the other 'prisoners' as a 'bad' prisoner and whose behavior might result in the other 'prisoners' being harassed by the guards. Unlike all too many of the guards, perhaps the 'prisoner' has not ceded his sense of moral decency to the experiment, and, consequently, he wants to do the 'right' thing by the other 'prisoners,' himself, and the experiment.

On the other hand, maybe the desire of the 'prisoner' to remain in the experiment is merely a variation on the 'Stockholm Syndrome.' In other words, perhaps, the allegiances of the 'prisoner' have been captured by the delusional nature of the 'prison' experiment, and, as a result, the 'prisoner' is having difficulty understanding that his desire to do 'right' by the experiment might merely be an expression of how much agency he has ceded to the experiment and why he feels inclined to remain in the experiment when he has the opportunity to escape an abusive situation.

On another occasion, Professor Zimbardo also reclaims a certain modicum of the moral and intellectual agency that he has ceded to the idea of the experiment when he intervenes with the 'guards'. He instructs them that they must not interfere with visiting hours.

Apparently, the 'guards' are upset with this sort of limitation that has been placed upon their conduct by Professor Zimbardo. However, they comply with the directive.

One wonders why Professor Zimbardo didn't take the steps necessary to rein in their power with respect to far more serious instances of abusing the rights of the 'prisoners. Perhaps, he was beginning to become a little more aware of the injurious impact that the abusive treatment of the 'guards' was having on the prisoners.

Professor Zimbardo might have had some assistance with respect to his condition of possibly enhanced awareness concerning the issue of abuse. After a number of 'prisoners' were permitted to withdraw from the experiment, Professor Zimbardo added a new 'prisoner.'

Despite the 'prisoner's' fear of the guards – he had been struck on the leg by a nightstick while being stripped naked and deloused – once initiated into the experiment, the new 'prisoner' went on a hunger strike. The hunger strike was intended to protest the manner in which the 'guards' were violating the conditions of the contract with respect to, among other things, the use of physical violence.

The 'prisoner' indicates that when he signed the contract to participate in the experiment, there were certain provisions in that document concerning the conduct of the guards. The 'guards' were violating those conditions, and the 'prisoner' made sure that everyone heard him with respect to that issue.

At least some of the 'guards' don't seem to care about the part of the contract that concerns their own behavior. They are only interested in the parts of the contract that cover the conduct of the 'prisoners' since violation of those portions of the contract enable the 'guards' to rationalize their abusive treatment of the 'prisoners.'

Such 'guards' have a vested interest in selectively reading the contract for the experiment because, apparently, they have begun to enjoy the abuse that they are inflicting on the 'prisoners.' However, the 'experimenters' also have a vested interest – namely, to keep the experiment going – to look the other way when the 'guards' violate sections of the contract (few though these sections might be) that govern the conduct of the guards.

During most of the first five days of the prison project, the experimenters have enabled some of the 'guards' to believe that the contractual rules that addressed the behavior of the 'guards are not relevant to what goes on in the experiment. Only very occasionally – such as when Professor Zimbardo instructed the guards not to interfere with the visiting hour arrangements – did the experimenters honor the contract that they, themselves, had drawn up, and, quite possibly, the fact that at least one of the experimenters reclaimed some semblance of moral and intellectual agency with respect to the experiment was triggered by individuals like the new 'prisoner' who kept reminding the 'guards' – and, perhaps, Professor Zimbardo -- that their behaviors were violating the terms of the contract.

The experiment begins to crumble toward being shut down when someone with whom Professor Zimbardo is romantically involved begins to insert a few rays of moral agency into the darkness of the 'prison' project. Previously, she had played only a small role in the drama when she served on the Parole and Disciplinary Board, but she had never visited the 'prison' or had any inkling of what actually was taking place there.

On the fifth day of the experiment, she is invited down to the 'prison.' Prior to reaching the 'prison' she has a conversation with one of the 'guards,' and based on that conversation, she comes away with the impression that the individual seems to be a very nice young man.

A short while later she is observing the 'prison' experiment through the hidden portal that is near the video camera. She is appalled that the individual whom just a short while earlier had left her with such a favorable impression is now engaged in mean and abusive behavior.

The transformation in conduct seems incredible. The individual is: talking, walking and acting in a manner that is completely different than had been the case when he was outside the building talking with her.

Professor Zimbardo tries to direct her attention to something that is going on in the 'prison.' She seems uninterested in what he is excited about, and, in response, Professor Zimbardo tries to justify what is going on as constituting a phenomenon involving human behavior that, up until then, was unknown and unsuspected ... other members of the experimental staff who are present take the professor's side in the matter.

Tears are streaming down her face, and she tells Professor Zimbardo that she is going home. He catches up with her outside the building and begins arguing with her and barraging her with belittling remarks concerning her potential for ever being a competent researcher if she can't manage her emotions better than what she is presently doing.

He explains to her that many people have visited the 'prison' and none of them have reacted to the situation in the way she has. He claims that they didn't find anything wrong with what was going on in the prison experiment.

The fact of the matter is that Professor Zimbardo is not being honest when he makes the latter sort of claims. First of all, no one outside of the experimental staff actually witnessed the sort of abusive treatment that was being inflicted on the 'prisoners' by the guards.

The priest who had been permitted into the 'prison' for a short time only interviewed the 'prisoners.' He did not observe any of the ‘normal’ interaction between the ‘guards’ and the ‘prisoners’ ... although the priest did smell one dimension of that interaction.

Moreover, the relatives and friends who had attended the ‘Visitors Night’ did not witness any of the pathological behavior that was taking place in the prison. However, one of the mothers wrote a note to Professor Zimbardo indicating – based on the appearance her son – that she was concerned about her son’s mental and physical health.

By his own admission, Professor Zimbardo had to take situational control of such situations. Otherwise, people might become aware of the abuses that were taking place in the basement of the psychology building and, therefore, he believed he had to manage people’s perceptions about what was actually happening in the experiment ... a tacit acknowledgement that the experiment was not as ‘innocent’ as he was attempting to convince people – including himself -- was the case.

For five days, Professor Zimbardo carried around within him knowledge – at least on some level – that what was taking place in the ‘prison’ was pathological and abusive. It took only a very short time for the woman with whom he was romantically involved to recognize and understand some of the unseemly underbelly of what he had been up to in his experiment.

The two had further arguments about the matter. She told Professor Zimbardo on several occasions that the young men in the experiment were suffering and that terrible things were being inflicted on those “boys.”

She was extremely concerned because like the guard with whom she had talked prior to venturing down into the ‘prison,’ she had viewed Professor Zimbardo as someone who was caring, kind, and compassionate. Yet, Professor Zimbardo was supervising an experiment in which there seemed to be little evidence that could demonstrate the presence of such a caring, kind, or compassionate person, and, like the guard, the individual (i.e., Professor Zimbardo) that she thought she knew was actually acting in a way that was contrary to what she had expected.

Following their discussion, the professor decides to end the experiment. When Professor Zimbardo returns to the ‘prison,’ he discovers that the ‘guards’ have invented a new form of abuse in which the ‘prisoners’ are required to mimic sex acts with holes in the floor and with one another whenever the ‘prisoners’ displease the ‘guards.’

Professor Zimbardo concludes that most of the ‘guards’ were unable to resist the situational temptations of control and power. On the other side of the ledger, Professor Zimbardo feels that most of the ‘prisoners’ had suffered varying degrees of physical, mental and emotional breakdown under the situational forces that impacted on them.

Unfortunately, Professor Zimbardo does not seem to understand that what has gone on for five days has little to do with people being transformed by situational temptations and forces. Instead, the experimenters enabled the entire pathology of the ‘prison’ experiment to occur as a result of their failure to enforce the contractual ‘right’ of the ‘prisoners’ to be free from physical violence as well as their failure to hold the ‘guards’ accountable for their many transgressions against that ‘right’.

The experimenters were caught up in the delusion that they were objective researchers who were pursuing noble, ground-breaking ends. Consequently, they were more interested in keeping the experiment going than they were concerned about the welfare of their subjects – whether ‘guards’ or ‘prisoners’ -- and, as a result, they continued to permit the areas of ‘problematic conduct’ in relation to the ‘guards’ to be broadened ... for to have done otherwise would have prevented the ‘guards’ from doing what they did, and what they did were the sorts of behavior that not only seemed to intrigue the experimenters but that had such ‘interesting’ effects upon the ‘prisoners.’

One of the questions hovering about the Milgram and Zimbardo experiments is the following one. Why did both experiments, each in its own way, permit abuse to be perpetrated in relation to subjects?

If either of the foregoing researchers had, to a sufficient degree, critically reflected on their respective experiments prior to the fact of those experiments being run, they might have considered the possibility that there were abusive dimensions to their research projects. In other words, whatever the 'teachers' might have 'done' (or believed they were doing) to the 'learners' in the Milgram experiment, and whatever, the 'guards' might have done to the 'prisoners', both Professor Milgram and Professor Zimbardo should have understood that the experimental process to which they were going to expose their subjects was inherently abusive ... if for no other reason than that the trust that subjects placed in the people conducting the experiment (and if trust had not been present, the subjects are not likely to have been inclined to participate in such a process) would be betrayed when, in one way or another, the subjects' sense of personal agency was manipulated, and then, the two experiments – each in its own way -- proceeded to hold that sense of agency hostage to the agenda and purposes of the various researchers.

Neither Professor Zimbardo nor Professor Milgram had a right to the sort of intellectual freedom that entitles them to abuse other human beings for the purposes of discovering something that might be of interest or even of value. The law of ignorance says that the boundaries of one's right to push back the horizons of ignorance extends only to being provided with a fair opportunity to do so, and this sort of fairness entails a reciprocal obligation not to undermine anyone else's right to have the same kind of fair opportunity to be able to proceed in a similar fashion.

When people are deceived and manipulated, the quality of fairness is significantly degraded if not entirely eliminated. What the alleged purpose of such deception and manipulation are is irrelevant to the issue of fairness and its inherent quality of reciprocity.

Just as the Milgram learning/memory experiment carried many implications for issues of governance, there also are many parallels between the Stanford Prison Experiment and the issue of governance. While there were many mistakes made in the Zimbardo experiment that are important to grasp because that sort of understanding might serve to guide one in relation to how not to conduct research, the prisoner experiment might be more important as an illustration of the pathological dynamics that often occur within almost any framework of governance.

For example, the Philadelphia Constitution is often portrayed as an experiment in democracy. However, like the Stanford Prisoner Experiment, the people who dreamed up the idea for such an experiment didn't necessarily know what they were doing or how things would turn out.

During the ratification process, when people asked questions about how the Philadelphia Constitution would work, the supporters of ratification had worked out stock, theoretical answers and these were fed back to the people asking the questions. Those answers were entirely theoretical and speculative because no one had previously tried such an experiment, and, consequently, there was little hard data to support any of those contentions.

Whenever Professor Zimbardo was asked what his experiment was about, he claimed that it was an exploration into what 'prisoners' would do to reclaim control of a situation in which their freedoms had been stripped from them. There was no hypothesis ... just a fishing expedition for data.

The people conducting the Stanford Prison Experiment had no idea how their project would turn out. If they did understand what might ensue from their project, they would either not have run the experiment at all or they would have not been surprised when things had to be shut down after five to six days.

Similarly, the individuals conducting the Philadelphia Constitution Experiment had no idea how their project would turn out. They wanted the power to try certain things – i.e., go on a fishing expedition for data that might confirm their speculations concerning democratic governance – and the deeply flawed ratification process provided them with the opportunity that they sought ... just as a deeply flawed system of ethical oversight (with respect to the sort of psychological experiments that should be given the green light) enabled Professor Zimbardo to have the opportunity and power to run with his ideas.

People suffered as a result of the Stanford Prison Experiment. People also have suffered as a result of the Philadelphia Constitution Experiment.

Blacks, Indians, women, poor people, Chinese immigrants (as well as many other immigrant groups), Japanese-American citizens, the disenfranchised, and blue-collar workers have all been abused by the system of governance put into play by the Philadelphia Constitution Experiment. The people conducting that experiment have known about such abuses, but like the individuals running the prisoner experiment, they have been too caught up in their own delusional systems to fully appreciate, or care about, what they were doing to other people.

The environment – both locally and internationally -- has been progressively degraded under the 'watchful' eye of the inheritors of the Philadelphia Constitution Experiment. In addition, millions of people in other parts of the world have been slaughtered, their lands confiscated, and their resources plundered in order to keep the Philadelphia Constitution Experiment running ... just as young male subjects had to be abused in order to keep the Stanford Prisoner Experiment going.

Professor Zimbardo utilized various experts – in the form of prison consultants, a prison chaplain, and people who conducted various psychological tests and interviews – to help inform the manner in which his experiment was conducted. None of those experts prevented what transpired. In fact, in many ways such expertise merely helped color the delusional character of the understanding through which they perceived their experiment.

Similarly, the people who started running the Philadelphia Constitutional Experiment – as well as their subsequent successors – employed lawyers, leaders of various descriptions, economists, media experts, educators, corporate and business executives, bankers, and military strategists. Yet, none of this expertise prevented the abuse that is continuing to be perpetrated through the legacy of the Philadelphia Constitution Experiment.

Like the Stanford Prison Experiment, the people conducting the Philadelphia Constitution Experiment know that pathological things are happening within the context of their experimental operation. However, just as the people conducting the prison project decided that they had to manage the perception of the 'visitors' to their prison, the individuals handling the constitutional project also have decided they must take 'situational control' and, as a result, they lie to people and hide things from the 'outsiders' who come to them and are concerned about what is taking place within the context of the constitutional experiment.

The people who conducted the prisoner experiment had sufficient awareness to understand that if the parents and friends of the 'prisoners' were to find out about the actual abusive character of the experiment, they would pull their loved ones from the experiment. As a result, they set about trying to mask the odor of corruption that had crept into their experiment, as well as attempted to clean up the physical appearance the facilities and the 'prisoners.'

The people conducting the Philadelphia Constitution Experiment also have sufficient awareness to understand that if 'We the People' were to find out about the actual abusive nature of the constitutional experiment, the people would pull out of that project. As a result, the people conducting the Philadelphia Constitution Experiment spend a great deal of time, energy and resources attempting to mislead, misinform, and spread disinformation among 'We the People' with respect to the 'state of the nation.'

Just as keeping the Stanford Prisoner Experiment going was more important to the individuals conducting that project than was the physical and mental welfare of the 'subjects' participating in their experiment, so too, keeping the Philadelphia Constitution Experiment going is more important to the people running that experiment than is the physical and emotional well-being of the 'subjects' – i.e., 'We the People' – who have been induced to participate in the constitutional experiment.

The people who conducted the prisoner experiment were so caught up in their own delusions concerning what they believed was transpiring in their experiment, that they argued with any 'outsider' – and there was only one such 'outsider' -- who was permitted to peek behind the curtain of secrecy surrounding the experiment and expressed shock with respect to what was taking place. The 'outsider' was told that she didn't have what it takes to be a psychologist, and the 'outsider' was told about the groundbreaking research that was going on and how no one had ever witnessed what was taking place within their experiment, and the 'outsider' was told that no one who been a witness to what was transpiring within the 'prison' had objected to what was taking place.

Similarly, the people conducting the constitutional experiment are so caught up in their own delusions concerning what they believe is transpiring within the context of their experiment, that they argue with and ridicule any 'outsider' who comes along and, somehow, gets to look behind the 'wizard's curtain,' and, as a result, begins to take issue with what is transpiring there. Such 'outsiders' are told that the constitutional project is the greatest experiment the world has ever known, and the 'outsider' is told that groundbreaking, breathtaking progress has been achieved because of that experiment – the sort of progress that the world has never before witnessed – and the 'outsider' is told that no one who has witnesses what is transpiring within the constitutional experiment has ever objected to what was taking place there.

To those 'outsiders' who are able to witness the tremendous abuses that are taking place within the context of the constitutional experiment and as a result of that project, such arguments are nothing more than attempts to rationalize the indefensible. If people have to be abused in order for progress to be achieved, then there is something inherently pathological about that notion of progress.

Unfortunately, the people conducting the constitutional experiment are too entangled in their own delusional thinking in relation to their project to understand that they don't have the right to abuse people ... any more than the individuals running the prisoner experiment had a right to abuse their subjects in order to serve the purposes of that project. There is no justification concerning those experiments that can demonstrate beyond a reasonable doubt that abusing people is okay and, therefore, the individuals conducting the experiment should be permitted to continue on with their pathological activities.

The individuals conducting the prisoner experiment might have had the most noble of intentions when they began their project. Similarly, the individuals conducting the constitutional experiment might have had the most noble of intentions when they began their project.

None of the foregoing matters because irrespective of whether the people conducting the respective experiments understood it or not, their intentions – noble though they might be -- led to the deliberate abuse of other human beings. Moreover, when those abuses were brought to their attention, they retreated into various delusional systems of thought in order to justify to themselves that the abuses that were occurring as a result of their grand experiments were something other than what they were.

Whether by design or out of denial, Professor Zimbardo and other staff members in the Stanford Prisoner Experiment lied to the 'prisoners' and told the 'prisoners' that their troubles were of their own making. The people conducting the experiment had ample evidence on video and audio tape, as well as through their own direct observations, that not only were the 'guards' behaving in ways that were not permitted by the contractual conditions governing the prisoner experiment, but as well, the 'guards' were inventing reasons and justifications for punishing the prisoners in ways that were disproportionate to anything done by the 'prisoners.'

Similarly, whether by design or out of denial, the people running the constitutional experiment have lied again and again to 'We the People' and have sought to justify such lying by claiming that the people are the authors of their own misfortune. For instance, those who, over the years, have conducted the constitutional experiment have set forth a mythology (a mythology rooted in misinformation and disinformation of one kind or another) which claims that: It was necessary for the Philadelphia Convention to be secretive and for everyone but the would-be architects of the propose constitution to be kept away from the experiment in constitution-making, and it was necessary for the participants in the Philadelphia Convention to disregard the wishes of the Continental Congress, as well as the provisions of the Articles of Confederation, and it was necessary to induce the members of the Continental Congress to be derelict in their duties under The Articles of Confederation, and it was necessary for the states to be derelict in their duties under The Articles of Confederation, and that it was necessary for many facets of the ratification process to be rigged in favor of those who supported the idea of adopting the Philadelphia Constitution, and that it was necessary for the flawed ratification process to be imposed on people, and that it was necessary for everyone to feel obligated in relation to the results of such a process ... and that whatever abuses have transpired in the context of such a constitutional experiment are entirely the fault of 'We the People' and has nothing to do with the structural character of the constitutional experiment and has nothing to do with the pathological conduct of the people who are overseeing that project.

The people conducting the Stanford Prisoner Experiment claimed that experiment was about what steps the 'prisoners' would take to reclaim their sense of personal agency after, or while, they were made to feel powerless through the actions of the 'guards'. The individuals running the prisoner experiment went to considerable lengths to enable the 'guards' to abuse the 'prisoners' ... even to the extent of permitting the 'guards' to continuously push the envelope on the issue of physical violence despite the fact that the 'guards' were contractually obligated to observe the rule concerning no physical violence.

The individuals conducting the Philadelphia Constitutional Experiment claim that their experiment is about self-governance – that is, the co-operative exercise of the sense of personal agency of 'We the People' – and the constitutional experiment is about what 'We the People' (i.e., the subjects) will do once constitutional arrangements have been made to make 'We the People' feel as powerless as possible through the actions of the Executive, Congress, the Judiciary, and the state. In addition, the people running the constitutional experiment have gone to considerable lengths to enable the constitutional system to abuse 'We the People' ... even to the extent of letting the 'guardians' of the government continuously push the envelope with respect to violating their contractual obligations concerning the 'rights' of 'We the People' in relation to, among other things, the issue of self-governance.

Just as the individuals running the Stanford Prisoner Experiment told their experimental subjects that they would have the right to withdraw from the experiment at any time, so too, the people conducting the constitutional experiment point to the Declaration of Independence and indicate how that document addresses the right of the people to abolish governments that are not serving the proper ends of governance. Moreover, just as the people running the prisoner experiment sought to manipulate their 'prisoners' when the latter individuals sought release from the prisoner experiment, so too, the individuals conducting the constitutional experiment manipulate 'We the People' by indicating that with respect to the basic issues of governance, "you can check out any time you like, but you can never leave" – '*Hotel California*,' The Eagles.

The people conducting the Stanford Prisoner Experiment claimed that they were the most qualified, objective individuals to evaluate what was taking place in their experiment. Yet, they didn't have a clue what they were doing, for if they did, the experiment would not have been terminated eight days earlier than scheduled.

The people who initiated the Philadelphia Constitution Experiment claimed that they are the most qualified, 'disinterested,' republican individuals to judge the character of their experiment. Nevertheless, within ten years of the inception of that experiment, people such as Madison and Hamilton who had been allies throughout the Philadelphia Convention, as well as during the ratification process (in the latter case, they, among other case, wrote the vast majority of the essays that would become *The Federalist Papers*), turned into the sort of enemies they might never have considered possible a few years earlier.

Such transformational shifts are suggestive. They indicate that one, or more, of the two aforementioned individuals didn't necessarily understand the nature of the experiment they had set in motion.

Professor Zimbardo's romantic partner broke with him over the prisoner experiment and couldn't understand how the person she believed she loved could permit such abusive things to happen to his subjects. Professor Zimbardo belittled his romantic partner and questioned her capacity for objectivity and research

Similarly, although Madison and Hamilton were not romantically involved, nonetheless, as fellow overseers of the constitutional experiment, they could not understand what had come over their former traveling companion along the path of republicanism. They soon were belittling one another in relation to the manner in which they respectively considered the other person to be guilty of betraying the principles of the Philadelphia Constitution Experiment ... despite the fact that the principles of that document were never actually justified beyond a reasonable doubt -- not even to individuals participating in the Philadelphia Convention given that they all had agreed there were many problems inherent in the constitutional experiment they had devised, and given that at least six individuals (George Mason, Elbridge Gerry, Edmond Randolph, John Lansing, Jr., Robert Yates, and Luther Martin) rejected what was transpiring in the Philadelphia Convention.

The people conducting the Stanford Prisoner Experiment induced the subjects who would become 'prisoners' to cede their sense of personal agency to the individuals running the project. Out of a sense of trust – along with other motivations – the subjects who were to become 'prisoners' did cede their sense of personal agency to the people conducting the experiment.

The people overseeing the prisoner project permitted the 'guards' to have an enhanced sense of personal agency by permitting them to have physical and emotional authority over, and control of, the 'prisoners.' In order to accomplish this, the individuals conducting the experiment had to cede some of their own agency – after all, they were the ones who supposedly were running the experiment – to the 'guards.'

Once enabled in the foregoing fashion, the guards – or, at least, some of them -- leveraged the agency that had been ceded to them by the experimenters and set about abusing the 'prisoners,' and began to push the envelope with respect to the rule that indicated that physical violence could not be used in the 'prison' by either the 'guards' or the 'prisoners.' Thereafter, the violent activities of the 'guards' were re-cast by the experimenters as something other than the abuse and contractual violations that they actually were.

The sorts of things that have noted above also have taken place -- and are continuing to occur -- in relation to the Philadelphia Constitution Experiment. The provisions of the Philadelphia Constitution – as interpreted by the Executive, the Judiciary, Congress, and the states -- have been used to cede an enhanced sense of personal agency to the 'guardians' of the constitutional experiment ... which, unfortunately, happens to be the: Executive, Judiciary, Congress, and states, and, therefore, contrary to the principles of republicanism, they all have become judges in their own causes.

Once enabled in the foregoing fashion, the ‘guardians’ of the experiment in democracy have proceeded to leverage the power that has been ceded to them through elections. As a result -- and as was true in the prisoner experiment -- the constitutional ‘guardians’ began – almost from the outset of the constitutional experiment -- to treat the ‘prisoners’ (i.e., We the People) in arbitrary and abusive ways as those ‘guardians’ sought to push the envelope with respect to violating the rights of the people in relation to the issue of self-governance – that is, the co-operative exercise of their sense of collective and individual personal agency.

The word “arbitrary” is used in the previous sentence because whether one is talking about the Executive, the Judicial, the Congressional, or the state branches of government, none of these facets of governance has been able to demonstrate beyond a reasonable doubt that their respective interpretations of the Philadelphia Constitution are viable ways of serving the purposes and principles that were set forth in the Preamble to the Constitution, or that their interpretation of governance can be justified, beyond a reasonable doubt, with respect to the ‘original right’ to which Justice Marshall referred in *Marbury v. Madison*. Consequently, the very fact of the arbitrariness surrounding those interpretive activities makes them abusive in relation to each human being’s basic right of sovereignty – that is, the right to have a fair opportunity to push back the horizons of ignorance with respect to the nature of reality. Any interference with that sort of sovereignty that cannot be justified beyond a reasonable doubt is arbitrary.

In the Stanford Prisoner Experiment, the behaviors of the ‘guards’ and the ‘prisoners’ are said to give expression to the manner in which situational forces come to dominate the dispositional tendencies of individuals, thereby, inducing individuals to behave in ways that would not otherwise occur. Entirely left out of the foregoing account is the manner in which the people running the experiment manipulated the sense of personal agency of both the ‘guards’ as well as the ‘prisoners’ and, in addition, ceded their own sense of personal agency to the kind of delusional understanding of the experiment that would permit fundamental violations of the contractual rules supposedly governing the experiment to occur in order to keep the experiment going.

In the Philadelphia Constitution Experiment, the behaviors of the 'guardians' of democracy are said to give expression to the manner in which the situational principles of the Constitution come to dominate the dispositional tendencies of individuals, thereby enabling individuals to behave in 'civilized' and 'democratic' ways that would not otherwise occur. Entirely left out of that kind of an account is the manner in which the people running the constitutional experiment have manipulated the sense of personal agency of the 'prisoners' (i.e., We the People) and induced them to cede such agency to the 'guardians' of democracy who, then, proceed to leverage that power to serve their own delusional understanding concerning: 'sovereignty,' rights,' 'justice,' 'liberty,' 'welfare,' 'tranquility,' and the 'common defense.'

Finally, during the Stanford Prisoner Experiment, there came a point during their project in which the individuals conducting the experiment convinced themselves that one of the 'prisoners' whom they had permitted to be abused and, then, subsequently released was going to come back with a gang of friends and free the remaining 'prisoners' as well as trash the 'prison.' They became so obsessed with the idea that they sought to move their experiment to an 'out of use' jail facility outside of the university, and when this plan did not work out, moved all the 'prisoners' to a windowless, poorly ventilated storage facility for three hours in order to foil the fiendish plans of the former 'prisoner.'

The foregoing delusional fantasy was set in motion by: (1) several 'guards' claiming that they heard the 'prisoners' talking about such a plot, and (2) one of the 'guards' claiming that he had seen the released 'prisoner' skulking about the halls of the Psychology Department. Rather than investigating to determine whether, or not, there was any truth to the various allegations of the 'guards', the experimenters entered into a paranoid delusional state and took steps that were consistent with such a condition – that is, they did what they thought was necessary to preserve their own experiment no matter how it might affect the 'prisoners.'

Eventually, the experimenters returned the ‘prisoners’ to the ‘prison’ facility in the basement. They had come to the conclusion that the whole ‘plot’ was nothing but ‘rumor’ and failed to understand that their behavior was a function of delusional thinking that was present long before the ‘rumors’ surfaced and that the ‘rumors’ had been given credence because they were filtered through the lenses of a delusional system of thinking.

Chapter 16: The Phenomenology of Charisma

A little over 20 years ago (1997), Len Oakes, an Australian, wrote a book: 'Prophetic Charisma: The Psychology of Revolutionary Personalities'. Building on the work of, among others, Max Weber and Heinz Kohut, as well as using insights gained through his personal experience with a cult-like group and leader, together with extensive psychological research involving testing, interviewing, and reading, Oakes sought to provide some degree of understanding and insight into the phenomenon of charisma.

While Oakes is to be commended for his attempt to bring light to an area that often exists in the shadows of our awareness, nevertheless, I feel his book is flawed in a number of essential ways. The following commentary constitutes some of my critical reflections upon Oakes' book.

The first problem I have is the manner in which Oakes approaches the idea of a 'prophet'. In order to understand the nature of the problem surrounding Oakes' use of the term 'prophet', his theory will have to be delineated somewhat.

To begin with, and as the aforementioned title indicates, Oakes engagement of charisma is through a psychological study and not from a religious or spiritual perspective. Therefore, one can acknowledge and appreciate that the way in which he defines the idea of a 'prophet' will be in a manner that is compatible with the psychological thrust of his study.

Notwithstanding the above acknowledgment, there are always advantages and disadvantages surrounding any choice one makes for a working or operational, definition of a given term. Consequently, one needs to determine if, how, and to what extent, Oakes's manner of defining key terms might introduce distortion and/or problems into his inquiry.

According to Oakes, a 'prophet' is characterized as anyone who: (a) proclaims a mission containing not just a recipe for salvation, but a mission that does so in a way that seeks to revolutionize conventional values; (b) draws, gathers, or attracts individuals who become followers of such an individual and seek to implement the guidance provided by the person being referred to as a 'prophet'. Oakes tends to lump together a number of people, ranging, on the one hand, from: Jesus and Muhammad, to: various Swamis, ministers, alternative community leaders, and the like.

Despite whatever differences might exist among those individuals to whom the label ‘prophet’ is given, Oakes suggest that what all of these individuals share in common are qualities such as: (1) a capacity to inspire people; (2) a resistance to, and opposition toward, various forms of conventionality; (3) possessing a remarkable and compelling personality that tends to set them apart from most people; (4) a grandiose sense of self-confidence that is the source for a great deal of optimism and fearlessness with respect to propagating the mission of salvation; (5) a natural capacity for acting that well-serves a ‘prophet’s tendency to manipulate people; (6) great rhetorical skills; (7) self-contained, independent of others, not given to self-disclosure; (8) a capacity for social insight that seems to border on the preternatural. Using the foregoing definition, Oakes identifies individuals such as: Joseph Smith, Madame Blavatsky, Bagwan Shree Rajneesh, Prabhupada Bhaktivedanta (Hare Khrishna), L. Ron Hubbard, Sun Myung Moon, and Jim Jones as instances of modern day ‘prophets’.

Depending on how one understood the idea of ‘salvation’ in the above definition of ‘prophet, one could expand the boundaries of the set of individuals who constitute ‘prophets’. For example, Adolph Hitler, who many Germans saw as the salvation of the German people, could, on the basis of the stated definition, be considered a ‘prophet’ because he attracted people who sought to follow his guidance concerning the nature of life and, as well, because some dimensions of such guidance sought to revolutionize certain realms of conventional values -- and, in fact, Oakes discusses Hitler along these lines at various junctures in the former’s book about charisma.

Oakes also lists Fritz Perls and Werner Erhard as exemplars of modern prophets. Since the sort of ‘salvation’ that Perls and Erhard sought for their clients does not easily, if at all, lend itself to spirituality, religion, or mysticism, then if individuals like Perls and Erhard are to be considered ‘prophets’ in Oakes’ sense of the word, one also, potentially, might be able to apply that same definition to a great many other people besides Perls and Erhard who gave expression to various artistic, literary, philosophical, scientific, psychological, social, economic, and political theories. Indeed, consistent with Oakes' definition of a prophet, there are many personalities across history who developed theories and paradigms that were intended, in one way or another, to serve as ways to salvation, and who, in the process, proposed an overthrow of conventional values -- to one extent or another - - as necessary for a realization of salvation, and, finally, who attracted people who were interested in learning how to live their lives in accordance with the teachings of the 'master'.

Oakes borrows a distinction, made by Heinz Kohut -- a psychoanalyst -- between 'messianic' and 'charismatic' personalities in order to try to frame Oakes' way of approaching issues such as 'prophets', charisma, and narcissism. Among other things, this distinction lends a certain degree of specificity to the discussion of prophets and helps address the issue of why people such as Perls, Freud, Hitler, and Erhard are part of the same group as a variety of individuals who are oriented in a largely religious, spiritual, or mystical manner.

According to Oakes, messianic prophets as those who: (1) tend to identify God as an 'external' source of inspiration; (2) often interact with Divinity in terms of a personal relationship that has an 'objective' nature; (3) usually teach by means of revelation; (4) seem to be motivated by a fantasy that construes one's individual existence to be part of the Godhead; (5) are psychologically oriented toward the external world and, as a result, are able to perform reality checks; (6) frequently are described as being very consistent with respect to behaviors or beliefs and, therefore, are seen as stable over time; (7) are fairly modest with respect to making claims about themselves; (8) seek to do works of virtue and excellence in conjunction with the world, as well as seek to work for what is perceived to be the welfare of others; (9) apparently are resigned to experiencing an eventual decline in influence and, as a result, often willing to make preparations for transition in leadership; (10) tend to generate new laws that foster a form of release that, ultimately, serves as a source of helping to constrain society; (11) give emphasis to doing 'God's work' that is at the heart of the messianic mission; (12) are inclined to be other worldly and withdraw from the world's corrupting potential; (13) treat truth and duty to be the two highest forms of ethical expression.

On the other hand, for Oakes, charismatic prophets are those who: (1) locate Divinity within rather than externally (in contrast to what messianic prophets do); (2) filter their relationship with 'being' in terms of impersonal forces; (3) teach by example rather than through revelation; (4) are motivated by the fantasy that 'I and the Godhead' are one; (5) tend to be out of touch with external reality and, therefore, unable to run reality checks; (6) are perceived as being inconsistent with respect to both beliefs and behaviors that leads to considerable instability over time; (7) are fairly immodest and given to bouts of self-aggrandizement; (8) are not interested in the welfare of others, but, rather, are likely to be antisocial and self-serving; (9) often self-destruct or fall from grace through their behaviors; (10) are oriented toward rebellion or a certain lawlessness, and consider release/freedom to be good in and of themselves; (11) seek recognition rather than seek to be a vehicle of God's work; (12) use the corruption of the world as a justification for amorality and the opportunistic exploitation of circumstances; (13) consider love and freedom to be the highest forms of ethical expression.

For the most part, Oakes considers messianic and charismatic types of prophets to constitute groups that are, to a large extent, mutually exclusive categories. In other words, if one compares the thirteen points outlined above in conjunction with both types of 'prophets', then with respect to whatever quality or characteristic is said to describe one type of 'prophet', there tends to be an absence of any common ground shared by members of the two, respective groups and, actually, in relation to any of the aforementioned thirteen characteristics, members of the two groups tend to be proceeding in very different directions -- sometimes in diametric opposition -- with respect to each of the points listed. Oakes does indicate that elements of each type of prophet might be combined in different sorts of permutations so that some individuals might give expression to mixed combinations of both messianic and charismatic types. However, on the whole, Oakes seems to believe that in most cases one can identify a given 'prophet' as being either of a messianic kind or a charismatic kind.

Although, as noted above, Oakes alludes to the possibility that a given individual might give expression to qualities and characteristics from each of the two sets of characteristics, he doesn't pursue this possibility in any concrete manner. Consequently, one doesn't really know what he means by his allusion other than that he states it as a possibility.

One could imagine someone who teaches by example (a charismatic trait) as well as through revelation (a messianic characteristic). In addition, one could conceive of an individual who located Divinity both within (a charismatic tendency) and without (a messianic quality). One also can acknowledge the possibility of there being 'leaders' who did not focus on just love and freedom (a charismatic property) or on just truth and duty (a messianic feature) but on all of these qualities together ... that is, love, freedom, duty, and truth would be part of an integrated, harmonious whole that were in balance with one another.

On the other hand, one could not be both stable (a messianic trait) and unstable (a charismatic property). Moreover, one cannot seek to genuinely enhance the welfare of other people (a messianic characteristic) and, at the same time, be antisocial (a charismatic quality).

One cannot be both relatively humble (a messianic tendency) and engaged in self-aggrandizement (a charismatic inclination); nor can one both sincerely seek to be removed from the world's corruption (a messianic characteristic), as well as exploit that corruption to justify one's own descent into one's own amoral version of such corruption (a charismatic quality). One cannot be both attentive to the external world and, as a result, be capable of monitoring one's behavior in the light of that world (a messianic property), while, simultaneously, being out of touch with that external world and, therefore, unable to run various kinds of reality checks intended to constrain one's behavior (a charismatic property).

Furthermore, Oakes does not directly discuss the possibility of there being 'prophets' who were stable (messianic) but caught up in the throes of self-aggrandizement (charismatic), or 'prophets' who were interested in serving God (messianic) but wanted recognition for their efforts (charismatic). Oakes also does not speak about 'prophets' who might engage in reality checks (messianic) and, yet, also have a tendency to rebel, flaunt convention, and become entangled with legal skirmishes of one kind or another (charismatic) ... in other words, a person might pay attention to the external world in order to better understand how to subvert it and manipulate it.

One could expand upon the nature and number of such permutations and combinations. Almost all, if not all, of the foregoing possibilities fall outside the horizons set by Oakes' exploration into the psychology of charisma.

One does not know how Oakes would respond to any of the foregoing possibilities other than, perhaps, to acknowledge them as issues that require further study. What one does know is that, in general, Oakes is inclined to place messianic prophets in a largely, if not wholly, spiritual-religious context, whereas so-called charismatic prophets tend to be perceived as individuals who do not necessarily participate in activities that can be described in religious, spiritual, or mystical terms.

Thus, individuals such as Hitler, Freud, Perls, and Erhard can be studied along side of overtly religious/spiritual figures such as Madame Blavatsky, Gurdjieff, Bhagwan Shree Rajneesh, Jim Jones, and Joseph Smith -- to name but a few. This is because the characteristic that ties these individuals together is not spirituality, per se, but the quality of charisma that can be manifested in both religious as well as nonreligious contexts.

One wonders why Oakes chose to use the term 'prophet' -- as opposed to, say, 'leader' or some other comparable word -- in order to refer to individuals who: proclaim a mission of salvation, seek to challenge or overthrow conventional values through that mission, and, in the process, try to induce people to participate in that mission by, among other things, applying the mission principles to their own lives through looking to the 'individual on a mission' as their guide or teacher concerning how one should go about accomplishing this. One possibility is that Oakes wanted to concentrate on what he perceived to be the 'function' of a 'prophet', independently of religious and spiritual considerations.

Thus, if one removes the element of spirituality from the idea of a prophet and just looks at the behavior of such an individual, then according to Oakes, prophets are individuals who: (a) proclaim a mission; (b) couch the nature of that mission in terms of some kind of salvation; (c) often run into conflict with certain conventional values that exist at the time the mission is pursued; (d) seek to attract adherents to the mission, and (e) serve as a guide or teacher for those individuals who are trying to incorporate the mission's principles into their lives. If one separates the element of spirituality and religiosity from the 'functional behavior' of a prophet, then individuals -- irrespective of whether they represented a religious or non-religious context -- might be considered to be observing 'prophetic' behavior if they satisfied the five conditions specified by Oakes that have been outlined above.

From a traditional, spiritual perspective, an individual does not proclaim himself or herself to be a 'prophet' or become a prophet by arbitrarily proclaiming that one has a mission. A Prophet is someone who is said to have been appointed by Divinity to serve in a particular capacity for a given community.

Secondly, to reduce the task of a Prophet down to being a mission of salvation is problematic. To be sure, prophets do speak about the issue of salvation, but they also speak about: knowledge, truth, spiritual potential, identity, purpose, justice, death, and purity in ways that transcend mere salvation and re-orients one toward the possibility of additional realms of the sacred—sometimes referred to as the mystical dimension of spirituality.

Thirdly, to say that the intention of a Prophet is to clash with conventional values, or to rebel against such values, or to start a revolutionary movement that opposes such values, this also is problematic. A Prophet of God seeks to speak and behave in accordance with the truth -- the reality of things -- and while it might be the case that what is true does conflict with certain, conventional values, the purpose of giving voice to the truth is not necessarily to generate conflict, rebellion, or revolution.

Moreover, even if it were true that some conventional values were opposed by a given Prophet, one need not suppose that, therefore, all conventional values in a certain community would become the focus of opposition. Whether conventional values became objects of conflict, or values might became objects of conflict, could depend on a variety of circumstances and, consequently, to maintain that a main feature of the 'prophetic' mission is to revolutionize conventional values is far too sweeping and ambiguous a claim.

Prophets -- in a traditional spiritual sense -- are sent to remind and warn people about a variety of things. They are sent to induce people to seek out the truth in all things. They are appointed in order to encourage people to be loving, thankful, sincere, honest, kind, forgiving, tolerant, modest, generous, considerate, friendly, respectful, aware, co-operative, hopeful, persevering, patient, peaceful, and to be inclined toward seeking repentance (with respect to both human beings and God) for the mistakes one might have made. Prophets also are sent to discourage people from being: deceitful, exploitive, abusive, unjust, lacking in compassion, cruel, arrogant, hypocritical, dogmatic, intolerant, unloving, unfriendly, disputatious, immodest, thoughtless, insensitive, and so on.

There might be vested interests and various centers of power who become threatened, for one reason or another, by the activity of a Prophet, but the intent of a Prophet is not necessarily to wage war or rebel against those who have vested interests. Historically speaking, whenever and wherever possible, conciliation, harmony, peace, compromise, and negotiation are pursued by Prophets ... not confrontation and conflict.

Fourthly, a Prophet is not necessarily trying to attract followers. A Prophet is seeking to speak the truth as well as to offer guidance for anyone who is willing to engage that truth and guidance with a receptive heart and mind.

A Prophet is trying to assist people to realize the potential of their own relationship with the Truth/Reality. The fact that a community of people might arise around that individual might only mean that they are a community with a common set of purposes rather than an amalgamation made up of a leader and his or her followers.

Of course, the foregoing points all raise the question of whether, or not, there is anyone who is actually appointed by Divinity to serve in a special, Divinely-ordained role of a Prophet. For the most part, Oakes tries to stay away from this issue and, therefore, restricts his discussion to what people claim to believe concerning their status as a 'prophet', quite independently of considerations concerning the truth or falsity of those claims.

However, Oakes does stray from a largely neutral stance when he says that messianic prophets tend to operate in accordance with the 'fantasy' that they are -- in a yet to be explained (and possibly ineffable) sense -- "part" of God, whereas charismatic prophets are, according to Oakes, motivated by the 'fantasy' that they and the Godhead (or the psychic mother/father) are one ... that they are 'God'. In other words, Oakes is making a statement about what he perceives to be the truth status of much of what a 'prophet' says when Oakes maintains that no matter whether one falls into the category of a messianic prophet or one is subsumed under the category of a charismatic prophet, both sets of individuals are motivated by a fantasy concerning their relationship with God.

One is free to believe whatever she or he likes about the truth or falsity concerning the existence of Divinity, or the 'authenticity' of a given spiritual claim about being a 'Prophet'. However, one cannot claim to have an aura of neutrality on such issues, while simultaneously trying to claim that, say, someone's understanding concerning the nature of his or her relationship with Divinity is necessarily rooted in fantasies of one kind or another.

To be sure, there are individuals who do suffer from delusions concerning their self-professed Divine nature or special status with God, and so on. Nevertheless, this does not automatically force one to conclude that anyone who makes such statements is delusional or under the influence of a fantasy or myth of some kind. This remains to be determined on a case-by-case basis ... to the extent that it can be determined at all in any conclusive manner.

One cannot assume one's conclusions. Assumptions ought to be clearly identified as such, and there should be some thought given to how one's conclusions might be affected, adversely or otherwise, if the operational definition one is using -- in this case, the idea of who and what a 'prophet is -- turns out to be problematic, skewed, or incorrect.

Further evidence of the foregoing bias shows up in a variety of places in Oakes' book, but, perhaps, one of the clearest expressions of this slant comes in the conclusion when Oakes asks, and then answers, a question:

"But is the prophet really an enlightened spiritual being? If this question asks whether the prophet has personally experienced with the fullness of his being -- with his feelings and his relationships -- a spiritual reality, then, the answer appears to be no. Indeed, quite the opposite is true; it is the very shallowness of the prophet's feelings and relationships, his pervasive narcissism that prevents him from ever entering into a genuine relationship with another, or ever having anything other than pseudo feelings for others."

The foregoing statements might be quite accurate in their portrayal of the individuals whom Oakes actually studied in the field, and, as well, this sort of characterization might even be true of many of the religious, revolutionary, and charismatic personalities about whom Oakes learned during that phase of his research. In addition, Oakes is making an important point when he makes the quality of behavior a crucial, defining feature in determining whether, or not, someone should be considered to be a fully realized spiritual being.

Nonetheless, one hesitates to apply Oakes' conclusions across the board to any and all 'prophets'. Although he does not say so directly, the implication of his foregoing perspective tends to extend to such spiritual luminaries as: Jesus, Moses, Muhammad, the Buddha, Krishna, David, Solomon, Joseph, Abraham, and a host of others who, collectively, are considered by billions of people to be emissaries and prophets of Divinity.

To be sure, in the context of Oakes' study, the aforementioned remarks concerning whether, or not, prophets are spiritually realized human beings is primarily intended to refer to those individuals who fall into the category of 'charismatic prophet'. However, and as will be developed shortly, because Oakes' idea of charisma is, itself, problematic, a variety of difficulties arise in conjunction with his belief that, in general, 'prophets' are not really enlightened spiritual beings.

Part of the problem here is that some of the previously noted characteristics that, supposedly, differentiate between messianic and charismatic prophets raise some questions. For example, Oakes claims that one of the distinguishing features of a charismatic prophet is that such individuals tend to identify themselves with the Godhead, and, so, one might be puzzled about the idea of prophets not being spiritually realized human beings when one remembers that Jesus (peace be upon him) is reported to have said: “I and my Father are one” (this is a statement of unity, not necessarily identity or incarnation).

Is Oakes prepared to claim that Jesus (peace be upon him) was not only an unrealized spiritual being but, as well, was, if one accepts Oakes’ logic, a charismatic prophet who was narcissistic and incapable of forming genuine, sincere, loving relationships with other human beings? If so, where is the evidence for this, and, if not, then perhaps, his theoretical framework will have to be modified accordingly.

Or, consider another possibility. According to Oakes, two of the characteristics of a charismatic prophet involve (a) locating Divinity within, rather than through external channels, and (b) filtering one’s relationship with ‘being’ through a set of impersonal forces rather than through a personal relationship with a ‘God’.

Presumably, on the basis of the foregoing, one might be required to place ‘the Buddha’ in the category of a ‘charismatic prophet’ since Buddhism is often portrayed, rightly or wrongly, as filtering one’s relationship with Being through non-theistic forces of, to some extent, an impersonal nature. Yet, if one does this, is one forced to conclude that ‘the Buddha’ was a spiritually unrealized human being who was inclined to narcissism and only capable of having pseudo, shallow relationships with other individuals?

Similar questions arise in conjunction with some of the remarks made by Oakes concerning the Prophet Muhammad. For example, Oakes indicates (page 182) that Muhammad was among a group of historical personalities who led successful movements and passed away with their integrity intact-- i.e., no scandals. Oakes also identifies others who he judges to be like the Prophet Muhammad in this regard – e.g., Father Divine, Phineas Quimby, Prabhupada, Kathryn Kuhlman, and Ann Lee -- that is, ‘prophets’ who led successful, scandal-free movements.

These are individuals who did not self-destruct as is the tendency of many individuals who might fall into the category of ‘charismatic prophets. Yet, at another juncture in his book (page 94), Oakes seeks to use Muhammad as an example of a historical prophet who, in Oakes’ opinion, “played the part of a wounded innocent”, by going into seclusion, in order to manipulate his wives into accepting his “dalliance with a slave girl”.

Oakes does not provide any evidence to support his interpretation of the foregoing judgment. He states the foregoing as if it were an obvious fact and beyond question.

However, why should one accept such a judgment or interpretation? Why should one suppose that Muhammad was 'playing' the role of a 'wounded innocent'? Why should one suppose that he was trying to manipulate anyone? Why should one suppose that his relationship with the 'slave girl' was a mere "dalliance"?

Oakes is using a number of pejorative labels in reference to this prophet. Where is the independent evidence that indicates that any of his ways of describing the situation are evidentially warranted rather than expressions of Oakes' arbitrary biases being imposed on something about which he has no genuine insight or understanding?

For Oakes, one of the defining features of charismatic prophets is their capacity for, and willingness to, manipulate others. Indeed, one of the features that, supposedly, permits us to differentiate 'messianic prophets' from 'charismatic prophets' is the amazing social insight possessed by members of the latter category -- a capacity that, according to Oakes, allows such individuals to, in a sense, know that buttons to push in order to maneuver people in a desired direction.

Consequently, as was the case with respect to the implications of Oakes' foregoing quote -- for both Jesus and the Buddha -- concerning the lack of spiritual enlightenment in relation to 'prophets', once again, one is faced with an implication that paints Muhammad as someone who, according to the implications of Oakes' logic, might have been spiritually unenlightened, narcissistic, manipulative, and capable of only superficial, shallow relationships with others.

One of the arguments that some individuals have leveled against theoreticians like Freud is that he used his understanding of abnormal behavior and psycho-pathology to set the tone for what he considered to be healthy, normal psychological development. According to such critics, when one starts with a certain kind of sample set -- namely, people suffering from pathology -- one might not be able to validly make the transition from: what that sample says about the nature of the people in such a sample, to: claims concerning the psychology of human nature in a population of people who do not suffer from such pathology.

Similarly, by using certain, arbitrarily decided-upon, behavioral and functional characteristics of individuals as the basis for labeling various individuals as 'prophets', one might wish to pause for a moment and ask whether the behavioral and functional characteristics being cited really are reflective of how an actual 'Prophet' might think, feel, act, or be motivated. Even if one wishes to argue that the latter considerations should not shape and orient a study in psychology, nevertheless, one still needs to take note of the lacunae that are, potentially, present when a researcher tries to do an end-around, or ignore, the idea of 'authenticity' with respect to someone who claims to be, or is perceived to be, a prophet in a traditional sense, and, as a result, employs arbitrarily chosen criteria to shape the operational definitions one uses to establish categories, differentiate individuals, and orient one's research.

If the definition of a 'prophet' does not necessarily reflect historical and/or traditional considerations, and if the sample being studied does not necessarily reflect historical and/or traditional 'realities' concerning the lives of Prophets, then at the very least, one should raise a caveat concerning the validity of applying the results of a given study -- like that of Oakes -- to a larger population containing some individuals who might actually be individuals who were appointed by Divinity to pursue goals, purposes, and activities that are in contradistinction to Oakes's operational definition of 'prophet' and who are neither necessarily delusional nor under the influence of one, or another, fantasy with respect to their relationship with Divinity.

What difference do the foregoing considerations make with respect to understanding the idea of 'prophetic charisma' or the psychology of revolutionary, religious personalities? As it turns out, perhaps a great many problematic ramifications might arise as a result of such considerations, and this might be most clearly described and explained through an examination of the way in which Oakes talks about two other themes -- charisma and narcissism -- within the context of a theory that claims to be directed toward helping us understand the nature of: 'prophetic charisma'.

I do not feel it would be distorting Oakes' position to say that, to a major extent, the phenomenon of charisma is, for him, an expression of, and rooted in, the phenomenon of narcissism. At least, this does seem to be the case as far as the idea of the psychology of religious personalities is concerned -- both with respect to 'prophets' as well as their followers.

Oakes indicates that someone can be referred to as charismatic when she or he is perceived to embody something referred to as "ultimate concerns". While this embodiment of ultimate concerns might be in relation to either oneself or others, however, the meaning of 'ultimate concern' tends to vary from person to person.

Nonetheless, when an individual has extraordinary needs in relation to whatever a given 'ultimate concern' might turn out to be for that person (and extraordinary needs are linked to the formation of a nuclear self early in life that is colored by, among other things, narcissistic forces), then according to Oakes, the perception of the embodiment of that ultimate concern in another human being gives expression to an extremely powerful magnetic force of attraction. This conjunction of 'ultimate concerns', 'extraordinary needs', and the 'embodiment' of such concerns in a person who, as a result, is perceived to be a vehicle for: accessing, being in proximity to, and/or realizing such ultimate concerns, is considered, by Oakes, to beat the heart of the phenomenon of charisma.

Although the foregoing description does not specifically limit charisma to spiritual contexts, nonetheless, Oakes does believe that charisma constitutes a spiritual power with a considerable potential to revolutionize society. Moreover, he believes charisma has the capacity to spiritualize the extraordinary needs and ultimate concerns of those who are seeking to have their needs and concerns fulfilled.

It is hard, at this point, to understand just what Oakes means by the idea that charisma can spiritualize ultimate concerns and extraordinary needs. If a given ultimate concern is not already spiritual in nature, or if an extraordinary need is not already rooted in spirituality of one kind or another, then how does charisma, per se, spiritualize either ultimate concerns or extraordinary needs? What does it mean to spiritualize something?

Furthermore, since Oakes has indicated that charisma is a function of the perception that someone embodies the ultimate concerns of oneself or others, and since Oakes has indicated that charisma is a function of the perception that someone will serve as a means to the fulfillment of one's extraordinary needs, then one wonders about the precise dynamics of how either charisma, or its alleged spiritualizing dimension, works. After all, on the basis of the foregoing considerations, charisma seems to be something that is conferred on a given human being -- e.g., a 'prophet' -- as a result of the perceived embodiment of one's ultimate concerns in, say, a 'prophet' due to the extraordinary needs of the one doing the perceiving.

If the foregoing characterization of things is correct, then charisma is not something that a 'prophet' possesses. Rather, charisma arises -- and, sometimes, Oakes appears to suggest as much -- when the right alignment of 'prophet', 'ultimate concerns', 'extraordinary needs', and perception takes place. As such, charisma is a function of the dynamics of a certain kind of relationship between two, or more, people.

What a seeker brings to the equation are: ultimate concerns, extraordinary needs, and a perceptual mind-set that is actively or passively looking for something that resonates with those concerns and needs. What a 'prophet' brings to this dynamic are his or her own kind of extraordinary needs, together with a set of qualities that not only resonate, to some degree, with the concerns and needs of the seeker, but which, as well, are perceived to have something of a supernatural-like aura about them.. that is, there is something about the relationship that appears to be largely inexplicable, magical, mysterious, and resistant to any kind of easy explanation ... something that is experienced as seductive, alluring, magnetic, compelling, and somewhat mesmerizing.

One of the qualities that Oakes believes plays a significant role in the felt presence of charisma is the 'prophet's' talent for observation and an accompanying special ability to derive, from such observations, penetrating insights into the nature of on-going social dynamics as well as the extraordinary needs and ultimate concerns of individuals who engage the 'prophet'. Someone once remarked that one society's technology might appear like magic to another society that does not understand the principles through which such technology operates, and, similarly, when someone does not understand how a given person has arrived at her or his insight into one's extraordinary needs, ultimate concerns, or the surrounding social dynamics, then the individual with insight might be perceived as someone who has magical-like, supernatural-like capabilities and powers simply because one might not understand how such insight is possible.

Do some ‘prophets’ actually have psychic, occult, extrasensory, or non-ordinary powers of perception? Oakes does not believe so.

He believes everything is explicable through the manner in which ordinary abilities and talents might be developed to an amazing degree by individuals who have extraordinary needs. These needs are dependent for their fulfillment on the existence and use of such capabilities.

Oakes maintains (page 188) that a charismatic relationship begins with a seeker’s surrender and trust. According to Oakes, only later does the seeker begin to project her or his own ultimate concerns onto the ‘prophet’ and through this projection become ‘fused’ with the person of the ‘prophet’ to such a degree that the ‘seeker’ interacts with the ‘prophet’ as if the latter individual were an expression of one’s own inner, deeper, more essential ‘self’.

If so, this leaves unanswered the question of why someone would trust or surrender to another individual without some sort of substantial motivation for doing so? Apparently, Oakes seems to be saying that trust and surrender arise prior to, and independently of, the establishing of a charismatic relationship that, according to Oakes, revolves around the dynamics of ‘extraordinary needs’, ‘ultimate concerns’, and the perceived embodiment of these qualities in the person of the ‘prophet’ -- something that Oakes claims happens later in the relationship and, therefore, does not appear to be the initial reason why someone trusts and surrenders to the ‘prophet’.

According to Oakes, charisma spiritualizes a relationship. Yet, somehow, trust and surrender -- which, presumably, are essential to any sort of spiritual relationship -- take place, on Oakes’ account, before the main component of a charismatic relationship -- namely, the perceived presence of the embodiment of ultimate concerns -- is established.

The foregoing sequence of events appears somewhat counterintuitive. A more likely explanation would seem to involve the possibility that the felt or perceived presence of charisma is what helps induce someone to trust and surrender to a ‘prophet’, and, if this is the case, then Oakes might be mistaken about when the projection of ultimate concerns on to a ‘prophet’ takes place.

Furthermore, one wonders if it is so much a matter of a ‘seeker’s’ projection of ultimate concerns onto the ‘prophet’, as it might be a matter of such ultimate concerns actually being reflected in, or resonating with, some, or all, of the words and behaviors of the ‘prophet’. In other words, is one to suppose that the perception of the embodiment of ultimate concerns in another human being is merely a delusion in which nothing of those ultimate concerns actually is present in what a ‘prophet’ says and does, or should one assume that, to varying degrees, something of a substantive nature concerning such ultimate concerns is actually touched upon by the teachings and actions of the ‘prophet’?

To be sure, a seeker could be mistaken. For example, a seeker might believe that something of his or her ultimate concerns was present in what the ‘prophet’s said and did, only to discover, subsequently, that such was not the case or that whatever was present was being expressed in a fraudulent and manipulative manner. Or, a seeker initially might believe that a given ‘prophet’ could serve as a venue through which the seeker’s extraordinary needs and ultimate concerns could be realized, only to, later on, come to the conclusion, rightly or wrongly, that the ‘prophet’ could not actually assist one to fulfill one’s extraordinary needs or ultimate concerns. Alternatively, a seeker’s first, cursory impression of a ‘prophet’ might have led the seeker to believe that the prophet and the seeker shared a set of common concerns, values, and the like, only to realize, upon closer inspection, that the two, despite initial impressions, really weren’t on the same page with respect to a variety of issues, concerns, goals, and values.

However, such mistakes are not necessarily delusional in character. They are beliefs that come to be, hopefully, constructively modified in the light of subsequent experience -- something (that is, constructive modification) to which delusions are inherently resistant.

As such, it is not ultimate concerns, per se, that are being projected onto the prophet/leader/teacher. Instead, what is being projected is a hope concerning the potential value of what might ensue in relation to one's ultimate concerns by linking up with someone claiming to be a prophet/guide/leader.

Trust and surrender are offered in exchange for a promissory note, of sorts, about future considerations in conjunction with the fulfillment of extraordinary needs and ultimate concerns. The felt presence of charisma is perceived, rightly or wrongly, as an indicator that someone -- namely, a prophet/leader/teacher -- can satisfy the conditions of that promissory note. The felt presence of charisma, justifiably or unjustifiably, tends to create certain kinds of expectations concerning the fulfillment of ultimate concerns and extraordinary needs in the future.

Notwithstanding the foregoing considerations, one still is unclear about what charisma is or how the perceived presence of charisma has the capacity to induce or inspire trust, surrender, and expectations concerning one's ultimate concerns and extraordinary needs. One has a sense that, somehow, the perceived presence of charisma might have a 'spiritualizing effect in as much as trust and surrender -- which are important components of spirituality -- might be engendered, somehow, through the presence of something called 'charisma', and, yet, the manner in which this takes place -- the dynamics of the spiritualizing process -- remains elusive and puzzling.

Oakes believes that the secret of charisma lies in a narcissistic dimension of human development. More specifically, he believes that the alleged 'extraordinary needs' of both a 'prophet' and a seeker are entangled in the agenda of a 'nuclear self' that forms under certain conditions that, according to Oakes, are conducive to the emergence of narcissistic personality disorder in, at the very least, 'a charismatic prophet'.

Although at one point in his discussion of the phenomenon of narcissistic development Oakes voices a cautionary note concerning the question of how well can we know the mind and inner life of another human being, nevertheless, he soon leaves such caution behind when delineating Kohut's theory of narcissism and seeks to link that theory to the idea of charisma. Of course, generally speaking, it is often part and parcel of theoretical work to take some risks while venturing into uncharted conceptual territory, but some risks might be more viable than others.

Heinz Kohut developed his theory of narcissism while treating patients with narcissistic personality disorder. Based upon his experiences with such patients, he sought to explain the origins of that disorder.

The patients being treated by Kohut tended to possess a grandiose sense of self-confidence, untouched by any sort of self-doubt. They often were very perceptive about people and social dynamics (sometimes uncannily so), could be quite persuasive, but also were given to blaming and accusing others of various failings and short-comings.

Such patients frequently were inclined toward exhibitionism and were given to voicing unrealistic, naïve fantasies concerning themselves and their place in the scheme of things. In addition, these individuals tended to demonstrate little evidence of possessing a conscience or experiencing any sort of guilt when involved in wrong doing. Moreover, their relationships with others usually were marked by an almost complete absence of empathy for people and, as well, appeared to be imbued with a belief that other people existed to serve the needs of the narcissist.

According to Freud, all of us go through a period of primary narcissism during infancy when we believe that everything not only revolves around us but that the world is, in a sense, a creation of our own. Furthermore, this period of narcissism is said to be characterized by a child's sense of oneness with the world (meaning the mothering-one) which is posited to be a continuation of one's life in the womb when, supposedly, the boundaries between mother and child are completely dissolved.

During this period of felt-oneness, the child is said to bask in the nurturing glow of exaltation transmitted through the mother's gaze and treatment of the child. Through this sort of adoring interaction, the child feels worshiped and develops a sense of uninhibited, grandiose omnipotence that permeates the mind-set of the infant.

In the course of normal development, Freud indicates that primary narcissism becomes significantly attenuated and modulated as experience introduces a child to the pain of feeling alone in a world that, in many ways, appears indifferent to the desires of the child.

Feelings of omnipotence are ravaged by the onslaught of a sense of helplessness.

With the waning of primary narcissism, a child no longer believes herself or himself to be the center of the universe. A Copernican–like revolution has shaken the foundations of the child's previously Ptolemaic existence.

The idea of 'primary narcissism' is a theoretical construct. Whether a fetus or an infant ever has a sense of oneness with the mother, or whether an infant ever operates out of a framework that is permeated with feelings of omnipotence and grandiosity, or whether an infant ever operates under the illusion/delusion that she or he is the creative and causal force behind the happenings of the universe, or whether an infant ever has a sense of being worshiped like a 'god', or whether an infant ever has the sense that he or she shares a state of perfection with a 'saintly' mothering one -- all of these are highly contentious, largely speculative considerations.

Instead, one might entertain the possibility that any deeply developed notion of primary narcissism in the Freudian sense might have a very difficult time becoming established amidst the realities of this world. After all, almost from the first spank on the bottom that introduces us to this plane of existence, there is a great deal of human experience indicating: that we are not omnipotent; that however intimate one's relationship with the mothering-one might be, there is felt separation in the sense that there are very real differences between how the mothering-one behaves and how we might wish the mothering-one to behave; that we cannot always make the nipple appear upon demand; that the discomfort of wet diapers or a colic-ridden system does not always disappear with the mere wish for this to be so; that we are not in control of how hot or cold we feel; that the ravages of colds, fevers and illness descend upon us without our permission; that an infant might have difficulty in believing that she or he rules over the universe when he or she can't even get her or his hands and fingers to go where he or she would like or accomplish what she or he would like with such appendages.

The bundle of problematic desires, wishes, impulses, thoughts, and motivations within each of us that collectively are subsumed under the term "id" is a very different entity than the idea of primary narcissism. There is a considerable amount of metaphysical theory (e.g., oneness, omnipotence, and grandiosity, being worshiped, shared state of perfection), infusing the concept of primary narcissism that is absent from the notion of 'id' that simply posits, based on observation and experience, that there are wishes, desires, thoughts, and motivations within us seeking expression and that tend to generate a sense of frustration or anger when the sought-for realizations are blocked, thwarted, or ignored in various ways.

Leaving aside such considerations for the moment, let's return to Kohut's theory of narcissism. According to Kohut, the mothering-one filters the tendency of the world to intrude into the life of an infant, and, as a result, the mothering one has a role to play in helping to gradually initiate an infant into the realities of the world and away from the influence of the condition of primary narcissism.

Sometimes, however, Kohut maintains that something happens and the filtering process breaks down. There is some sort of traumatic tear in the process and, in one way or another, the child is deprived not only of the filtering assistance afforded by the mothering-one but, as well, the child loses the process of gradual initiation into the realities of the world ... realties that undermine and attack the child's sense of primary narcissism.

As a result, Kohut believes that some children, when faced with such a traumatic situation, seek to assume the responsibility of managing the filtering/initiation process by using the condition of primary narcissism as a coping strategy to try to filter and fend off the demands of the world. In such individuals, rather than the condition of primary narcissism becoming attenuated and modulated over time, this condition becomes strengthened and comes to dominate many aspects of that person's way of interacting with the world.

Although those individuals who become inclined to filter reality through the colored lenses of primary narcissism do learn -- through trial and error (sometimes with great difficulty) -- how the world operates and how to negotiate many different kinds of problematic encounters with the world in a way that will help to avoid punishment while garnering various rewards, nonetheless, Kohut believes that, for the most part, such people are ensconced in a paradigm of reality that is: self-serving, largely (if not completely) devoid of empathy for others, lacking in conscience, steeped in a sense of grandiosity concerning oneself, constantly seeking feedback from others that validates that sense of grandiosity, and are often skilled in insightful social observation as well as the art of persuading and/or manipulating others to become tools for the acquisition of whatever is desired or sought ... especially positive feedback concerning one's fantasies and delusions about grandiosity (this is often referred to as 'narcissistic supply').

Anyone who opposes, seeks to constrain, or interferes with the paradigm of primary narcissism through which the world is perceived and engaged by someone in the throes of narcissistic personality disorder is likely to become the focal object of what Kohut refers to as 'narcissistic rage'. Such interlopers are resented, resisted, and riled against -- either openly and/or through various forms of indirect stratagems in which people become pawns to be used, and if necessary sacrificed, to check the perceived antagonist.

Kohut distinguishes between messianic personalities and charismatic personalities (rather than 'leaders' or prophets') within the foregoing context of primary narcissism gone awry. The messianic personality is someone who projects a sense of grandiosity outward in the form of an 'object' and identifies this externalized, "idealized superego", or 'self', as a 'god' who is to be served, worshiped and from whom revelation/guidance is received. The charismatic personality, on the other hand, is someone who internalizes the sense of grandiosity and equates one's own being with an idealized sense of the omnipotent 'self' or Godhead that is to serve as an example for others.

Kohut believes a messianic personality is pulled by externalized ideals and the challenge of trying to emulate and live up to those ideals. A charismatic personality, however, is driven by ambitions revolving about her or his need for self-aggrandizement, together with a validation of that sense of grandiosity through the recognition and acknowledgment of others.

Following up on an idea of Kohut's, Oakes advances the theoretical possibility that 'seekers' might hook up with 'prophets' in ways that are mutually accommodating. In other words, individuals who have had their own problems negotiating the transition from primary narcissism to a more 'realistic' way of understanding that the world does not revolve around one's existence, might have 'extraordinary needs' that a messianic or charismatic prophet is perceived to be able to address and/or resolve. By helping a messianic or charismatic prophet to validate his or her sense of reality through the act of following such an individual, a seeker hopes to receive, in return, what might be needed in the way of the satisfaction of the seeker's ultimate concerns that will permit that individual to be happy, transformed, content, at peace, in harmony with one self or the world, or whatever else might be the thrust of the ultimate concerns and 'extraordinary needs' of a psychological/emotional nature inherent in the seeker.

Presumably, those individuals who identified with, or felt resonance in, the coping strategy adopted by a messianic personality, prophet or leader, would gravitate toward, or be attracted by, or feel 'at home' in circumstances where the 'idealized superego' had been projected outward and could be sought in the external world as an 'object' of some kind through which one's world could be ordered, guided, and ethically oriented. On the other hand, those individuals who identified or found resonance with the coping strategy developed by a charismatic personality, prophet or leader, might be inclined toward, attracted by, or feel comfortable in an environment where the 'grandiose self' was sought within and, if located, could lead to a sense of omnipotence, freedom, and primal release.

Although there is a certain degree of coherence and consistency to the foregoing theoretical framework and without wishing to argue that there is no one (either among 'prophets' or followers) who operates in accordance with such psychological dynamics, nonetheless, there are a great many reservations one might have concerning such a theory. For instance, to assume that all people externalize an 'idealized superego' or identify with an internalized 'grandiose self' might be a way of accounting for the observed behavior of some individuals, but such an assumption also tends to prevent one from considering the possibility that truth and reality are not necessarily a function of what we project, create, or identify with but might exist quite independently of what we think, feel, and believe.

Not every search for the truth is necessarily a reflection of unresolved issues of primary narcissism. Not every issue of ethics or morality necessarily reduces down to what we seek to impose on reality or what we internalize in the way of parental values. Not every search for identity is necessarily a function of the nuclear self's agenda that, according to Kohut and Oakes, precipitates out of the transition from primary narcissism to more mature modes of interaction. Not every search for wisdom is necessarily a reflection of the development of coping strategies for psychic survival. Not every search for justice is necessarily a reflection of one's likes and dislikes. Not every search for guidance is necessarily an exercise in finding a match between a 'prophet's' psychological profile and one's own psychological needs.

Not every 'prophet' is necessarily a product of the psychodynamics of everyday life. Not every thought of awe or omnipotence is necessarily either self-referential or a matter of what one projects onto the universe. Not every experience of love is necessarily a mirrored reflection of the presence of narcissism. Not all dissatisfactions concerning the limitations, problems, and lacuna of psychoanalytical thought are necessarily evidence that denial and other defense mechanisms are at work to save us from the painful realization of repressed wishes, fantasies, impulses, and thoughts.

What is the truth concerning such matters? Whatever they might be, one shouldn't start out by, in various ways, pre-judging the matter.

One cannot claim to be objective while being predisposed to restrict one's investigation to purely psychological principles in relation to some phenomenon without examining the possible merits of metaphysical or trans-personal explanations with respect to that same issue. One cannot claim to be value-neutral while ignoring possible data, experience, and phenomena that are not necessarily consistent with one's philosophical and/or psychological orientation.

Oakes admits that trying to trace such ideas as messianic and charismatic personalities back to the dynamics of infantile phenomenology is a speculative exercise (e.g., page 42). However, at other times he speaks in terms that appear to transpose these speculative exercises into 'likely' explanations of this or that phenomenon, or this or that individual (and, I have already pointed out that almost none of what Oakes or Kohut have to say is 'likely' to be accurately reflective of the lives, teachings and personalities of such individuals as Jesus, the Buddha, or Muhammad, not to mention any number of other spiritual luminaries who appear among the ranks of both historical Prophets and the great mystical guides from many different spiritual traditions).

Although it is desirable to want to subsume as large a body of phenomena, behavior, and data, as is possible, under the rubric of one theoretical framework, one also has to be prepared to acknowledge the possibility that reality might be far more complex, rich, nuanced, and problematic than the capabilities of any single theory. Moreover, while certain individuals might exhibit behavior and characteristics that are compatible with, say, the theories of Kohut, nevertheless, this does not automatically preclude the possibility that there might be many individuals who do not demonstrate profiles that easily, if at all, conform to the requirements of such a theory. Indeed, there might be a variety of different currents of human potential that are running through the ocean we call 'reality'.

One might be willing to accept Kohut's psychoanalytical theory concerning the way in which some individuals supposedly deal with the problem of primary narcissism. Nonetheless, even if one were to accept

Kohut's tendency to conceive of the difference between messianic personalities and charismatic personalities as being a function of whether, respectively, an 'idealized superego' was externalized or a 'grandiose self' was internalized, one still has difficulty understanding precisely how the ideas of 'prophet', 'narcissism', and charisma fit together.

Oakes does suggest that 'seekers' tend to be attracted to, or inclined toward, those 'leaders', 'guides', and 'prophets' who best reflect the 'extraordinary needs' of such 'seekers. As a result, some people are attracted to, and follow, messianic 'prophets', while others are attracted to, and follow, 'charismatic prophets'.

However, right away there is a problem here. If charisma is, to some extent, a function of the resonance of psychological profiles between, on the one hand, a 'prophet' or 'leader', and, on the other hand, a follower, then why refer to only one of the two classes of 'prophets' or 'teachers' as charismatic?

In both cases, there might be some sort of attraction involved. Yet, apparently, the attraction experienced in the case of so-called 'messianic prophets' is not an expression of charisma.

Of course, Oakes argues, quite explicitly, that charisma is very much rooted in someone -- 'prophet', 'teacher' 'leader' 'guide' -- being perceived to be the embodiment of another individual's ultimate concerns. Nonetheless, the same kind of question that was raised in the foregoing comments needs to be asked again.

More specifically, if one assumes, as seems logical to do, that both 'messianic prophets' and 'charismatic prophets' might be perceived to embody someone's ultimate concerns, then why does the adjective, charismatic only refer to one of the two classes of 'prophets'? Someone might counter, in Oakes's defense, by saying something along the lines of: 'Well, there are 'extraordinary needs' present in the case of the followers of 'charismatic prophets' that are not present among the followers of 'messianic prophets' and this phenomenon of 'extraordinary needs' together with the idea of the embodiment of ultimate concerns is what gives rise to the experience of charisma'.

However, such a possible response seems rather weak and not without its own problems. For example, if 'extraordinary needs' are a reflection of the unresolved issues of someone's psychological profile with respect to, say, primary narcissism, then why should one suppose that the needs of someone who seeks out and follows a 'messianic prophet' are any less extraordinary than the needs of someone who seeks out and follows a 'charismatic prophet'?

For example, why should one suppose that developmental problems surrounding the issue of an externalized 'idealized superego' are any less extraordinary than the developmental problems swirling about the internalization of a 'grandiose self'? What are the criteria for determining what constitutes "extraordinary needs"?

Furthermore, there are also some questions that ought to be directed to the alleged link between charisma and the perceived embodiment of ultimate concerns. In other words, just because someone is seen to embody the ultimate concerns of another individual, why should one automatically assume that the former person will be considered to be charismatic?

Oakes indicates that the meaning of 'ultimate concerns' will vary with the 'seeker' or 'follower' being considered. Ultimate concerns could be of a political, economic, ecological, philosophical, sexual, social, and/or spiritual nature.

We might consider our children to be expressions of our ultimate concerns, but this doesn't necessarily make those children charismatic. We might treat our careers as an expression of our ultimate concern, but this doesn't make our boss charismatic. We might believe that a given political leader embodies our ultimate concerns concerning a variety of social, legal, and economic issues, but we might not necessarily view the leader as charismatic so much as we might evaluate the 'leader' in terms of competence or incompetence, or in terms of someone who is popular or unpopular. A defendant in a murder trial might see his or her defense attorney, the judge, and the jury to be embodiments of her or his ultimate concerns concerning freedom, but this fact does not necessarily cause the defendant to perceive those other individuals as charismatic. We might believe that doctors, school teachers, police officials, fire fighters, and university professors might embody some of our ultimate concerns, but we don't necessarily consider those individuals to be charismatic. The members of a congregation or parish might perceive their minister, rabbi, priest, or imam to embody the ultimate concerns of the congregation, but those members do not necessarily consider such 'leaders' to be charismatic -- although they might consider them to be knowledgeable, approachable, compassionate, interesting, moral, and committed.

Consequently, one need not feel compelled to automatically agree that charisma is a function of the perception that someone embodies our ultimate concerns. Nor is it necessarily the case that charisma is a function of 'extraordinary needs' per se.

According to Oakes, individuals follow a 'prophet', 'leader', 'guru', or 'guide' for a reason (page 126). They are looking for something and come to believe, rightly or wrongly, that such a 'prophet' might be able to provide what they are looking for, or they need something and, rightly or wrongly, they come to believe that the 'prophet', leader, or teacher might be the key to the fulfillment or satisfaction of that need.

Oakes cautions his readers that trying to fathom the deeper motivations that shape the decisions that people make with respect to whether, or not, to follow a 'prophet', 'teacher' or 'leader' is an exercise in speculation. Oakes goes on to indicate that when the people whom he interviewed were asked why they joined a group or decided to follow a 'prophet/leader/guide', quite frequently, those being interviewed responded in terms of wanting to realize some sort of ideal -- such as enlightenment, salvation, or some similar "great work" that involved a transformation of the 'self' – and, yet, when these same individuals were asked what joining a group had permitted them to accomplish or what leaving such a group would mean to them, Oakes said that very different kinds of responses were given.

When the purpose of the 'great work' of self-transformation is not realized, followers often speak in terms of other kinds of values. For instance, they might speak about the process of having been part of something in which they placed their trust and to which they surrendered and that yielded certain kinds of experiential dividends and life lessons other than total self-transformation.

Some of these individuals might have had many of their illusions, naïve and otherwise, dispelled as physical proximity exposed the feet of clay of this or that 'prophet/guide/leader'. Yet, these same individuals might, nonetheless, feel a sense of gratitude for what they have experienced and learned in conjunction with that 'leader/prophet/teacher'. Other individuals speak in terms of the satisfaction derived through having been able to work hard and achieve or learn things that, prior to joining, they might not have thought possible or expected of themselves.

Oakes mentions four qualities that he claims form the core of a follower's attachment to a 'prophet/teacher/leader'. These qualities are: (1) faith (very vaguely and amorphously defined), (2) trust, (3) courage (in the sense of the courage that a 'prophet' gives to seekers in his or her role of someone who, allegedly, has attained salvation or self-realization, and, therefore, is a living exemplar, supposedly, of what is within the grasp of one and all) , and (4) projection (the placing of one's ultimate concerns onto the figure of the 'prophet/guide/leader').

A charismatic 'prophet/leader/guide' could strengthen faith, or induce trust, or inspire courage, or provide a reason for why one believes that such a 'prophet' actually does embody one's ultimate concerns, and, therefore, represents a worthy recipient of such projection. However, admitting this possibility doesn't really make charisma something that is caused by some combination of faith, trust, courage, and/or projection, as much as this might indicate that charisma could play a causal role in the explanation of why someone becomes attached to a given 'prophet/leader/teacher' through faith, trust, courage and projection.

Similar sorts of comments could be made in relation to Oakes' contention that, for example, 'love' and 'freedom' are characteristic of groups led by 'charismatic prophets', whereas 'truth' and 'ethics' are associated with 'messianic prophets'. To begin with, it is not obvious, in any prima facie manner, that someone who is perceived to be an extraordinarily loving human being would necessarily be any more charismatic than someone who is rigorously devoted to the truth, or that someone who is an extreme individualist will necessarily be perceived as being more charismatic than someone who is devoted to duty with respect to moral and ethical issues.

We might be attracted to all of these kinds of individuals. Yet, such attraction is not necessarily of a charismatic kind. We might be attracted for other reasons such as having respect for such people or wanting to emulate them or wanting to learn from them or feeling comfortable around these kinds of individual.

One is still left wondering why messianic 'prophets/teachers/guides' aren't referred to as 'charismatic'. One also is still wondering why so- called 'charismatic prophets' are considered to be 'charismatic'.

Oakes devotes a whole chapter to the idea of the 'charismatic moment'. This is described as an instant, or relatively brief interval of time, in which a person is willing to open up one's heart, to lay bare one's soul, to trust without reservation, to become totally vulnerable to another and surrender.

The charismatic moment is to experience an exhilarating, intoxicating, powerful, intense, electric blurring of boundaries between oneself and the 'prophet/teacher/guide' and/or the group that is led by such an individual. These moments are said to give expression to a primal, life impulse (which Weber refers to as 'pure charisma') that might be charged with sexual energy and are often steeped in a shroud of mystery, secrecy, tension, the unpredictable, a leap into the unknown, and an exhilarating, edgy sort of riskiness -- all of which might intensify one's willingness to throw caution to the wind, abandon normal conventions, and become open to the moment.

According to Oakes' the 'charismatic prophet' is someone who is accomplished in inducing such moments through, among other means, establishing rituals conducive to the generation of charismatic moments. Oakes believes that such rituals are one of the most creative accomplishments of a 'charismatic prophet'.

However, Oakes also indicates (page 148) there often is a dimension of the whole process that is beyond the capacity of the 'prophet/teacher/guide', the group, or a follower, to control. More specifically, no one knows, for sure, whether, on any given occasion, the 'spirit' (or whatever it is that is transpiring at a given instant) will flow and the gathering will be anointed with the presence of a charismatic moment.

Apparently, charismatic moments do not necessarily flow through the teacher to the other participants. 'Prophets/leaders/teachers' cannot always produce these moments on demand. Consequently, while 'prophets/teachers/guides' might, or might not be, necessary conditions for the advent of a 'charismatic moment', they are not always sufficient conditions for such phenomena.

When reading Oakes, one often is puzzled because he sometimes alternates among a variety of expressions that are not necessarily reducible to a single phenomenon. Sometimes he talks about charismatic prophets -- and, indeed, the title of his book is Prophetic Charisma -- as if they are the source of, or channel for, charisma.

However, sometimes he talks about how charisma is a product of the way followers project their ultimate concerns onto a given 'prophet/leader/guide'. On still other occasions he talks about how charismatic prophets are very adept in creating rituals that can lead to the experience of charismatic moments and, yet, whether, or not, the spirit moves on such occasion seems to depend on something beyond what the 'prophet/teacher/leader' brings to the table in the way of creative rituals.

Oakes states that: people who are narcissistic personalities are often perceived as individuals who project an image of unshakeable confidence and strength concerning their purpose, role, and mission in life. Oakes also describes such individuals as being perceived as courageous, even fearless, with respect to those who oppose her or him. Moreover, the capacity of many narcissists to exhibit an uncanny sensitivity to social and individual psychological dynamics lends them an aura of someone with supernatural powers. Finally, because narcissists have an inflated sense of their own self-importance, they also tend to be perceived as being positive and upbeat about life.

A narcissistic individual might appear strong and self-confident because she or he cannot admit the possibility that he or she might not be whom she or he takes himself or herself to be. Such an admission is an anathema to the narcissist.

A narcissistic personality might appear courageous and fearless because, in a very real sense, their psychic survival depends on being able to oppose anything that would cast doubts upon, or bring into question, or cast aspersions and ridicule upon, the narcissist's beliefs about who she or he is and what role such an individual plays in the scheme of things. When opponents seek to put them in a corner, they often respond with the ferocity of someone fighting for survival -- a courage and fearlessness that can be camouflaged to appear as being in defense of truth and justice when it is really self-serving.

Oakes describes the charismatic prophet as someone who utilizes some of the strengths of his or her narcissistic condition to attract, influence, and manipulate seekers and followers. When people encounter someone who seems to be strong, self-confident, purposeful, committed, positive, courageous, fearless, and insightful, such people might be induced to consider those individuals to be extraordinary personalities and quite different from most other individuals, and depending on how adept the narcissist is in camouflaging the true significance and meaning of such qualities (that is, as expressions of a pathological strategy for coping in life rather than any form of spiritual accomplishment or realization), a narcissistic personality might, on the surface, seem like someone who possesses the 'pure charisma' that is believed to mark the 'anointed ones' of destiny or Divinity.

Oakes points out how the career choices of many people who go on to assume the role of a 'prophet/leader/guide' often have a connection to activities in which communication tends to play a central role. For example, on page 88, Oakes lists such careers as: entertainers, sales people, teachers, clergy, and counselors (especially in conjunction with alternative heath) as having prominence in the backgrounds of many of the people in his research.

People who have the gift of gab, people who are adept in the arts of social influence, people who have experience with using language skills to shape the ideas, opinions, values, and desires of other people -- all of these individuals are specialists in framing reality to serve their purposes. This need not mean that all such individuals are pursuing malevolent or exploitive purposes, but, under the right circumstances, this could be the case.

Narcissists who enjoy strong skills of communication, persuasion, influence and the framing of reality tend to use such skills in manipulative, controlling, and destructive ways. However, if a narcissist can succeed in inducing people to believe that something other than what is actually going on is going on, then this could be an extremely powerful means of altering another person's sense of reality, identity, purpose, truth, meaning, right, and wrong.

Finally, if one adds to the foregoing set of qualities an element of what is referred to as love, the package could assume quite a powerful presence in the perception of a seeker. Only much later, if at all, will a seeker discover that such 'love' is really nothing more than a manipulative device devoid of all empathy and compassion for another and solely geared toward priming the pump of narcissistic supply that is the life blood of a narcissistic personality and that is sucked from other human beings like a vampire with an inexhaustible hunger for that which they do not have and that can only be provided by warm bodies and souls.

In the beginning, however, all of this is hidden from view. First, superficial impressions might dominate the perception of a seeker – to the benefit of the narcissist and to the detriment of the seeker.

Presumably, it is the foregoing package of perceived qualities that helps a narcissistic personality to appear, to some, as a charismatic figure and, thereby, enable a 'prophet/leader/guide' to arrange for 'charismatic moments' that induce vulnerability, trust, surrender, and even a sense of complete abandon in some seekers/followers. The creation of such moments is part of the repertoire of tricks and stratagems the narcissist has picked up over the years to help manage his or her world in a way that permits a continuation in the flow of narcissistic supply to come to her or his way as followers -- caught up in the rapture, ecstasy, power, and release of such moments -- shower the 'prophet/leader/teacher' with adulation, reverence, gratitude, and love (i.e., provide narcissistic supply).

The seeker/follower interprets such moments as a validation of the idea that truth and spiritual transcendence are being channeled through the 'prophet/leader/teacher'. The 'prophet/teacher/guide' interprets such moments as a validation that he or she is who she or he believes himself/herself to be in the cosmic scheme of things and, therefore, that she or he has a right to the adulation and love that is being showered upon him/her.

Notwithstanding the foregoing considerations, one might still ask the question: What is the source of the charisma of a charismatic moment? Alternatively, what makes such moments charismatic?

If one defines charisma as the perceived embodiment of one's ultimate concerns, then seemingly, the charisma of a 'charismatic moment' would appear to be connected with the character of the experience that arises during that period of time. However, just because an experience is intense, powerful, inexplicable, mysterious, ineffable, emotionally moving, and ecstatic, does this necessarily make the experience a manifestation of the embodiment of one's ultimate concerns?

LSD, nitrous oxide, Ecstasy, alcohol, sensory deprivation, marijuana, giving birth, falling in love, and holotrophic breathing can all lead to experiences that bear many of the characteristics of so-called 'charismatic moments'. Many of the aforementioned, powerful, emotional qualities can be experienced when one looks up into the sky on a clear night sky and away from the city lights, or when one sees a range of mountains, or watches ocean waves come crashing into shore, or witnesses the power of nature in the form of a tornado, hurricane, lightening, volcanic eruption, or earthquake. The right musical, artistic, cinematic, literary settings or performances have the capacity to induce many of these same kinds of experiential qualities.

Charismatic moments can be manufactured or naturally occurring. These kinds of experience might, or might not, be about ultimate concerns, but, nonetheless, they have the capacity to move us in fundamental ways ... often in ways about which we might become uncertain or confused as to exactly why we might feel moved or affected in the way we are.

On several occasions, Oakes refers to the work of Charles Lindholm in relation to the phenomenon of charisma. According to Lindholm, the primary, but hidden, purpose of a charismatic group is not necessarily to help people to discover their essential spiritual identity or to realize ultimate spiritual concerns but, rather, to experience itself again and again as a certain kind of collective. Charismatic moments give expression to these kinds of experience.

In many ways, if the goal of a collection of people is to experience itself not just as a group but as a group that journeys through, or is opened up to, or is, to varying degrees, seeking to be immersed in intense, powerful, moving, primal, mysterious, emotional, joyous, ecstatic experiences, then the phenomenon of charisma -- whether manufactured, illusory, delusional, or real -- becomes the raison d'être underlying the structure, dynamics, and activities of the people in this sort of group. As such, certain kinds of experience become ends in themselves, rather than a possible means for struggling toward a spiritual understanding, knowledge, and insight concerning truths and realities that might transcend those experiences.

In such a context, 'charismatic prophets' are those individuals who serve as facilitators for arranging, manufacturing, and moving people in the direction of experiencing (or believing they are experiencing) charismatic moments. If this sort of facilitator is a narcissistic personality, then the idea of a charismatic moment becomes the bait that is used to lure people to help the 'prophet/leader/teacher' acquire what is necessary for his or her own charismatic moments ... namely, to feed off the souls of the people who wander into the vampire's lair. If the aforementioned facilitator is not a narcissistic personality, then one has to carefully study the dynamics and structure of the group with which such a facilitator is affiliated in order to determine whether the group has any constructive, spiritual purpose other than as a venue for generating certain kinds of experiences.

People who troll the waters of life seeking charismatic moments need to understand that there are other beings who are also trolling the waters of life, and these latter beings are trolling such waters in search of people who are trolling the waters seeking charismatic moments. If one is only seeking certain kinds of experiences -- described as charismatic, trans-personal, mystical, or altered states of consciousness -- and if one is not interested in gaining knowledge, understanding, and insight in order to become a better person with respect to developing and bringing into harmonious balance such character qualities as: patience, kindness, compassion, honesty, tolerance, love, forgiveness, fairness, generosity, integrity, nobility, peacefulness, altruism, modesty, and moral courage, then one is a very good candidate for winding up on a milk carton as a soul who has become lost or missing somewhere along the way.

Elsewhere in this book (e.g., see the chapter entitled: "A Fate Worse Than Death"), considerable time was spent describing some of the phenomenological boundary dynamics entailed by spiritual abuse and why disengaging from spiritual abuse -- even when one might be aware that spiritual abuse is going on -- can be very difficult to do. In addition, something also has been said within this book about how powerfully addictive certain kinds of operant conditioning learning schedules are that exhibit what are referred to as intermittent, variable-interval reinforcement properties.

Charismatic moments naturally lend themselves to becoming part of an intermittent, variable-interval reinforcement learning schedule in which the learned behaviors connected to seeking additional exposures to such moments can be very hard to extinguish once this sort of seeking behavior is set in motion. Once a person has had the experience of some sort of charismatic moment, this moment can be the point out of which emotional and psychological addiction arises.

In a sense, a narcissistic personality who is playing the role of a 'charismatic prophet' is pushing the charismatic moment like someone would push cocaine, heroin, or Ecstasy. The narcissistic personality is someone who, himself or herself, is addicted to a different drug -- namely, the narcissistic supply of adulation and surrender coming from others -- and the narcissistic personality uses this addiction to justify her or his efforts to make charismatic junkies of other human beings in order to preserve his or her own access to a constant source of narcissistic supply.

Irrespective of what one might believe about the existence of God or transcendent, spiritual truths, or the realization of essential identity and potential, a spiritual narcissist knows there are millions of people who do believe in such things ... each in his or her own way. This is the belief, this is the holy longing, to which a narcissistic, charismatic 'prophet/leader/guide' seeks to appeal and, subsequently, exploit or manipulate in the service of his or her pathology.

There is one other entry point to the issue of charisma that Oakes explores in an attempt to provide understanding with respect to the phenomenon of charisma. This additional avenue involves the work of Max Weber.

Although Oakes introduces his readers to the ideas of Weber fairly early in his book on Prophetic Charisma, I have left these ideas for the last part of the present essay. I have done this for a number of reasons but, perhaps, the primary one being that what Weber has to say dovetails with the way in which I wish to finish the discussion.

Oakes notes that Weber is the individual who is responsible for many of our modern ideas about the phenomenon of charisma. Weber describes charisma as a particular dimension of the personality of certain, special people that engenders in others a sense of feeling that the latter are in the presence of someone who is extraordinary, or someone who possesses supernatural capabilities, or someone who has some sort of close proximity and elevated status in relation to Divinity.

Weber indicates that charisma might be felt and manifested in non-religious contexts, but, nonetheless, he maintains that charisma is largely a religious or spiritual phenomenon. Furthermore, even though Weber was an advocate for seeking and providing social (rather than, say, psychological) explanations concerning the causes of a variety of individual and cultural dynamics, he also was of the opinion that ideas were capable of altering society and individuals in ways that could not be reduced down to purely social factors ... this was especially the case in conjunction with religious ideas.

According to Weber, the phenomenon of charisma gives expression to a continuum of possibilities. These range from: something that Weber referred to as 'pure charisma', to: relatively mechanical and derivative elements of charisma.

Weber considered instances of 'pure charisma' to be very rare and might only have been present during the very early, originating/creative stages in the formation of a group or movement when people first began to gather around a charismatic leader/personality. For Weber, the more routine manifestations of charisma usually arose after the founding force had passed away and/or when the original charisma had become diluted as that force is dispersed among secondary leaders and communities rather than being focused in one individual or the original group of followers.

On the one hand, Weber seems to believe that charisma was an expression of a fundamental, elemental, primitive life force. Yet, at the same time, Weber also appears to indicate that the source of charisma's capacity to influence resides as much in the power that followers cede to a leader as it does in the qualities of charisma that might be independent of such followers.

While it might be possible for a group of people to create the illusion of charisma being present in a given person when such is not the case (e.g., the manufactured charisma of celebrity status), nevertheless, presumably, there is a certain 'something' present in a charismatic individual that has the capacity to attract people and induce the latter to become inclined to place trust in that individual or to surrender, to varying degrees, to that individual. So, without wishing to dismiss the idea of manufactured charisma, Weber would seem to have something more in mind when he talks about 'pure charisma' -- 'something' that exists prior to, and independently of, group dynamics.

Somewhere between pure charisma and routine charisma lay several possibilities that Weber refers to, respectively, as 'magical' and 'prophetic' charisma. Magical charisma is said to be characteristic of shamans who use charisma to, on the one hand, introduce people to the realm of ecstasy, while, on the other hand, helping to maintain the basic structure of simple or primitive groups, communities, or society. As such, magical charisma is largely a conservative, stabilizing force.

Prophetic charisma is described by Weber as characteristic of more complex communities or societies. Such charisma supposedly is given expression through individuals who announce the sort of mission (often religious, but it could be political in nature) that is intended to lead to social change, if not revolution. Through a charismatic force of personality, and/or through the performance of miracles and wondrous deeds, and/or through a capacity to induce intense, passionate, and ecstatic experiences in others, a person who possesses prophetic charisma is capable of affecting other human beings in ways that run very deep emotionally, psychologically, physically, spiritually, and socially.

According to Weber, some charismatic personalities use charisma to assist others to become explorers of ecstatic mysteries. Some charismatic personalities, referred to as 'ethical prophets', use charisma as an ethical instrument intended to lead people in the direction of developing a life devoid of aggression, hatred, anger, fear, and violence by inducing states of euphoria, enlightenment, as well as what would now be termed 'born again' conversion experiences. Still other charismatic personalities seek to arouse, shape, and channel the passions of people to serve, whether for good or evil, various political, financial, and social ends.

Weber believes that the experience of intense, euphoric, passionate, ecstatic states comes about when charisma is used to put an individual in touch with his or her own inner psychological/emotional primeval, instinctual depths that enables an individual to break away from, or become released from, the inhibiting forces of convention and repression that normally hold people in place within a given society. As such, Weber maintains that charisma is a life force that is inherently antagonistic to the forces of inhibition, constraint, convention, and conservation that normally modulate the dynamics of social interaction. For Weber, the natural inclination of charisma is to seek to overthrow, transform, or cast off all external values of conventional society as charisma initiates individuals into that which is located beyond the horizons of traditional social structure ... something so 'other' that it is viewed as belonging to a Divine realm that transcends normal society and conventions.

Weber considered charisma to be: too irrational, unpredictable, unwieldy, and, therefore, dangerous to be tamed and controlled in any responsible fashion. Although he believed that charisma could serve as the creative spark that ignited the fires of social progress, he also was of the opinion that limiting the influence of charisma -- at least in any 'pure' sense -- to the early period of originating or creating would be the prudent thing to do.

In the Islamic spiritual tradition, the Qur'an speaks about 'alastu bi rabikum' -- the time when, prior to being brought into this plane of existence, God gathered the spirits together and asked them: "Am I not your Lord?" Many other spiritual traditions allude to, and speak about, such a condition as well. Anything that resonates with that experience is believed to have a quality of jazb about it – that is, a euphoric, ecstatic condition as one is drawn back toward that moment, or as one is drawn toward a state that resonates, in some way, with that original, primal time of an aware, felt, intimate, loving, direct connection with the Divine presence.

From a mystical or spiritual perspective, authentic Prophets do not call us back to some biological state of the womb in which one, allegedly, felt one with the universe. Authentic Prophets do not call us back to some mythical state in which all boundaries between the mother and the self were dissolved so that the mother and the individual were felt to be as one, nor do authentic Prophets call us back to a condition of primary narcissism when, supposedly, we feel ourselves to be omnipotent, sacred, godlike creatures around which the universe rotates and in whose service the universe has come into existence, nor do authentic Prophets call us back to some instinctual, primeval, emotional depths that is seeking to release from the conventions and values of society.

Instead, authentic Prophets call us to seek the truth concerning the purpose, meaning, possibilities, dangers, and nature of existence. Authentic Prophets call us to inquire into our essential identities and potentials. Authentic Prophets call us to honor the rights of all aspects of creation, as well as to learn how to engage life through justice, integrity, gratitude, love, sincerity, courage, compassion, sacrifice, kindness, honesty, patience, and humility. Authentic Prophets call us to discover the true nature of our relationship with all of Being and to go in search of the essential meaning of worship.

From a mystical or spiritual point of view, authentic Prophets are the individuals chosen by Divinity who are provided with a charismatic authoritativeness (said by traditions to consist of forty-seven different parts, one of which concerns the ability to provide correct interpretation of dreams) as a Divine gift to enable such individuals to carry out their mission, as best their individual capacity and God permit, to call people back on a journey of return to their spiritual origins, nature, identity, purpose, potential, and destiny. In such individuals, charisma is the felt manifestation of the presence of this Divine gift.

If one accepts the principle that there is no reality but Divinity, then the passion play of Divine Names and Attributes forms the woof, warp, and fabric through which the tapestry of creation and every modality of manifestation is woven. Everything to which we are attracted bears, to one degree or another, the imprint of the underlying Reality.

As such, there are many kinds of charisma. There is a form of charisma associated with every manner in which Divinity discloses something of the Divine Presence. Natural wonders the mysterious, incredible athletic performances, great musical or artistic talent, literary masterpieces, extraordinary heroic deeds, works of great intelligence or profound inventiveness and creativity ... all of these attract according to the degree that they give manifestation to the charisma inherent in the Divine Presence that is peeking through the veils of Creation.

Power carries an aura of charisma because it is God's will that enables someone to ascend to the throne of power. Even Satanic power and capabilities might have a quality of charisma to them because such powers and capabilities are exercised only by God's leave and that serve -- in a way that God understands but Satanic forces do not -- Divine purposes.

The natural inclination inherent in the pure charisma that is given expression through the lives of authentic Prophets is constructive, not destructive. It is benevolent, not malevolent ... it is peaceful, not aggressive and hostile ... it is committed to the distribution of fairness, justice, and the honoring of the rights of all facets of Creation, rather than given to the generation of upheaval, discord, and rebellion ... it is oriented toward the acquisition of essential knowledge, wisdom and understanding through which the constructive potential of life, both individually and collectively, can be released and set free, rather than being oriented toward primitive forms of physical and emotional release associated with the individual desires, whims, and wishes of the carnal soul.

If God wishes, authentic Prophetic charisma offers spiritual nourishment to both individuals and communities. God willing, people become strengthened and constructively energized through the presence of authentic Prophetic charisma.

The desire to be in the presence of authentic Prophetic charisma is part of the holy longing that seeks to feel re-connected, in an intimate way, with the Divine. From the standpoint of traditional spirituality, authentic Prophetic charisma is the catalyst provided by Divinity that is intended to help facilitate such a connection and return.

It is unfortunate that Oakes has used the term 'prophetic charisma' to refer primarily to pathological attempts to counterfeit authentic expressions of 'prophetic charisma'. This has happened, I believe, because the sample that Oakes used to develop his notion of a prophet was problematic and skewed in certain, problematic directions.

The 'package' of qualities that is manifested through narcissistic personalities attempting to convince others (and themselves) that they possess the charisma of an authentic Prophet is but a counterfeit of the qualities that are in evidence in an authentic Prophet. This package is an illusory/delusional framework that is intended to create an impression that qualities like: confidence, purpose, strength, courage, fearlessness, meaning, identity, love, social insight, creativity, powers of communication, persuasiveness, transformation, and transcendent experiences of spiritual ecstasy are present in an authentic, sacred way when such is not the case.

Quite frequently, when people encounter spiritual abuse, this experience tends to destroy a person's faith and capacity to trust. Once one has felt betrayed in an essential way -- which is at the heart of all forms of spiritual abuse -- regaining a sincere desire to continue on one's quest to realize one's holy longing is very difficult to do.

A mistake that many people make who write about spiritual abuse is to approach the issue from an excessively rational, philosophical, and psychological perspective ... one that seems to tend to preclude the possibility that the phenomenon of Prophetic charisma -- as an expression of the Presence of Divinity in our midst and that is inviting us to a journey of return to our spiritual potential and essential identities -- is not a myth, fantasy, delusion, or mere belief.

Although I believe that Oakes' work on 'Prophetic Charisma' contains much that is interesting, insightful, and useful, I also feel that, ultimately, his study fails to place the phenomenon of charisma in a proper spiritual perspective. One of the reasons why narcissistic personalities can fool people -- and some narcissists are much better at this than are others -- is because individuals in the throes of narcissistic personality disorder are able to turn people's natural vulnerabilities concerning issues of holy longing against the latter.

In other words, even when someone seeks the sacred out of a sincere desire for the truth and not out of the 'extraordinary needs' of, say, unresolved, developmental issues involving the alleged infantile stage of primary narcissism, nonetheless, such an individual doesn't really know precisely for what he or she is longing. There are many kinds of experiences and circumstances that can resonate with the condition of -- 'alastu bi rabikum (Am I not your Lord)? -- in a misleading manner.

A narcissistic personality who is trying to pass herself or himself off as a charismatic prophet/leader/teacher knows that seekers don't know -- that is why the latter group of people are seeking answers from others about how to satisfy their sense of holy longing ... because they don't know how to do this on their own. Even in the case of sincere people, what the latter sort of individuals don't know constitutes a source of vulnerability through which such sincerity can be misinformed, led astray, corrupted, or entangled in a variety of ways.

Narcissistic personalities are often masters at re-framing experience to make it appear to be other than what it is. Satan is the prototypic role model for such a narcissistic personality disorder.

At one point, Oakes mentions that in 'The Heart of Darkness' Joseph Conrad, through the character Marlow, suggests that a "fool is always safe". In other words, an individual who doesn't care about the holy longing within, who is not sincere about matters of essential importance to existence, will rarely be fooled by those who -- through manufactured or natural charisma of one kind or another -- seek to use the attractiveness of such charisma to mislead people into supposing that something essentially substantial is being offered when such is not the case. Fools are always safe from being misled in this manner because they have no interest in, and feel no attraction for, things that actually matter.

Intelligent, sincere, decent people are vulnerable to the presence of counterfeit spiritual charisma. Mistakes of judgment concerning whether, or not, some individual is capable of helping one fulfill one's holy longing are relatively easy to make, and, unfortunately, once made, not all of these mistakes admit to easy solutions.

Short of God's Grace, there is no fool-proof way to identify or avoid narcissistic personalities who seek to prey on holy longing. However, one point that might well be worth reflecting on in this respect is the following -- any use of charisma that invites one to abandon basic principles of decency, kindness, honesty, integrity, compassion, generosity, fairness, modesty, humility, patience, tolerance, forgiveness, peacefulness, and love toward one's family or other human beings irrespective of the beliefs of the latter, should be considered to be a tell-tale sign that spiritual abuse is being perpetrated. This is so no matter how euphoric and ecstatic various 'charismatic moments' might be that are associated with such a use of charisma.

There is a fundamental problem inherent in any use of charisma that does not assist one to become a better human being, with a more fully developed and realized moral character that is encouraged to be actively practiced and not just thought about as an abstract ideal. However, sometimes -- depending on the forces at play in a given set of circumstances and depending on the skills of the narcissistic perpetrator who is busy weaving a tapestry of illusions, delusions, and manipulative deceit -- discovering that such a problem exists can be a long difficult process, and, furthermore, disengaging from such circumstances once this problem has been discovered is not necessarily an easy, painless, straightforward thing to accomplish. Indeed, sometimes, long after one has left a narcissistic personality who has been posing as a charismatic prophet, remnants of the toxicity continue to flow through one's system ... not because one wishes this to be the case but because this is often part and parcel of the destructive, insidious nature of the ramifications ensuing from spiritual abuse.

Chapter 17: Piaget and the Biology of Knowledge

What might be referred to as an 'interactionist' theme is a hallmark of Piaget's genetic epistemology. As Piaget states very early in Biology and Knowledge:

"... no form of knowledge, not even perceptual knowledge constitutes a simple copy of reality, because it always includes a process of assimilation to previous structures."[2]

There is a certain amount of ambiguity in the foregoing statement because it is not clear whether Piaget: (a) is advocating a copy theory of reality (although not a simple one); or, (b) he is not putting forth a copy theory of reality -- simple or otherwise; rather, he is suggesting that assimilatory activity interferes, to varying degrees, with determining the nature of reality.

This ambiguity remains unclear after noting that Piaget claims:

"Knowing does not really imply making a copy of reality but, rather, reacting to it and transforming it (either apparently or effectively) in such a way as to include it functionally in the transformation systems with which these acts are linked."[2]

Although an individual is said to be capable of transforming reality, one is still uncertain about the relationship between the nature of the transformation and the degree to which it accurately reflects, represents or captures various qualities of that which is transformed.

A short while later in Biology and Knowledge, however, one runs into a brief discussion of certain kinds of transformations ... a discussion that seems to indicate that Piaget does allow for the possibility of a copy theory of reality even if such a theory tends to be complex in character. More specifically, when Piaget talks of mathematical/logical transformations, he does convey the distinct impression that one is potentially capable of penetrating to the true nature of reality. For example, consider the following:

"It may be said that ... mathematics acts simply as a kind of language. But mathematics is much more than that since it alone can enable him to reconstruct reality and to deduce what phenomena are, instead of merely recording them ... Mathematics consists not only of all actual transformations but of all possible transformations. To speak of transformations is to speak of actions or operations the latter being derived from the former ..."[3],

and, when discussing the nature of logic, he stipulates:

"Logic, for its part, is not to be reduced, as some people would have it, to a system of notations inherent in speech or in any sort of language. It also consists of a system of operations (classifying, making series, making connections, making use of combinative or 'transformation groups' etc.) and the source of these operations is to be found beyond language in the general co-ordinations of action."[4]

Apparently, on the basis of the foregoing statements, reality can be reconstructed through the application of operations that are derived from activity rooted in systems having mathematical/logical properties that co-ordinate such action. Thus, as a first approximation of what Piaget might be getting at here, he seems to be saying that mathematical/logical transformations yield results in which the understanding (in this case a mathematical/logical one) bears an analogical relationship to that aspect of reality to which a transformation gives expression such that the actual object, situation, or event is accurately represented to some degree.

According to Piaget, the thread that runs through the whole epistemological process -- giving it its direction and tying it together -- is "action". Through certain features of actions (once repeated, differentiated, recombined, and so on, in particular ways from one situation to another), a context of assimilation is established consisting of various sorts of themes.

Since such themes are rooted in, and result from, actions, Piaget refers to them as "action schemata". Consequently, according to Piaget "to know an object implies incorporating it into action schemata" (pp. 7-8).

There are, however, several questions that might be raised in conjunction with this latter contention of Piaget's. First of all, although the term 'action schemata' gives implicit, if not explicit, reference to the notion of organization, the source and nature of such organization remains somewhat vague.

Even when one invests such organization with a mathematical/logical quality, one is, at this point, still unclear about a number of things. For example, does Piaget hold that: (1) the various transformations that produce (and are derived from) still other transformational processes, somehow generate the mathematical/logical character of the existing organization without themselves being mathematical/logical in nature -- and if this is the case, how does one account for a non-mathematical/logical transformational context being able to produce a transformational structure having a mathematical/logical dimension? ... or, does Piaget believe that: (2) the various transformational contexts have an inherent mathematical/logical structural and/or functional character that they transmit to subsequent action schemata.

Presumably, Piaget would claim (1) is the case since (2) contains a strong flavor of preformation -- which, in such circumstances, he tends to reject. Therefore, following the course of his arguments in order to examine how he attempts to bridge the apparent gap between qualitatively different transformational contexts might prove instructive.

Piaget's contention about knowing -- that is, knowing implies a process of incorporating any given thing or event that is to be known into action schemata -- raises various questions with respect to the nature of the knowing that precipitates out of such incorporating activity. Seemingly, merely assimilating an object into action schemata is not enough to guarantee or necessitate the object's being known in any significant manner -- at least not without further transformations being performed in conjunction with what is being assimilated. If this is so, then the generation of knowledge implies that not just any sort of incorporating activity is sufficient, and, as well, the acquiring of knowledge also implies that not just any action schemata will do --

rather, one must have an 'incorporating activity' and an 'action' schemata that give rise to something that constitutes a certain kind of change in understanding concerning some aspect of the phenomenology of the experiential field.

Presumably, for Piaget (given his previous statements on, for instance, mathematics) the character of both must be of a mathematical/logical nature. However, asking why the nature of the incorporating activity or the action schemata must be of a mathematical/logical sort in order for one to be able to legitimately speak of knowledge, does not appear to be unreasonable In other words, what principle demands that all knowledge must be an expression of mathematical/logical structures and processes, and how would one go about justifying such a principle?

For example, when a mystic speaks of love of God as being immersed in the knowledge of God, how does one reduce this to the sort of mathematical equations or logical relationships to which Piaget is alluding? Or, when someone writes a poem, or paints a picture, and so on, what is the mathematical or logical character of creativity?

With respect to questions concerning the origins of the property of 'organization' in the knowing process, Piaget wishes to concentrate upon the biological basis of epistemology. Although -- in the matter of the formation of action schemata -- he has no intention of overlooking the roles played by the general environment and the particular nature of the objects or events to be known, Piaget, clearly, wants to emphasize the importance of "internal", biological factors in generating action schemata with respect to both the structural form of such schemata as well as their concomitant functions.

Among the most basic of these internal factors, Piaget lists the general neurophysiological framework, including certain reflexes and instincts ... which, in the case of human beings, are considered minimal in number and influence. Nevertheless, what reflexes and instincts do exist in humans -- together with the spontaneous movement that occurs as a result of general activity in the nervous system -- represents, according to Piaget, the foundations from which, among other things, cognitive schemata will gradually emerge.

In addition to the foregoing sorts of internal factors, Piaget also emphasizes an organizational dimension of biological activity that tends to frame all such phenomena ... from the simplest to the most complex. This is known as auto-regulation or equilibration.

Auto-regulation refers to what seems to be a characteristic feature of organic processes on all levels. This involves the feedback systems within any given biological unit (the organism taken as a whole, or considered in terms of some portion thereof such as a given organ or cell) that modulate or regulate the biological unit's internal processes with respect to the immediate environment.

Moreover, according to Piaget, a given biological entity develops and the related species -- taken as a whole -- evolves (see *Biology and Knowledge*, pages 23-26) through the increasing differentiation of organic and cognitive networks. Such differentiation comes about as a result of a gradually broader base of activity to which auto-regulatory structures and functions are applied.

When examining the issue of organization in biological systems (whether in terms of various structures and functions or in terms of the feature of equilibration), one might keep in mind that Piaget distinguishes between organic and cognitive systems. That is, the latter are not, strictly speaking, reducible to the former.

To be sure, cognitive systems would not be possible without the organic foundations that they presuppose and out of which they gradually emerge. However, a crucial part of Piaget's theoretical framework stresses the importance of differentiating between organic and cognitive dimensions.

For Piaget, the most essential aspect of this differentiation concerns the notion of "epigenesis" that, generally speaking, refers to the idea that some, if not all, biological structures and functions (either organic or cognitive) develop in relation to, but somehow separate from, the hereditary underpinnings that initially generate such structures and functions.

In addition to using the notion of epigenesis to explain cognitive development -- and following Waddington -- Piaget also extends the epigenetic notion to the evolutionary context in an attempt to account for the gradual differentiations of organisms ... both in terms of within a given species, as well as in terms of the transformations from one species to the next. Furthermore, just as general organic and cognitive networks are governed by, and organized according to, auto-regulatory or equilibrating systems, so too according to Piaget, are genetic networks (i.e., genomes) regulated and organized according to such systems.

Thus, for Piaget, there is an isomorphic continuity from one context to the next -- from the genetic to the embryological, and from the morphological to the physiological and the cognitive. These various levels of functioning are tied together by the epigenetic and equilibration features that they hold in common and that conserve the organism through various transformations ... and, yet, these same features of epigenesis and equilibration give expression to the differentiation that takes place as one goes from one level to the next within a given organism, and from one species to the next within the evolutionary context (see, for example, Piaget's discussion on pages 120-125 in *Biology and Knowledge*).

However, these notions of epigenesis and equilibration -- especially the former -- are among the most problematic aspects of Piaget's theoretical framework. While one can easily acknowledge that the cybernetic characteristics of many organic networks are fairly well documented in the biological literature, the precise meaning of equilibration with regard to cognitive and evolutionary networks is much more hypothetical in nature.

To be sure, with respect to cognitive structures and functions, Piaget conceives of the various stages -- extending from the pre--sensorimotor period to the level of formal operations -- as a series of equilibrations that tend toward greater and greater stability (the most stable being the stage characterized by mathematical/logical structures and functions). However, there are, at least, two points of contention concerning Piaget’s perspective at this juncture.

(1) Why should one treat the mathematical/logical structures and functions of the formal stage of operations as the most stable, or even the highest, form of the equilibration process? (2) Is cognitive development more accurately depicted in terms of a process of 'progressive' equilibration in which one, somehow, goes from one level, with one set of properties, to another level, with a different set of properties, or is cognitive development more akin to a process of unfolding in which inherent capabilities are brought to fruition

according to a complex interaction of motivational, emotional, intellectual, and environmental factors ... processes of 'complex interaction' that are not necessarily a function of any equilibration process (although, on occasion, this might be the case)?

Both areas of contention above relate to similar sorts of questions that can be raised in connection with Piaget's proposed relationship between equilibration and evolutionary phenomena. Perhaps, the most important of these questions concerns why one should either characterize such phenomena as a function of auto-regulatory processes or, better yet, why one should accept the presupposition on which such a characterization is based -- namely, that evolutionary phenomena occur at all.

This latter point leads directly to the issue of epigenesis, for much of Piaget's theoretical foundations depend heavily on whether he can build a tenable theory by means of the notion of epigenesis. If Piaget could accomplish this, then among other things, he might be in a strong position to argue that:

(a) one should treat mathematical/logical structures and functions as the most stable of the equilibration processes; (b) equilibration did accurately characterize the developmental process, and (c) there was strong evidence in favor not only of the existence of evolution but of its having an auto-regulatory nature.

Moreover, if successful in the foregoing quest, Piaget would have provided a plausible scenario for the source and nature of the organizational dimension that permeates biological activity on every level: evolutionary, organic and cognitive, and, in so doing, this would give expression to a theme of continuity -- as indicated previously -- that links the various levels, one to another, even while providing for their differentiation both within and between levels. Clearly, the notion of epigenesis is a very powerful and essential, theoretical tool for Piaget ... if that tool actually does what Piaget wishes it to accomplish.

Piaget himself states the nature of the problem very well when he says:

"... cognitive functions, seen in this light, are specialized organs of auto-regulation controlling the exchanges underlying all behavior. But having said as much, if we are to continue the argument in biological terms, we shall have to explain how such cognitive auto-regulations might be formed ... What needs to be explained is where cognitive functions get the instruments of auto-regulation which they are to exert."[5]

Furthermore, although Piaget seems to feel the answer to the foregoing problem is fairly simple when he contends that:

"... cognitive auto-regulation makes use of the general systems of organic regulation such as are found at every genetic, morphogenetic, physiological and nervous level, and forthwith adapts them to their new situation ..."[6]

he merely has pushed the problem back one space. He has not removed it. Now, he must explain, on the one hand, where the "general system of organic regulations" comes from, and, on the other hand, he must account for how the system of cognitive auto-regulations develops the ability to adapt the general system to new situations.

According to Piaget:

"... biologists today, like Julian Huxley and Waddington with their "synthetic theory" of species, are making phylogenesis depend in part on ontogenesis, and not only the inverse. Indeed genes are not actually static elements but, rather factors identical or analogous to enzymes, whose nature is revealed by their activity, interdependently and subject to a whole set of regulations throughout the entire process of embryogenetic growth in interaction with the environment. The result of this is that the information supplied by the genotype is not only transmitted but also transformed in the course of all this development, so that the essential system is no longer the genotype in isolation but a total 'epigenetic system'."[7]

Thus, even on the genetic level, the notions of interactionism and constructivism -- which Piaget considers characteristic of epistemological activity in general -- are thought to apply. Instead of treating the genotype in isolation (which had been the tendency of classical mutationists) and as something mysteriously removed from the observable phenotypic variations in a given race or species, modern genetics construed the collection of genotypes as a relational totality or genetic system (known as a genome) in which there were genes capable of performing different, but complementary, functions of a structural and regulatory nature.

In other words, some of the genes were of the traditional sort, so to speak, and conveyed or transmitted structural information concerning such things as the physiological or morphological properties of different biological dimensions of a given organism. On the other hand, there were other genes that were concerned with regulating the organizational properties of the genetic system as a whole -- both in terms of the way structural genes transmit their information, as well as in terms of the way in which a genetic system responds to, and interacts with, the environment. Considered as a whole, structural and regulatory genes represent a series of processes that encompass a range of qualities (such as transmission, variation, deep structure and surface structures) said to be characteristic of genetic phenomena.

In addition to conceiving of the hereditary mechanism as a dynamic, interacting totality, Piaget also describes how there is a growing tendency -- to which he subscribes -- in modern biology, when considering the issue of the basic genetic unit, to switch the emphasis, or focus, from the genome to the genetic pool or population.

Attendant to this switch in focus, from the genotype to the genetic pool, there is also a change in emphasis concerning the "reaction norm". A 'reaction norm' refers to the set of possible phenotypes that can be generated from a genotype -- given variations in the environment to which the genotype responds by way of altering the genetic system (either in a structural or regulatory manner) such that phenotypic variations subsequently appear. With the aforementioned change in emphasis and focus in certain facets of biological investigation, the notion of "reaction norm" (while still appropriate and meaningful in the context of individual genotypes) also came to be used as a way of referring to the set of phenotypic possibilities represented by the mixture of genotypes existing in any given population.

Seen from the perspective of the interaction of genomes and population, evolution consists of the complex series of transformations that occur on two levels -- each of which affects the other level. These levels are: (1) the responses of the individual genotype to the surrounding environment – which, itself, represents a contribution to the genetic pool; (2) the responses of the population as a whole to the surrounding environment, that includes the influences of a variety of structural and regulatory possibilities that are generated internally by individual genotypic reaction norms within the population.

Moreover, just as there is a set of equilibration principles that co-ordinate the activity of the genome or collection of genotypic possibilities within the hereditary mechanism of a given organism, so too, according to Piaget, there is a set of organizational principles that are auto-regulatory in nature with respect to the genetic pool as a whole. For Piaget, this set of organizational principles represents both the source, as well as the result, of evolution in general. (e.g., see his discussion on pages 278-284 in 'Biology and Knowledge').

Using the genome/genetic pool interactionist approach outlined above, Piaget plans to analyze what he considers to be the three possible ways for theoretically accounting -- in evolutionary terms -- for the relationship between organism and environment. These three ways are:

"(1) environment takes control of the organism and molds it throughout its working existence, affecting even its hereditary structures, that easily submit to its influence;

"or (2) it is the organism that imposes certain independent hereditary structures on the environment, the environment merely eliminating such structures as prove unsuitable or nourishing those it finds congenial;

"or (3) there are interactions between organism and environment such that both factors remain on an equal footing of cooperation and importance."[8]

However, since Piaget is primarily interested in establishing the biological underpinnings of epistemological processes, he also needs to draw up a corresponding set of possibilities with respect to the sorts of biological structures and functions (which, presumably, can be accounted for by one, or more, of the three foregoing theoretical frameworks) in which knowledge can be rooted. Thus:

"There are, in effect, three possible kinds of knowledge: (1) the kind that is linked with hereditary mechanisms (instinct, perception), which may or may not exist in man but which correspond in biological terms to the sphere of characteristics transmitted by the genome; (2) knowledge born of experience, which thus corresponds in biology to phenotypic accommodation; and (3) the logical-mathematical kind of knowledge which is brought about by operational co-ordinations (functions, etc.) and corresponds, in biology, to regulation systems of any scale..."[9]

However, before Piaget discusses the foregoing kinds of knowledge, he wants to lay the foundations for them by demonstrating how an epigenetic approach can provide a tenable means of accounting for evolutionary development. If successful, then epigenetic principles also might serve as a prototypic example, in general, for explaining a large variety of transformational processes -- including the transition from organic structures and functions to cognitive systems.

When Piaget mentions evolutionary theory in the context of the sort of organism/environment relationships that can be construed in terms of the environment's taking control of an organism, he, generally, has in mind: (a) Lamarck's (or a Lamarckian-like) theory in which the exercise of various organs during the course of development influenced the direction and nature of such development; (b) the way in which the changes brought about by the exercising of organs during development were fixed in hereditary as acquired characteristics; and, (c) the manner in which the environment -- in terms of its physical properties -- forced or selected the exercising of particular organs that led to the fixing of such hereditary characteristics.

For Lamarck, the biological organism was, largely, a passive or malleable entity that was molded according to the nature of the influences and pressures existing in the different features of the immediate environment and the effect such forces had on various organs in a given organism. Although Piaget does acknowledge the importance of the role played by the environment in modifying the hereditary mechanism and credits Lamarck for having seen its significance in the evolutionary context, he nonetheless criticizes Lamarck for, among other things, having overestimated the passivity (or having underestimated the activity) of the biological organism in bringing about evolutionary change -- which is to say, that even though the organism is influenced by external influences, such influences are assimilated to various action schemata that exist prior to the organism's present encounter with the environment.

Furthermore, Piaget notes that on the basis of Lamarck's emphasis on the organism's supposed passivity, one would tend to expect the organism to be malleable to an indefinite extent according to the direction and nature of the environmental factor that was affecting the modification in, say, a given organ's functioning. Yet, nowhere, according to Piaget, does one see evidence of such malleability.

Instead, one finds that, generally speaking, the limit situation with respect to malleability is a function of the reaction norm ... that is, it is a function of the range of phenotypic possibilities associated with both the individual genotype as well as the population consisting of mixed genotypes. Consequently, as far as Piaget is concerned:

"... what is lacking in the Lamarckian interpretation is the explicit recognition of the fact that the effects of these exercises (i.e., of the organs) are always relative, not only to the environment, but to the genotypic structure (pure or impure) of the lineages being studied. To sum up, where Lamarck sees nothing but the effect of environment... there are really interactions between external factors and the genome."[10]

At the opposite extreme from the Lamarckian penchant for emphasizing the significance of the environment in effecting evolutionary change, is the tendency of those theorists who play up the importance of an organism's endogenous factors in bringing about such change. For Piaget, the most notable of such theories is the mutationist school of thought.

According to this approach to evolution, genotypes are generally considered to be static or invariable hereditary structures except in instances in which variations (due to certain factors internal to the organism) in these structures are introduced on a, supposedly, random basis. The term for such variations is 'mutation'.

Moreover, the classical mutationists contend that the role of environment as an evolutionary agent is after the fact and, consequently, has no real evolutionary significance. In other words, since evolutionary change is a function of random variations or mutations and the role of the environment is restricted to a post facto selection of certain of these variations that it favors, evolutionary transformation per se is, in the mutationist conception, unrelated to environmental considerations and dependent only on the nature of the random variations.

One objection Piaget has to the mutationist position is that such a theory tends to treat the hereditary mechanism in an atomistic fashion. Thus, genes are considered to be so many separate boxes that open up only on those occasions when it releases a new mutation that its internal processes have mysteriously produced and immediately thereafter seals itself off from external influences.

This atomistic conception of the gene effectively isolates the gene from all possibility of interaction with the environment. As a result, he believes this neglects the considerable evidence compiled by Waddington, Julian Huxley and others concerning the complex relationship between genome and environment that is said, by such investigators, to be responsible for evolutionary change.

Moreover, the mutationist view is in considerable contrast to the cybernetic features that Piaget has argued are characteristic of biological phenomena on every level -- from the hereditary to the cognitive. Therefore, for Piaget, the mutationist position appears strangely inconsistent with what seems to be a persistent feature of biological activity in general.

In addition to the foregoing sorts of objections to the mutationist position, Piaget cites another kind of argument much later in 'Biology and Knowledge' during a discussion of instinctual phenomena. Piaget argues:

"But if it is not considered in any way incompatible with survival that evolution should wait some thousands of centuries to endow a horse with a tail and a mare made of hairs and not feathers, it becomes rather difficult to envisage how long it would take to ingrain the instincts of reproduction, nest-building, and so on among species whose very existence depends on cognitive precision in relation to those instinctive mechanisms. We need only take one example the eye in vertebrates'. This is not indispensable as a means of acquiring knowledge but it is indubitably useful. Bleuler's calculations showed that if the mutations necessary for the formation of this organ had been brought about simultaneously or co-jointly, they would have had a probability of only 1 in 10 (raised to the 42nd power), in other words, practically none. On the other hand, if it had been a question of successive mutations, in which new ones were simply added to preceding mutations so that a cumulative effect was achieved, then it would have taken as many generations as would correspond to the age of the world or even exceed it."[11]

Of course, Piaget acknowledges that such calculations are dependent on a number of variables (such as the age of the' earth, rates of mutation, population sizes, and so on) that have been assigned numerical values based on a certain amount of approximation and guess work. However, even if one were to dramatically readjust the calculations in the direction of estimations more favorable to the mutationist position"(which might not be at all justifiable except in a logically heuristic sense) and, thereby, reduced the probability to, say, 1 in 10 (raised to the 15th power), one is still talking about a very, very small probability.

While one might be willing to admit the logical, and even empirical, possibility of such a small probability of occurrence becoming a reality on occasion, the boundaries of credulity are distorted beyond recognition or reasonableness at the suggestion that numerous events of such small probability should have happened with such frequency. Indeed, seemingly, one is forced to seriously consider the possibility that such a combination of happy coincidences might be the result of operative factors other than random mutations.

Any position that arrives at a conclusion contrary to the foregoing appears to be demanding that the individual take a great deal on faith. To believe that such a series of random coincidences occurred on a regular basis appears to be a rather far-fetched exploitation of the notion of logical possibility, and, as such, is far removed from any kind of empirical evidence capable of pointing to its 'likelihood' or plausibility.

Surprisingly enough, after denouncing the mutationist perspective through much of Biology and Knowledge, Piaget does advance a sort of modified version of mutationism -- although quite different from the classical mutationist position of someone such as de Vries. Piaget's approach to this issue, however, is couched in the context of his own epigenetic models in which the basic focus is on the importance of recombinations within a cybernetic system. Piaget states:

"The first thing to notice here is that recombinations can have no effect unless ... applied to the differences between the elements that are being reorganized. Now, unless we assume that there are perpetual new formations in the genes, we have to say that new genes are engendered from their predecessors by means of the progressive addition of specific and limited mutations. There must, therefore, be a process of intra-genetic variation at the DNA nucleotide level. In view of, this, the way in which recombination exploits mutation by means of efficient combinatorial systems is of capital importance for the process of evolution ... recombination provides an explanation for those vital initiatives taken by living creatures in the course of evolution, whereas chance or selection alone offer none."[12]

To be sure, recombinations would provide an explanation of vital initiatives if they had a nature that could generate such initiatives, but Piaget tends to gloss over a few problems too quickly and, as a result, one is left puzzling over certain aspects of his exposition. For example, in a footnote, Piaget indicates that Darlington, Lewis and John all:

"... calculate the recombination index in terms of the sum of the haploid number of chromosomes and the average number of crossings-over per cell."[13]

Without delving into what causes crossovers, or what crossovers are possible, or whether such crossovers are governed by any laws of transposition -- and, if so, what those laws are and why - or whether such crossovers could really produce anything not already present, in principle, in the genetic givens (of either the individual or the population), Piaget seems to feel that the idea of recombination is sufficient to lay the foundations for a theory capable of explaining evolutionary change. Of course, he carefully notes that recombinations "can have no effect unless applied to the differences between the elements that are being reorganized", but even having said this (aside from leaving unanswered the question of exactly what sort of differences between elements are to be considered appropriate ... that is, differences considered from what perspective), Piaget seems to be alluding to some rather sophisticated differentiating capabilities on the part of whatever is responsible for the recombination process at the sub-cellular level.

This "whatever is responsible for recombinations" is another dimension (although presumably represented somewhere in the cybernetic aspects of the genome) that is devoid of crucial details with respect to how, for instance, the analysis of differences actually takes place. Moreover, even if one overlooks the vagueness of the meaning of "neo-formations", one still has difficulty in understanding: (a) what is meant by a "specific and limited mutation"; (b) how they occur; (c) whether there are limits on the kind of mutations that can occur, and (d) why one should treat recombinations as being of fundamental when: (1) a cybernetic system (which, according to Piaget a genome is) represents a relational totality in which everything is an integral part of the overall system, and (2) recombinations are functionally dependent on "specific and limited mutations" since "new genes are engendered from the predecessors by means of the progressive addition of" such mutations.

Conceivably, as far as (d) above is concerned, one could counter this by arguing that without such mutations, Piaget (or someone arguing on his behalf) might maintain that recombinations "exploit mutations by means of efficient combinations systems". However, this position could, itself, be countered by arguing that without such mutations there would be nothing to exploit except the possibilities inherent in the individual or the population ... which might be limited to the reaction norm and some recessive variations on either side of the norm.

Even allowing for a wide range of combinations, how anything will be produced that is sufficiently new that the new structure differs from the reaction norms (plus variations) in a way that will lead to the foundation of new species, classes, phyla, and so on[14], is something of a mystery. Furthermore, one tends to be curious about how such "efficient combinations systems" even come into existence without: (a) assuming something very much like a preformationist perspective, or (b) assuming they come about by chance.

Surely, if one rejects (a) -- as Piaget, undoubtedly, would -- and given that "new genes are engendered from their predecessors by means of the progressive addition of specific and limited mutations," then how else is one to explain the appearance of systems" except by happy circumstance and chance since there exists no systematic means for exploiting such mutations[15].

Of course, as far as the credibility of Piaget's thesis is concerned, the forced choice between (a) and (b) is equally disastrous. Seemingly, however, at least (a) might allow him to continue on theoretically without being totally inconsistent -- although, presumably, he might have to considerably alter or re-think some important aspects of his position ... especially with respect to epigenesis.

While discussing the mutationist position, Piaget launches an attack against the notion of preformation that tends to be caught-up with the mutationist's position. In other words, given that the early mutationists believe that variations of a lasting sort (i.e., genotypic) --

and not a temporary kind (i.e., phenotypic) -- are caused by events inside the gene and given that they believe such events are not connected, in any significant way, with external or environmental circumstances[16] and, therefore, are not part of any cybernetic genome/environment interchange, then, according to Piaget, such a position is committed to maintaining that all future possibilities are already present, in some sense, in the gene.

Piaget views such a position as being of a preformationist kind ... a thesis that he already has indicated, on several previous occasions in 'Biology and Knowledge', as being nothing short of preposterous. For example, at one point in the first chapter of his book, when discussing how mathematical/logical operations are rooted in the coordination of actions, he argues:

"... do we have to conclude that the whole of mathematics is laid down in advance to our nervous system? Not only is this unthinkable, but the facts prove that logic itself, even in its most "natural" forms, is by no means innate in human beings in the sense that it exists at any age."[17]

Piaget continues his critical analysis of preformationism by discussing the position of Konrad Lorenz (see page 117 ff. in 'Biology and Knowledge') ... who Piaget characterizes as being both neo-Darwinian and Kantian. With respect to the latter aspect of this characterization, Piaget argues that the preformationism notion is really only a variation on Kantian apriorism in which the individual comes to any given situation with a set of ready-made structures (i.e., categories) that frame and color experience and give to such experience its "necessary" qualities.

During his analysis of Lorenz' preformationist position (which does have Kantian overtones), Piaget refers to Lorenz' interest in instinctual phenomena and outlines what he feels is a serious difficulty for such a position. This problem concerns the issue of necessity:

"In the biological field there is nothing biologically necessary about instincts, since they vary from one species to another, and there are no instincts common to all the species except, maybe, the preservation of life, that, lacking special organs, has nothing specifically instinctive about it, whatever people say, and is merely a functional continuation."[18]

Aside from wondering why something must have a special organ in order to be a candidate for instinctual phenomena or why the notion of "functional continuation" -- even if one were to accept such an idea -- could not have an instinctual dimension or character, regardless of what Piaget says, there is a much more immediate problem in Piaget's statement. More specifically, this problem revolves about Piaget's assumption that for something -- in this case instincts -- to be necessary, they must be identically evident from one individual to another or they must be held in common by all individuals.

The nature of necessity might be clothed in different contingencies from situation to situation, but such contingencies should not be confused with the underlying set of factors or themes that might constitute the dimension of necessity. Piaget, himself, readily admits (e.g., see page 215, 1st paragraph, 'Biology and Knowledge') that the origins and generative principles of instincts are completely unknown, and, therefore, for him to claim that "there is nothing biologically necessary about instincts" seems rather presumptuous.

On the basis of the kinds of problems that have been thrown at Piaget in the last several pages – and even if one were to agree with him concerning his basic criticisms of Lamarck's theory (i.e., it underestimates the activity of organisms and overlooks the dimension of interaction between organism and environment) and his criticisms of the mutationist position (i.e., it is not reconciled with modern data indicating the cybernetic quality of biological phenomena as well as being based on a rather far-fetched account (i.e., randomness) of evolution) -- Piaget is not in any position to claim that the epigenetic account of evolution is superior to other alternatives. Perhaps, one would be more accurate if one were to say that while one might agree that the synthetic approach to evolution is more comprehensive and adequate, in some sense, than either of the other two evolutionary positions outlined above, the synthetic approach still hasn't established that an evolutionary theory based on an epigenetic approach to biological phenomena is more adequate, with respect to accounting for the available evidence, than is a preformationist theory approach to accounting for the origins of biological phenomena.

One reason for claiming the foregoing is that there is nothing to prevent a preformationist from adopting large portions of the synthetic approach and, then, adjusting various facets of the synthetic position to a preformationist perspective. In other words, much of the evidence compiled by modern genetics represents data that fit equally well into either an evolutionary or a preformationist framework and, consequently, doesn't necessarily give the former approach any edge over the latter one.

In any case, a preformationist can subscribe to many genetic discoveries and principles (including the cybernetic models that Piaget values so highly) without necessarily becoming involved in any inconsistency or contradiction. The difficulties, of course, arise when one comes to the issue of whether the different genealogical levels are the result of evolutionary transformations over time (going from simple to complex) or whether the various species, families, classes; phyla and kingdoms resulted from some sort of 'emergent property) (either all at once or in periodic 'bursts').

Piaget, by rejecting Lamarckian, mutationist and preformationist views, obviously believes that the notion of epigenesis can provide an adequate account of evolution and represents a valuable means of getting at unsolved biological problems as well. However, there is still, at least, one remaining major obstacle that must be removed before one might be more favorably disposed toward Piaget's position.

One still does not know what epigenesis entails, or even what it means, on a biological level. That is, while one understands in general terms what Piaget is trying to get at by employing the notion of epigenesis, one does not know how this concept is to be translated into a workable biological mechanism or principle capable of explaining how either life arose or intelligence evolved.

For example, consider the following quote:

"As soon as it is recognized that selection is brought to bear only on phenotypes and that, throughout their period of development, all phenotypes continue to be a series of directed by the environment, then it becomes possible to speak of ... 'cybernetic circuits', and development can be seen as a series of organizational ladders, all different and all perpetually subject to cyclic causality."[19]

In general terms, the essential principle of epigenesis stipulates that: all organization is a development and all development is an organization, and this principle represents the 'tertium quid' that, according to Piaget, allows evolution to float, so to speak, between the fixed hereditary system of preformation and the dominating influence of Lamarck's environmental functionalism (e.g., see *Biology and Knowledge*, pages 120-125).

Nevertheless, after all is said and done, one is left with a rather uneasy feeling that evolution still remains a mystery. To use some terminology favored by Piaget, how does one explain a genomic response to environmentally created tension that falls outside (as it must if Piaget is not to be charged with harboring a preformationist position) both the reaction norm of the individual organism's genotypes as well as the population's reaction norm? Even if one were to add depth and breadth to the notion of "reaction norm" and allow for a wider range of phenotypic possibilities based on 'multiple' variations, one is still puzzled about how, for example, 'new' species would be created on the basis of the allowable combinations with respect to a given genome or a population of such genomes.

At one point, Piaget says:

"The genes as a whole, which are often thought of today as being structural and regulatory, simultaneously and without exception, do not exist in a fixed state but are continually breaking down and making new formations, by some internal metabolism, in the course of genetic transmission."[20]

However, precisely this internal metabolism of the gene is what must be known in order to understand how recombinations of the possibilities within the gene could lead to formations that were significantly different from existing reaction norms to lead toward, given time, new species.

In short, if Piaget wishes to avoid being forced into a preformationist position, he must be able to account for -- in epigenetic terms -- the emergence of totally different reaction norms that would be capable of, eventually, leading to what would be characteristic of, a new species, or new class, or new phylum, or new kingdom[21]. Possibly, this might be as much a mystery to Piaget as it is for someone trying to understand what Piaget means here.

Roughly speaking, an isomorphism is said to exist between two entities or events when one can recognize a system of connections in both that tends to indicate a similarity of structure or function[22] with respect to the collection of elements that constitute the system of connections in such entities or events. To use a sports analogy in order to help illustrate what is meant here, one might say that hockey and lacrosse were, in many respects, both structurally and functionally isomorphic because the system of connections (both in terms of the rules and in terms of the actual activity that constitute these sports, respectively, and represent the elements within the system of connections) indicate a similarity of form and process without being identical, whereas the isomorphism between, say, hockey and basketball is much 'weaker ... although one could still talk in terms of 'partial' isomorphisms since there are certain similarities on both a structural and functional level between the two sports.

Biological examples of isomorphism are readily identifiable as are sport isomorphisms. For instance, one might talk of the structural isomorphism between' a human skeletal system and that of a gorilla or a dog -- the degree of isomorphism being weaker in the latter case than in that of the gorilla. Or, one could compare the functional isomorphism existing between a human capacity for the conserving of information (i.e., memory) and such a capacity in, say, a paramecium.

Piaget is committed to rooting epistemology in a biological context -- one that can simultaneously differentiate between strictly organic structures or functions and cognitive structures or functions. Consequently, the notion of isomorphism is of considerable importance to his overall theoretical position since Piaget believes his perspective represents a means of showing how epistemological structures and functions could be based on -- and, therefore, be linked to various organic processes and organs -- without being identical, or reducible, to such processes and organs.

In essence, the foregoing is a fundamental hypothesis or theme running throughout Biology and Knowledge, in particular, and many other written works of Piaget. Thus, for Piaget:

"... cognitive mechanisms constitute both the resultant of general auto-regulatory processes in the living organization and are also specialized regulatory organs in exchanges with environment. If there is a good foundation for this hypothesis, it will mean that -- from the functional point of view -- certain general functions common to both organic and cognitive mechanisms do exist, but that, in the case of cognitive mechanisms, a progressive specialization of functions also exists."[23]

In short, what Piaget wants to show is that: organic and cognitive mechanisms are isomorphic – functionally[24] and structurally[25] -- and these isomorphisms are the result of cognitive mechanisms having developed, over evolutionary time, out of general, organic auto-regulatory processes. At the same time, Piaget wants to contend that cognitive mechanisms, once having been generated, are capable of constructing (again over time) their own specialized organs of regulation that can become involved in complex interchanges with the environment that, as far as the organism is concerned, tend toward a progressive specialization of functions.

According to Piaget:

"... knowledge comprises first and foremost an organization function, and that is our first fundamental analogy with life."[26]

The meaning of "organization function" in the above quote refers to the way in which functioning as a whole -- that is, the dynamic aspects of structures taken as a whole -- acts upon the various substructures.

This is another way of saying that the organization function plays a reciprocal role in the auto-regulation of the organism (or an organ) relative to the part played by the functioning of a given substructure and its (i.e., the substructures) action upon the total structure ("structure" referring to either the organism as a whole or the particular structure or organ of which the substructure is a part). Thus, in attempting to establish an isomorphism between knowledge and life (which he later hopes to cash in on as a basis for arguing that epistemology is rooted in biological functioning, in general, and auto-regulatory processes, in particular), Piaget is claiming that, among other things, both life and knowledge share this feature of an organization function.

The functioning encompassed by both totalities (i.e., life and knowledge) acts upon the various substructures such that, in each case, the whole is not merely a simple collection of individual elements but has an effect greater than the sum of the parts in terms of the interrelationships made possible by the existence of the whole. On the other hand, the whole is not something that is other than and distinct from its various functional and structural elements.

In further elaborating the idea of "organization function", Piaget stipulates that:

"... the organization qua functioning is not transmitted by hereditary as are characteristics such as shape, color, etc., it continues and succeeds itself qua functioning as a condition necessary to every transmission and as a transmitted content."[27]

From this perspective, Piaget points out that one of the primary characteristics of organization function is its quality of conservation in which the organism or organ is observed to maintain its form and/or function despite the fact that various transformations are taking place within the organism or organ on a continuous basis.

However, this leads to something of a problem for Piaget -- especially in terms of its implications for his evolutionary theory. Once again, an issue is raised (and which has been discussed previously) concerning the question of origins.

If, as the previous quote from Piaget indicates, organization qua functioning is said to be a necessary condition for hereditary transmission in addition to being a transmitted content, then in terms of accounting for the first appearance of life on earth, one would like to know how such an organization function came about since it seems to presuppose itself as a necessary condition. If it didn't already exist in some sense -- which Piaget needs to assert due to the preformationist ramifications implicit in accepting the prior existence or organization -- then it couldn't have presupposed itself and, therefore, is not a necessary condition for hereditary transmission.

This logical, if not empirical, question not only has the effect of leaving unexplained how the organization function subsequently develops, but, as well, it has the effect of creating something of an ontological chasm between organization and evolution since that which remains unexplained leaves open the possibility that the two are not as dependent on each other as Piaget would like them to be, and, as a result, drags one back toward something like a mutationist account in which random, unorganized occurrences somehow bring about evolutionary change ... at least, until the sort of cybernetic auto-regulatory system that Piaget is proposing was somehow generated. Yet, this is the gap that Piaget cannot account for -- namely, how this generation comes about.

Piaget's difficulties do not end here, however, since, quite ironically, the foregoing problem has a persistent tendency to carry over into the issue of epistemology in an 'isomorphic' fashion. For instance, Piaget already has stipulated, on several occasions in 'Biology and Knowledge' (e.g., see page 145, toward the beginning of Section 3), that he considers it "ridiculous" for anyone to contend that intelligence exists at every level of organic life -- which obviously means that some levels of organic life manifest organization without the organization possessing the quality of intelligence.

However, given that Piaget maintains that:

"Any act of the intelligence presupposes the continuity and conservation of a certain functioning,"[28]

one is left with a disturbing puzzle. If one is to assume that the nature of "certain functioning" does not manifest a quality of intelligence --

although it is organized -- and, thereby, avoid the problem (for Piaget) of preformation, and if one is to assume that this "certain functioning" possesses -- through its very activity, the capacity to modify structure -- one would not be unreasonable if one were to ask, at this point, how such functioning (which is, by Piaget's own admission, non-intelligent but organized) is (merely through its dimension of activity) able to either generate structures and functions of an intelligent sort or lead toward a context that will be able to do so.

Up until now, the focus has been on the possibility of functional isomorphism (or correspondence) between organic and cognitive contexts. Piaget, however, in a bid to lay the foundations for his contention that cognitive functions developed out of organic functions, also attempted to establish a case for the existence of structural isomorphisms.

Nonetheless, and one might have anticipated this, there are some problems lying in wait for him. For instance, Piaget maintains that all cognitive systems -- from the simplest to the most complex -- are characterized by two broad features: namely, the tendencies to differentiate and integrate ... which are features that cognitive systems hold in common or share with all biological systems.

Furthermore -- and leaving aside, for the moment, the issue of integration in order to be able to concentrate on the dimension of differentiation -- one notes that Piaget claims (see page 158) that every differentiation of an organization contains an hierarchical order with respect to the structures and functions that are involved in the differentiation. In addition, according to Piaget, one of the most basic forms that hierarchical orders tend to manifest -- a hierarchy in this instance being a matter of structure, ranging from very general to quite specific -- is that of "inclusion" in which a structure incorporates into itself either a substructure of some kind or part of a structure.

On many different levels of biological activity, the notion of inclusion could represent an important means of linking-up cognitive and organic structures, especially since the inclusion property is a prominent theme of many logical structures. While discussing the notion of inclusion in different biological contexts, Piaget points out that on every step of the evolutionary ladder there exists a wide range of assimilatory processes through which the organism is engaged in interchanges (e.g., food cycles) with the environment and that all these various processes involve "discriminations of a type not unlike classificatory inclusion" (page 161).

In other words, since different organisms have varying requirements with respect to, say, sustenance (e.g., what will nourish a beetle will not necessarily nourish a bee, and so on), then each organism is required to make the kind of discriminations among the variety of possibilities in the environment that will provide appropriate nourishment and avoid that which will not. Moreover, even on a physiological level, Piaget describes how different cells have different requirements and manifest a certain kind of discrimination with respect to their internal conditions and the external circumstances most immediate to them, which result in complex interchanges.

Apparently, classificatory schemata (which are forms of inclusion) are very prevalent and very important in all biological organisms. Indeed, they are so important that Piaget insists:

"... there can be no behavior without some elementary form of classification. Every act of perception is "categorical", as J. Bruner has demonstrated; this means that it tends to identify the object perceived in relation to previous action schemata, and this presupposes some classification. The exercise of instinct like-wise presupposes classification ..."[29]

The last sentence of the above quote is an interesting one as well as an obscure one. It is interesting because of the questions it tends to elicit.

For example: what kind of classification does instinct presuppose? Or, how does such a classification system lead to the establishment of instinct -- especially since Piaget has insisted, again and again, that instinct is a trans-individual (e.g., see pages 277-278) phenomenon and, therefore, cannot be a function of just the classification schemata that appear in a single individual?

Besides being interesting, the above quote is, as indicated previously, also obscure. This is because the questions raised remain unanswered and, consequently, shroud Piaget's meaning in a certain amount of theoretical darkness.

Once again, he is faced with some very embarrassing queries. This time the problem concerns the origins of the classificatory inclusion structures that all behavior presupposes. One could agree with Piaget when he says:

".. the classification function seems to be found in every organization structure, and this fact constitutes a remarkable structural isomorphism between biological and cognitive organizations. Of course, we are not talking of the same kinds of classification."[30]

Yet, saying this does absolutely nothing to establish Piaget's position. If anything, it tends to bring out, under examination, certain problems for Piaget, as well as to point increasingly to the need for some other kind of explanatory approach since his epigenetic approach to evolution seems to be floundering on a beach of unanswered (and, perhaps, unanswerable) questions[31] -- not the least of which concerns the problems surrounding the questions of origin and etiology of (and here one couldn't be more in agreement with Piaget) the differences in classificatory structures.

Although the idea of differentiation is, in principle, a very important one, nevertheless, as it stands, it is far too vague. Supposedly, this vagueness was to have been eliminated by Piaget's epigenetic approach, but, as it has turned out so far, what has happened is that one merely ends up substituting one brand of vagueness for the condition of vagueness inherent in various theories of evolution proposed by, say, the mutationists, upon which, Piaget is seeking to improve.

In a sense, what Piaget has provided is a sort of surface structure clarity. However, this has been purchased at the expense of an understanding of the deep structure that generates and shapes many, if not most, of the surface features -- or, at least, which establishes the limit boundaries within which, and through which, the surface features might take on their different values. Indeed, Piaget as much as admits this is the case when he notes that:

"... Bertalanffy says rightly: "what we would like to know is not merely a few equations of measurable vectors but the law which integrates them ..."[32]

Repeatedly throughout 'Biology and Knowledge', Piaget makes claims similar to the following one:

"Between a hereditary system and some acquisition imposed on the subject by the environment and its regular sequences, there does, in fact exist a tertium quid, which is exercise. Thus, it seems almost certain by now that maturation of such a sector of the nervous system is allied to some functional exercise."[33]

One can agree that maturation of the nervous system is intimately connected to functional exercise without having to be committed to saying, therefore, that such exercise represents a tertium quid or is a sui generis phenomenon (as Piaget does, among other places, on page 321 of 'Biology and Knowledge'). What Piaget often seems to overlook or ignore is that the aforementioned process of exercise is, itself, dependent on what is structurally and functionally possible in an organism, and what is possible in this sense is a function of the potential built into the genetic givens.

A human being is different from a bird not because they become engaged in different patterns of exercise (although, of course, they do become so engaged). They are different because the allowable possibilities concerning such patterns already have been set down in what has been transmitted genetically and, thereby, give expression to different patterns of exercise.

Piaget seems to want to establish a sort of semi-presuppositionless philosophy in which, for example, the organization function -- in conjunction with, say, a cyclic open system[34] -- are related to organic givens but, somehow, independent of them as well, such that they can combine to construct new functions and structures (or new sub-functions and new sub-structures) which were not present, even in principle, in what existed prior to the construction.

The phrase: "even in principle", in the foregoing sentence, is crucial. Otherwise, Piaget, implicitly, would be harboring a preformationist position that is logically inconsistent with his epigenetic perspective.

Consequently, what one is left with is a neutralized sort of exercise principle ("neutralized" because to have anything built into it would permit some form of preformation to slip in the back door, so to speak). This principle appears, mysteriously, to be suspended in the midst of the organism and represents an alleged means of transformation from: merely organic functions or structures, to: cognitive functions or structures ... all of which supposedly is intended to explain the existence of an isomorphism between organic and cognitive forms of activities since the latter have developed out of the former and carry with them something of their ancestry without being limited by it.

At one point, Piaget states:

"If one can pass from schemata made up of forms that are both organic and sensorimotor, such as reflex and instinct schemata, to schemata that are sensorimotor, properly speaking, such as "habit" schemata, it becomes clear that such a transition is equally natural if made between habit schemata and schemata of representational intelligence. The intervening stages are supplied in this case by the many schemata of sensorimotor intelligence which are initially mere co-ordinations of habit schemata but which eventually set up schemata astonishingly isomorphic to those of representational intelligence. For example, a certain number of partial displacements, each one of which can correspond to one habit schema only, finally coordinate into a wider system, corresponding to a "displacement group ... Now this sensorimotor "group" schema, however limited it might be in its functioning nonetheless constitutes a substructure, on which, at some time between seven and twelve years, the thinking will build a corresponding operational structure -- a structure that is still unreflective, in the sense that it remains internal to the functioning of the intelligence (but as a representation now, no longer merely as an action) and is not an object of the intelligence. After this, reflective abstraction of a mathematical kind will build up a structure qua object of reflection, in the same way that it builds up all other elementary operational structures (groupings, inter-sections, orders, connections, etc.) from structures inherent in the functioning of thought and action."[35]

Piaget has been quoted at length, here, because the excerpt is 'vintage' stock, so to speak. It is fairly representative of any number of passages in his various books and articles that attempt to describe how transitions from instinct to mathematical/logical operations occur.

The foregoing extended quote also displays the sorts of characteristics which give so many of his descriptions the appearance of an explanation without having, upon examination, the substantive qualities of a true explanation. For example, contrary to what Piaget maintains, it does not become "clear that such a transition [i.e., from instinct and reflex schemata to 'true' sensorimotor schemata ... my addendum] is equally natural if made between habit schemata and schemata of representational intelligence". At least, this isn't clear as long as Piaget contends that the transition is effected by neutralized epigenetic principles of a sui generis nature (see *Biology and Knowledge*, page 321).

Moreover -- and despite Piaget's confidence in the alleged significance of the alleged isomorphism between the schemata set up by sensorimotor co-ordinations and those of representational intelligence -- one still is at a loss concerning exactly how the intervening stages that supposedly are supplied by sensorimotor intelligence are able to bridge the gap between instincts and representational intelligence (or, how a number of partial displacements corresponding to certain habit schemata become 'coordinated' into a wider system) unless one were to assume that the coordinating capacity, and so on, were already present in a sense that goes far beyond what Piaget is willing to agree to in the way of innate givens.

Finally, notwithstanding Piaget's assurances concerning the 'sameness' of the construction or building process, one remains mystified as to how, in epigenetic terms, thinking first builds unreflective operational structures from non-operational sensorimotor substructures and, then is somehow capable of generating reflective abstractions from structures that are neither reflective nor abstract.

Seemingly, for Piaget, there still are unexplained evolutionary gaps between the organic and the cognitive. In addition, there are unexplained gaps between cognitive stages as well -- gaps that, despite the isomorphisms between stages and functions, do not seem capable of being filled in by Piaget's sui generis, epigenetic tertium quid.

Piaget is very adept at talking in terms of: "integration", "differentiation", "building up", "recombining", "spontaneous exercises",[36] "setting up", "generalizing", "abstracting", "reconstruction", "organizing", "adjusting to" and a number of other similar expressions that give the appearance of explaining, without saying anything sufficiently specific to allow one to understand what it is that is actually going on in any deep sense. In fact, Piaget closes out his discussion of isomorphism in the following way:

"The analysis we have striven to make throughout this chapter remain, nevertheless, incomplete and fragile, for partial isomorphisms have no meaning ... unless transformation laws can be produced such as will allow a transition from one of the compared terms to the other, and unless proof is furnished that these transformations can actually - - and in this case biologically -- be realized;"[37]

Precisely those transformation laws that are being alluded to in the foregoing quote are what are missing from Piaget's epigenetic position. Without such laws, the idea of making isomorphic comparisons might be suggestive, but this notion is extremely problematic as well, as has been indicated in the previous 30, or so, pages of discussion.

Footnotes

1.) Jean Piaget, *Biology and Knowledge*, (Chicago, University of Chicago Press, 1971), page 4.

2.) Ibid, page 6.

3.) Ibid, page 6.

4.) Ibid, pages 6-7.

5.) Ibid, page 34.

6.) Ibid, page 34.

7.) Ibid, page 81.

8.) Ibid, page 99.

9.) Ibid, page 100.

10.) Ibid, page 106.

11.) Ibid, pages 273-274.

12.) Ibid, page 279.

13.) Ibid, page 279

14.) Piaget discusses, in several places in *Biology and Knowledge*, the idea of population genetics (e.g., see pages 277-285). Following a trend in certain areas of biological research, Piaget develops the view that population and individual are interdependently involved with each other (although Piaget tends to attribute a greater importance to population over individual -- see top of page 281) in interchanges concerning genetic information ... information that is, ultimately, a function of the responses within a population or among individuals (usually of a sort that seeks to re-establish equilibrium to tensions in the environment). In this regard, he speaks of hereditary modifications through a "probability of action" involving all possible crossings in the population's genetic pool and which is drawn upon as the population's response (and, therefore, the individual's response) to the different tensions produced by the environment.

In my opinion, however, the whole population genetics movement is seriously misguided to the extent it attempts to supplant the individual in favor of the population. The possibilities inherent in the population are little more than what is given to it by the individuals of the population in both a negative and positive sense ... "negative" referring to the limitations that are inherent in a given species, and "positive" referring to the flexibility and scope of possibilities inherent in the species.

In either case, it remains to be seen how a population, per se, can generate anything new that was not already inherent in the contributions of the various individuals to the genetic pool. Mutations might cause the appearance of something new but mutations appear, on the one hand, independent of the population concept and, on the other hand, mutations only can bring about a change in terms of acting upon the givens and, therefore, the change is going to be functionally related to, and not independent of, what it acts upon.

In short, a population cannot produce something totally outside the structures on which it works. Population is limited to the possibilities of modification at hand that are defined by the nature of the potential inherent in the organisms that give expression to the population.

15.) Natural selection does not determine what will be generated by chance events in an organism. Natural selection only reinforces, as it were, those chance mutations that are capable of surviving in a given environmental context to which the notion of natural selection gives expression.

As such, natural selection does not represent a systematic way of exploiting mutations. What works, remains, and what does not work, disappears.

16.) The major exception to this is the case of radiation from an external source that affects the gene. Obviously, such an admission means we no longer are talking about a 'pure' mutationism involving only endogenous factors. In any event, the point to emphasize here is that a mutationist position, even with this acknowledgment, is a considerable distance from the sort of cybernetic process that Piaget has in mind.

17.) Ibid, page 15.

18.) Ibid, page 118.

19.) Ibid, page 135.

20.) Ibid, page 91.

21.) When considering Piaget's position vis–à–vis epigenesis, one might keep in mind a certain amount of evidence collected by Luther Burbank and others. These data indicated what seemed to be a principle inherent in the breeding experiments they had performed -- namely, the tendency of a species, when pushed along various lines of phenotypic transformations, to encounter certain limits beyond which the species, apparently, could not go without becoming sterile and/or dying out.

Closely related to this principle is what has been referred to by some as the 'law of reversion to average'. This has been observed to occur after the products of extended breeding experiments were returned to a natural setting and their descendants subsequently manifested a tendency, within a few generations, to revert to the boundaries of the reaction norm for which was characteristic of a species in question.

Both of the above points tend to add to the puzzlement one encounters when trying to come to grips with how epigenesis works since they represent counter-evidence to the sort of explanation Piaget is trying to establish. That is, they lend strong support to the possibility that there are limits that are built into the genetic system of any given species.

In order for Piaget to have a plausible theory, he must explain how it is possible to by-pass what seem to be the structural and functional limitations that are intrinsic to a given genome. Vague references to the internal metabolism of the gene, however, do not accomplish this task.

22.) Piaget distinguishes between "function" and "functioning". "Functioning", generally speaking, refers to the dynamic aspect, or activity dimension, of a structure. "Function", on the other hand, might mean one of two possibilities: (1) an "organized group of structures together with their functioning"; or, (2) "the action exerted by the functioning of a substructure on that of a total structure", (see page 141 in *Biology and Knowledge*).

23.) Ibid, page 145.

24.) Although Piaget uses the term "structural isomorphism" without any misgivings with respect to whether, or not, the structural features of two given entities can be compared in a meaningful or legitimate fashion, he has certain reservations concerning the use of the term "functional isomorphism" because one often is unable to identify a one-to-one correspondence between the elements of different organs that manifest or carry out the same kind of function. Consequently, Piaget prefers to use the term "functional correspondence" when attempting to compare the similarities of functioning in different frameworks and tends to focus, therefore, on the dynamic roles played by various organs (or substructures of such organs) with respect to the overall functioning of the organism of that the organs are part. As long as this shift in emphasis is kept in mind, speaking of "functional isomorphism" seems perfectly appropriate.

25.) Clearly, while Piaget believes that the inter-relationship between structure and function is a very intimate, cybernetic sort of phenomena, he tends to assign slightly more significance to the functional dimension (in the sense that many different situations might fulfill or serve the same function) and, therefore, in a sense, are more likely to be stable across evolution.

26.) Ibid, page 150.

27.) Ibid, page 148.

28.) Ibid, page 150.

29.) Ibid, page 163.

30.) Ibid, page 163.

31.) In addition to 'inclusion structures' and 'cyclic open system structures', Piaget also speaks of 'order structures'. However, given such statements as: "...order structures do seem at the outset (from the DNA stage) to be inherent in every biological organization and its functioning" (page 166), then seemingly, one might encounter additional difficulties that are similar to the ones noted in the discussion of functional isomorphism.

32.) Ibid, page 166.

33.) Ibid, page 188.

34.) This claim is based, to a large extent, on his agreement with certain aspects of Ludwig von Bertanlanffy's approach to examining organizational systems and their implications for, and applications to, a biological framework. Piaget especially keys in on the notion of an "open system" and when given the added dimension of a 'cyclic' order, Piaget develops the idea of a ‘cyclic open system’ that represents a set of structures within all organisms that is said to be capable of systematic interchanges with the environment, as well as being capable of an 'upwardly mobile' sort of transformation process. But, since the idea of a 'cyclic open system' tends to encounter many of the same problems pointed out in the discussion on function isomorphism, this will not be examined further.

35.) Ibid, pages 181-182.

36.) Piaget likes to speak of "spontaneous coordination" (e.g., see page 241 of *Biology and Knowledge*), "spontaneous exercise" (e.g., page 242), "spontaneous exploration" (e.g., see page 254), as if use of the term "spontaneous" automatically made the coordination, or whatever, an epigenetic phenomenon when, in truth, such a term only might be a euphemism for our ignorance of the principles underlying the reality of such ‘spontaneity’ -- principles that might, or might, be epigenetic in character, and principles that an epigenetic approach to evolutionary theory might, or might, be able to explain.

37.) Ibid, page 213.

Chapter 18: Chronobiology

Jeremy Campbell (*Winston Churchill's Afternoon Nap*) indicates that Einstein had removed time and space from their traditional metaphysical pedestal of unchanging absoluteness. In other words, the effect of relativity theory was to physicalize space and time. As a result, time and space became fluctuating components of the physical universe capable of entering into dynamic interactions with other facets of that universe.

Just as time was physicalized through the efforts of Einstein, Campbell contends time has been "biologized and psychologized" through the work of a variety of recent experiments and explorations. According to Campbell, just as Einstein seemed to show that time interacted with the motion of a given system, biologists have been introducing experimental data indicating biological clocks are affected by the conditions of life that surround such clocks.

When Einstein physicalized space and, especially, time, he was culminating, as well as transforming, a process popularized by Galileo (though this process did not begin with the latter). Galileo treated time as a continuous and uniform entity that could be represented by a straight line. Thus, time was construed in a spatialized manner within a mathematical framework.

As such, time came to be treated as if it were a fourth spatial direction that is continuous in the same way that space is supposed to be continuous. In other words, both space and time were alleged to consist of an infinite number of points, all of which can be mapped on to the real number line.

Consequently, the modern conception of time has deviated rather substantially from the idea of time that had prevailed for nearly 2000 years. In the traditional view, time was considered to be some sort of absolute master clock that was independent from all of physical/material reality. Today, time has become just another component of the physical world that is capable of fluctuating under a variety of conditions.

However, all of these changes in the way in which time is, and has been, conceived might be more a reflection of the way time is methodologically engaged than they are a reflection of the structural character, or actual ontology, of time. In other words, what really might have changed in the last 2000 years is the way in which time is methodologically engaged.

These transitions in methodology have led to comparable transformations in the way that time is conceptualized. None of these changes, however, necessarily has anything to do with giving insight into the ontology of time.

Organisms are not only oriented in space, they are also oriented in time. Chronobiology is the science that studies the role that temporality has in biological functioning. A great deal of relatively recent experimental findings suggests there are innate mechanisms in a large number of species of organisms that give expression to a variety of temporal rhythms. These rhythms regulate different facets of biological and behavioral processes in various species.

For example, consider animals living in burrows. Such animals have an internal, biological clock that is entrained by the temporal rhythm of alternating patterns of night and day.

Each day, the internal, biological clocks of these animals are reset to reflect the changing relationship of the ratio of daylight hours relative to nighttime hours. When they wake up in the morning, their internal clocks, not the light of day, has awakened them?

Franz Halberg introduced the term circadian rhythm to describe those instances of temporal entrainment, such as in the case of the burrow animals mentioned above, that are based on a period lasting roughly one day. Alternating cycles of day and night act as a zeitgeber or 'time giver'. Organisms use this as a temporal frame of reference to set its circadian biological clock.

When an organism is disentrained -- that is, when an organism is unable to make contact with the temporal frame of reference provided by the relevant zeitgeber (in this case, the alternating cycle of day and night), such a disentrained organism will operate on the basis of the intrinsic properties of its internal biological clock. This clock, left on its own without any external standard by which to set itself, will run either somewhat longer than a 24-hour period, or somewhat shorter than a 24-hour period.

Organisms entrained by various kinds of temporal rhythms, of which circadian rhythms are but one example, do more than just reset their internal clocks to synchronize with various rhythms of the external world. Entrainment means virtually every biological process that goes on in a given organism will have a determinate phase relationship with events occurring both in other parts of the body, as well as in various aspects of the external world.

The phenomenon of diapause is an example of how the behavior of an organism can be governed by the phase relationships that the biological clock of that organism establishes with respect to certain features of the external world. Diapause refers to the period of inactivity or quiescence exhibited by many insects during relatively regularly occurring periods of detrimental weather conditions, such as drought or winter weather.

However, the preliminary stages of diapause occur much in advance of the forthcoming, adverse weather conditions. Insect activities such as the storing of food or the building of shelters are steps that are preparatory in nature and that take place independently of any specific stimuli of drought or cold or snow.

The preparatory activity is an expression of the phase relationships that exist among: (a) certain biological clocks of the insect; (b) various motor systems in the insect, and (c) the changing ratio of sunlight to nighttime. As the character of these phase relationships changes, behavioral patterns emerge that are preparatory to the later set of phase relationships that constitute diapause proper - that is, the actual period of quiescence.

Therefore, biological clocks are part of a system that enables an organism to grasp (although not necessarily on a conscious level or in a self-reflexive manner) the character of a changing set of phase relationships in the dialectic between organism and environment. In a sense, there is a process in which certain rules of temporality are internalized. These rules have the effect of placing constraints on the freedom of an organism to act.

From the perspective of the present article, the internalization of rules of temporality is not really an accurate way of describing the situation. More specifically, the organism consists of a spectrum of ratios of constraints and degrees of freedom. This spectrum establishes a set of parameters within which, and through which, the organism is capable of responding or manifesting itself under appropriate circumstances of dialectical interaction with the environment.

Although phase information might be exchanged, and although the effect of this exchange of phase information might bring about a transition in the aspect of the organism's spectrum of ratios that is being manifested, no rules, temporal or otherwise, are internalized by the organism. A principle is activated, instead, through the dialectical activity.

The term "principle" refers to certain kinds of ratios of constraints and degrees of freedom. Such ratios might be manifested in the form of hermeneutical point-structures, neighborhoods, or latticeworks.

What makes a given ratio of constraints and degrees of freedom, or set of such ratios, a principle has to do with the structural character of the phase relationships that exist in the ratio(s). A principle consists of a set of phase relationships that form an attractor basin.

The attractor basin might be either linear or chaotic, depending on the nature of the principle. However, usually speaking, principles involve chaotic attractors, not linear attractors.

Rules, when they do arise, tend to be associated with linear attractors. Such attractors are fairly, narrowly defined and do not permit much, if any, deviation from the scope of the parameters that describe a rule.

Principles, on the other hand, provide a basis for a far more sweeping range of possibilities. All such possibilities are self-similar, rather than self-same.

Consequently, principles are capable of being receptive to, as well as of responding to, nuances and variations that fall beyond the largely linear horizons of a rule. Nonetheless, despite such variability, all these self-similar possibilities fall within the structural parameters of the chaotic attractor to which they give expression.

The principle(s) inherent in a given biological clock form an attractor basin that is sensitive to, and shaped by, certain kinds of phase information being relayed to the basin(s) as a result of the organism's engagement of, and engagement by, different aspects of the environment. In other words, the presence of certain kinds of phase relationships induces shifts or transitions in the way the attractor basin/principle gives expression to itself. As a result, the principle, in this case a biological clock, is activated.

Subsequent behavior that is generated in, or that is colored by, such an attractor basin, will conform to the parameters of constraints and degrees of freedom that have been established by means of the activated principle/attractor basin. Moreover, since the activated attractor basin/principle is sensitive to, and shaped by, the changing character of the phase relationships in the dialectic between organism and the environment, those behavioral patterns that are influenced by such an attractor will reflect the shifts in phase relationship information.

In short, certain aspects of the organism's behavior become entrained by transitions in phase relationship. Thus, although no rules have been internalized, principles have been set in motion and behavior has been affected as a result of the dialectical engagement between organism and environment.

In the early 1970s, a certain amount of excitement was generated when a number of biologists believed they had discovered a master biological clock. Such a clock is supposed to be autonomous and independent of all external, temporal cues. In addition, a master biological clock is theorized to be responsible for generating all the different rhythms of the body.

The would-be master clock discovered in the 1970s is located in the frontal portion of the hypothalamus. It consists of several clusters of cell groups that have become linked during the course of development. The technical term for these coupled cell clusters is suprachiasmatic nucleus -- or, SCN, for short.

Two properties, in particular, of the SCN seemed to enhance its attractiveness as a candidate for the master clock. First of all, the coupled nuclei of the SCN display a great deal of oscillatory activity. Oscillatory behavior is something one would expect to observe in any candidate for a master clock since the clock is responsible for regulating a wide variety of rhythmic patterns.

Secondly, the suprachiasmatic nuclei are connected, via a nerve tract, to the retina in each eye. One obvious implication of this link is that the SCN would be able to receive important data concerning temporal rhythms in the external world. Especially important in this regard would be those rhythms involving the changing pattern of the ratio of daylight to nighttime as one progressed through the year.

Subsequent experiments, in which the SCN were removed, indicated the master clock had not been found. These experiments showed that although the temporal identity of an organism is significantly altered when the SCN are removed, nevertheless, temporal identity was not destroyed. In other words, while the SCN seemed to play a fundamental role in synchronizing various biological rhythms, they were not responsible for generating these other rhythms. Consequently, there must be other biological sources that are underwriting temporal identity.

Although the suprachiasmatic nuclei do not constitute ' the' master biological clock, they are believed to be the locus within which one of two master clocks can be found. Together, these two clocks are considered, by many chronobiologists to be responsible for regulating the vast majority, if not all, of the biological rhythms in the human body. These rhythms range from: the secretion of growth hormone, to cycles of activity and inactivity, to establishing the point in the sleep cycle when vivid dreams are most likely to occur, to the rise and fall of core body temperature, and so on.

The location of the second master clock has not yet been established. However, this second clock is thought to be the more stable, as well as the more powerful, of the two clocks.

Nevertheless, this second, more stable and powerful, master clock is believed not to have any direct contact with the changing patterns of light to darkness ratios. Therefore, this second clock might be entrained by the so-called master clock thought to be located in the suprachiasmatic nuclei, since this latter "master" clock is in contact, via nerve tracts extending to the retina, with external data concerning the changing ratio of light to darkness.

There are some chronobiologists who do not accept the two-master-clock hypothesis. They believe there might be a number of other "master" clocks in addition to the two already mentioned.

For example, there is considerable evidence pointing toward the adrenal gland as the locus for, yet, another clock of sorts. More specifically, one of the hormones secreted from the outer cortex of the adrenal glands is cortisol.

Cortisol plays a fundamental role in the way the body responds to stressful situations. Fluctuations in the level of cortisol secretion appear to follow cyclical rhythms during the course of the day.

The adrenal-clock, however, is not necessarily a master clock. Quite frequently, a given biological system will have an intrinsic periodicity that characterizes its biological activity. This innate periodicity is not, in and of itself, a master clock. Such inherently periodic systems are known as a tau.

The structural character of a tau gives expression to certain aspects of an underlying genetic blueprint. Although a tau's general structural character is species specific, the individual members of a species will display a tau that is similar to, but not precisely the same as, the average value for the species with respect to that tau.

Human beings, along with a variety of other species, are capable of being entrained, simultaneously, to a variety of different biological clocks. On the other hand, human beings are also capable of having some of their biological rhythms synchronized with others with whom they live in close contact over a period of time.

Some hormones play a role in communicating, to various systems in the body, information concerning the temporal phase of external rhythms. These hormones are referred to as temporally active hormones.

These sorts of hormones are believed to keep different circadian systems in touch with the fluctuations occurring in various rhythmic patterns in the external world that are relevant to the body's circadian rhythms. In human beings, there are a variety of temporally active hormones providing humans with a number of different sources of temporal information.

As a result, such hormones help establish a spectrum of ratios of constraints and degrees of freedom with respect to the way a human being can engage the environment in a temporal dialectic. Furthermore, although the general number and structure of biological clocks is pretty much the same from one human being to the next, there can be a great deal of variance in how these different clocks are linked together in different individuals. In other words, different individuals will exhibit different patterns of synchronization with respect to how the clocks will be linked to one another.

Sometimes these differences are a result of genetic inheritances. Sometimes the differences in patterns of synchronization are due to the kind of life the individual leads. Finally, sometimes a combination of the two foregoing factors will lead to differences in patterns of synchronization from individual to individual.

Modern high-speed computers have taken on a function, with respect to biological rhythms, somewhat similar to the role that a prism played with respect to light waves. Just as a prism is able to show visible light is an aggregate of a number of different wavelengths of light, so too, modern computers have been able to show there is a spectrum of biological rhythms underlying an organism's activity.

Through the application of computer and inferential statistical techniques, approximately seven to eight basic types of rhythms have been discovered so far. They are: ultradian (less than 20 hours); circadian (between 20-28 hours); circasemiseptan (31/2 days); circaseptan (7 days, plus or minus 3); circadiseptan (14 days, plus or minus 3); circavigintan (21 days, plus or minus 3); and, circannual (1 year, plus or minus 2 months). The term infradian is used to refer to cycles lasting longer than 24 hours.

Circaseptan rhythms (which have a period of approximately 7 days) are showing up in a variety of biological processes. Generally speaking, these rhythms are of low amplitude and, therefore, are hard to detect amidst the higher amplitude, more prevalent circadian rhythms. However, although, on an individual basis, the circaseptan rhythms are weaker than the circadian rhythms, over the course of a week, the aggregate collection of circaseptan rhythms has a large amplitude.

While circaseptan and circasemiseptan rhythms do not appear to reflect any external temporal rhythm, these rhythms are not arbitrary. They have a harmonic relationship with such external rhythms as the cycle of day and night, as well as the lunar cycle.

Thus, the rhythms associated with various biological functions (such as growth, maturation, cell maintenance, reproduction, immune responses, and so on) will be a complex harmonic function of the way entrainment properties of external rhythms dialectically interact with the vectoring properties of innate biological currents such as the circaseptan and circasemiseptan rhythms. However, nobody in the field of chronobiology knows, yet, what the structural character of this dialectic is or what the harmonic laws are that govern that dialectic.

One can differentiate between music and noise by noting how the former consists of a set of sound waves that have an ordered, structured relationship with one another. In the case of noise, the aspect of orderly relationship is missing.

In music, a given complex sound is a function of a set of simple waves that are whole-number multiples of some fundamental, lowest frequency, wave component inherent in the given complex sound. This lowest frequency wave component is known as the first harmonic. Depending on the sort of whole-number multiple a given wave component has relative to the frequency of the first harmonic, the other wave components of a complex musical sound will be referred to as harmonics of the second, third, fourth, etc. order.

Some of the more complex temporal rhythms (e.g., circannual or circavigintan , etc.) might be whole-number multiples of some of the simpler rhythms such as the ultradian or the circadian. Thus, the more complex biological rhythms could be seen to be higher order harmonics of the basic temporal units.

Just as light plays a fundamental role in Einstein's special theory of relativity, light also plays a fundamental role in chronobiology. Light is the standard to which the body refers in order to re-gauge its biological rhythms so they can be synchronized with, among other things, the primary circadian rhythms generated by the alternating cycle of night and day.

Although most of the light impinging on the individual's eye is transduced into visual signals, a certain amount of the light serves as a source of temporal information concerning the external rhythm of the cycle of day and night. This information is passed on to the suprachiasmatic nuclei in the hypothalamus. These nuclei are linked with a variety of other biological clocks and taus. The end result of this dialectic is to permit the organism to get into an appropriate phase relationship with external rhythms.

The pineal gland is known as a neuroendocrine transducer. This means it is capable of converting or translating the action potentials of the nervous system into the secretion of various kinds of hormones. One of the hormones transduced by the pineal gland in this fashion is melatonin.

The suprachiasmatic nuclei are connected to the pineal gland by means of a nerve tract. By sending certain messages along this nerve tract to the pineal gland, the SCN is able to control the quantities, and, therefore, activity, of a particular enzyme in the pineal gland. The enzyme regulated by the SCN plays a role in synthesizing melatonin from a precursor neurotransmitter, serotonin.

Although the precise role of melatonin is not presently known, it is deeply implicated in the body's circadian system that is hooked into external rhythms of night and day. The levels of melatonin secretion are highest between the hours of 11 at night and 7 in the morning. Alternatively, the levels of melatonin secretion are lowest during the hours of waking activity.

Apparently, light serves as a signal for the suppression of melatonin secretion, whereas nighttime acts as a stimulus leading to the synthesis of melatonin. The rhythmic rise and fall of melatonin levels is a waveform that is propagated throughout the body.

This cyclical waveform plays a role in the synchronization and harmonious interaction of a variety of biological rhythms. Furthermore, while the amplitude, frequency and phase of this wave can be affected by altering the timing and/or intensity of the organism's engagement with light stimuli, each species has its own characteristic way of responding to such alterations in the character of light stimuli.

Almost all vertebrates come equipped with a pineal gland. Although the function and the size of the pineal gland varies from species to species, generally speaking, the more critical the role(s) that is(are) played by temporal rhythms in a given vertebrate species, the larger will be the size of that species pineal gland. In addition, in many of, if not most of these vertebrate species, fluctuations in the level of melatonin synthesis and suppression in the pineal gland are linked to the way the organism establishes phase relationships with external cyclical patterns such as day and night, as well as summer and winter.

In the latter case, the nervous system might have some sort of mechanism for both: (a) keeping running totals of the ratio of melatonin synthesis to melatonin suppression and, then, (b) coupling (a) with a process that compares the latter ratio against some innate or learned (such as through critical periods) standard. This mechanism allows the organism to make fairly complex preparations for forthcoming seasonal changes.

The suprachiasmatic nuclei are also linked with the lateral geniculate nucleus. The primary neurotransmitter propagated along the nerve tract connecting the SCN and the LGN is known as neuropeptide Y.

In experiments in which neuropeptide Y has been introduced directly into the SCN, this neurotransmitter appears to have the effect of resetting the circadian clock of the suprachiasmatic nuclei in the same manner as if the organism had encountered the darkness of night. One of the implications of this kind of experiment is as follows. Just as there are biochemical components that act as carriers of the temporal information of light, there also might be systems responsible for the generation and regulation of carriers of the temporal information of darkness.

All species exhibit a mixture of constraints and degrees of freedom in relation to the temporal dimension. In other words, for every species there are some aspects of functioning in which temporal relationships are central or critical, whereas there will be other aspects of functioning in which temporal relationships play only a very minor, if not non-existent, role.

The ratio between these two possibilities (i.e., instances in which temporality is important and instances when temporality is relatively unimportant) establishes a given species' temporal identity. Temporal identity sets the tone, orientation and so on with which a given organism will interact with different patterns of external rhythms under various circumstances.

The phenomenon of critical periods is one of the modes through which the temporal identity of a given species or individual is given expression More specifically, for a large number of species, there seem to be temporal phase windows, of varying lengths of time, within which the learning of various kinds of behavior or the development of certain kinds of capabilities must take place. Vision in kittens, social behavior in monkeys, the singing of songs in different species of birds, identification of the mothering-one in geese, and language in human beings, are all examples of learned behaviors that appear to be shaped by the structural character of the temporal windows that seem to form integral aspects of the temporal identity of the respective species.

Other kinds of learning also exhibit a rootedness in the ratio of temporal constraints and temporal degrees of freedom. Honeybees, for example, are able to learn certain information concerning the scent, color, location, and distance of a source of nectar. However, each segment of information can be learned only at certain phase states during the bee’s interaction with the nectar source.

More specifically, the honeybee only can learn the color of a flower in the two second period just prior to landing on the flower. Secondly, the honeybee only can learn the scent of a flower when it has actually landed on the plant. Thirdly, the honeybee is able to learn the location of the nectar source only as it leaves the flower on which it has landed. Finally, the honeybee can learn the location of the hive entrance only when it leaves the hive as it goes in search of food sources.

In all of these cases, the temporal phase linking the honeybee to the learning cycle assumes a fundamental importance. If anything disrupts the temporal window within which, and through which, certain kinds of data must be stored in the honeybee's memory, then, learning of the requisite sort will not take place.

The fact that in some species there are critical temporal windows or critical phase relationships that must exist in order for certain kinds of learning to occur raises the question of whether there are similar sorts of temporal windows of learning in human beings. This is an issue of some importance.

For example, the network of phase relationships that arises as a result of the dialectic between a given individual's temporal identity and the way in which a given curriculum program allows a topic to unfold over time might play a fundamental role in determining the way in which the individual engages, and is engaged by, the subject matter. The structural character of such an engagement process might affect, in turn, both the quality and quantity of learning that occurs in relation to a given subject matter.

Some curriculum programs might enhance an individual's likelihood of learning because such a program is conducive to the individual's mode of temporal identity. As a result, a resonance process arises that permits heuristic transitions in some of the ratios of constraints and degrees of freedom governing an individual's understanding.

On the other hand, other curriculum programs might diminish an individual's likelihood of learning since such a program is not compatible with the structural character of the individual's temporal identity. In other words, the dialectic between individual and curriculum does not permit a resonance process to be established that is conducive to heuristic transitions in the ratios of constraints and degrees of freedom governing that individual's understanding.

Sometimes a curriculum program might need to expand the character and quantity of constraints surrounding the unfolding of a given subject matter in relation to an individual of a given temporal identity. At other times, one might need to decrease the character and quantity of such constraints for a given individual.

Similarly, sometimes one might need to expand the character and quantity of the degrees of freedom surrounding the unfolding of a given subject in relation to an individual of a certain temporal identity. At other times, such degrees of freedom might need to be decreased.

Phase relationships might play an important role in, yet, another aspect of the manner in which temporal identity is linked to the process of learning. This further possibility concerns some of the techniques associated with super-learning or suggestopedia.

One of the reasons why baroque music of a particular time signature has proven to be so integral an aspect of super-learning programs seems to be because the temporal identity of human beings as a species finds such a tempo to be compatible with enhanced learning opportunities. Alternatively, perhaps one of the reasons why some people have experienced only limited success with the super-learning program is because different individuals might require music with slightly different time signatures that might, or might not, be harmonically related to the baroque music time signature.

Moreover, the visualization techniques, together with the practice of positive self-regard and relaxation exercises, used in conjunction with the super-learning program, might all help to focus, and/or heuristically orient, the network of phase relationships through which one engages, and is engaged by, learning material. The combined effect of all these processes might help to create chreods or canalized pathways that make learning easier and more efficient.

In experiments involving human beings, in which all time cues were removed from the experimental situation and people were allowed to set their own routine with respect to sleeping, eating, working, and so on, scientists found a number of themes that, on average, seemed to be characteristic of human sleep. Apparently, sleep patterns are shaped by several distinct components.

One of the components shaping the sleep cycle is innate. The other component shaping the sleep cycle is a function of the way an individual interacts with on-going environmental contingencies involving work, recreation, social relationships, and so on.

Part of the innate component of sleep has to do with how long, in general, any given period of sleep lasts. This component is strongly influenced by a biological clock intrinsic to the genetic blueprints that lay down the spectrum of ratios of constraints and degrees of freedom that shape biological patterns.

Moreover, the onset of sleep is also affected by an innate biological clock since, on average, people tend to seek out sleep a short time after the core temperature of the body has reached its lowest level. As indicated previously, the cyclical character of deep body temperature is regulated by a biological clock.

The structural character of the sleep cycle has four or five fundamental stages that run in sequence throughout a 'normal' period of sleep. These stages are differentiated from one another by, among other things, the frequency signature of the brain waves that occur during a given stage of sleep, as well as, at least in some stages of sleep, the level of synthesis activity of certain neurotransmitters (namely, acetylcholine, norepinephrine and serotonin).

At various, relatively regular, intervals (approximately every 90 minutes) during the running of the sleep sequence, the REM phenomenon occurs. REM sleep is characterized by a paralysis of the muscles of the body, a heightened level of activity of the nervous system, and vivid dreaming. Usually, REM sleep occurs after, or in conjunction with, stage 2 sleep, once the sleep sequence has completed the following sequence of stages: 1,2,3,4,3,2.

With the exception of stage 1, this pattern is repeated a number of times throughout the period of sleep. Finally, the amount of time that any given individual spends in REM sleep tends to be both characteristic of the individual, as well as relatively stable over the course of the individual's life.

Allan Hobson and Robert McCarley have studied the aminergic and cholinergic components of the biological clocks that help regulate and shape not only the waking-sleep cycle, but the sleep-dream cycle as well. The aminergic component, that is located in a specialized group of cells in the brainstem, gives expression to the so-called amine force. This 'force' is responsible for the synthesis and release of the neurotransmitters, serotonin and norepinephrine.

There is second group of specialized cells in the pons that gives expression to the cholinergic force. This 'force' controls the synthesis and release of acetylcholine.

According to Hobson and McCarley, the aminergic system plays a fundamental role in bringing about and sustaining the waking portion of the wake-sleep cycle. All throughout the waking state, serotonin and norepineprhine are synthesized and released in a regular, clock-like fashion. The effect of these manifestations of the aminergic force is, among other things, to inhibit the activity of the giant pons cells that are the locus of synthesis of acetylcholine.

During the sleep segment of the wake-sleep cycle, the activity of the aminergic system is suppressed. This results in the disinhibition of the cholinergic system. Once disinhibited, this system proceeds to synthesize and release acetylcholine.

The combined effect of the gradual suppression of the activity of the aminergic system, together with the disinhibition of the cholinergic system, permits a variety of systems of the nervous system to become activated. One of the systems activated in this manner begins synthesizing a neurotransmitter that is conveyed to the voluntary muscle system.

When this neurotransmitter arrives at the site of the voluntary muscle motor plates, it takes on the function of a blocking agent with respect to motor nerve impulses, thereby, preventing movement of arms, legs and so on. In addition, Hobson and McCarley believe the combined effect of the suppression of the aminergic system, along with the disinhibition of the cholinergic system, leads to the increased level of activity of the nervous system out of which REM sleep arises. REM sleep activity is specifically stimulated by the presence of acetylcholine.

In broad, general terms, one can categorize brain circuitry in two ways. On the one hand, there are circuits that are dominated by fast-acting but short-lived neurotransmitters such as acetylcholine (which excites cellular activity in the nervous system) and GABA (gamma amine butyric acid) (which inhibits cellular activity in the nervous system). These neurotransmitters are generally found in motor and sensory circuits where speed of response is important.

On the other hand, there are brain circuits that are dominated by relatively slow-acting but long-lived neurotransmitters like serotonin and norepinephrine. These neurotransmitters are generally associated with activities of learning and attention.

Although the roles of acetylcholine and GABA have been mapped out fairly precisely in relation to sensory and motor activity, such is not the case with respect to the roles of serotonin and norepinephrine in relation to learning and attention activities. In other words, although serotonin and norepinephrine might be implicated in conscious, intelligent activities, just how they bring about such activities, or how they sustain them, or how they underwrite a system that permits differential attention is not known.

Surely, any attempt to reduce the extremely diverse and complicated possibilities surrounding learning/intentional activity to being a function of biogenic amine neurotransmitters, will encounter theoretical difficulties. For example, even if there were 25 or 30 of these sorts of neurotransmitters (i.e., enough for a complex alphabet of sorts), one still would be faced with the following problem: biogenic amine neurotransmitters, such as serotonin and norepinephrine, do not control their own levels or rates of synthesis. Nor do they control where in the nervous system they will be sent or when they will be released for propagation. Thus, even if one were to suppose that learning and attention are somehow reducible to being a function of various combinations of biogenic amine neurotransmitters, one needs to uncover the structural character of the system that is responsible for organizing, shaping, regulating and directing the components of the biogenic amine code to form the complex, diverse structural properties characteristic of both learning and intentional activity.

In a sense, the problem facing the biogenic amine neurotransmitter theory of learning and attention is, at best, like that of a person who is trying to decode an alien language. When a language is radically dissimilar from any with which one is familiar, one might not be able to apply the normal mathematical rules of decryption.

If the problems facing the biogenic amine neurotransmitter theory of learning and attention are comparable to those facing the decryption of an alien language, then, all that the biological cryptologist has to go on is, at most, a few letters of the alien alphabet (i.e., the known neurotransmitters). Knowledge of these letters, however, is not accompanied by any understanding of how the letters are organized to give expression to the sort of syntactical or semantic processes that are capable of giving expression to learning and attention.

There are further problems that arise if the biogenic amine neurotransmitter system of learning and attention does not operate like a language. If this is the case, then, biogenic amines such as serotonin and norepinephrine are not analogs for letters or words and have some entirely different functional role that they fulfill. What this role might be, no one presently knows.

However, irrespective of what their role might be, the underlying problem that needs to be solved remains the same. In each case, one needs to discover the identity of the structural character of the process or mechanism responsible for the organizational capacities that establish the spectrum of ratios of constraints and degrees of freedom that give expression to the learning and attentional pathways.

These pathways could be characterized by waveforms of synthesis activity that have varying frequencies, amplitudes and wavelengths involving different biogenic amines or different combinations of such amines. In fact, to a certain extent, various biogenic amine neurotransmitters might be just a medium of transmission for some underlying source of information, order, communication or organization. If so, one should pay more attention to the shape and character of the wave being propagated by the amine medium than one pays to the medium itself.

If the foregoing were the case, then, the idea of wavelength might have something to do with the duration of the burst of synthesis activity of a particular biogenic amine, whereas frequency might have something to do with how often such a wavelength is generated per unit of time greater than the duration period. Furthermore, amplitude might have to do with the level of intensity of the synthesis activity surrounding a given biogenic amine.

Then, one would have to work out a functional relation between different waveform properties and various kinds of learning and attentional behavior. In addition, an extra dimension of vectored shaping might be introduced if one were to assume that the same waveform propagated through different biogenic amine mediums might mean quite different things or have quite different functions in different circumstances.

Throughout the aforementioned sort of waveform activity, the property of phase relationships would play an extremely important role of shaping and communicating various aspects of understanding. Indeed, in light of the fact that more and more aspects of biological functioning are being construed in terms of periodic, cyclical, or rhythmic patterns of activity, the need to map out phase relationships within, and among, such cyclical patterns of activity, as well as to map out the character of phase transitions under various circumstances of learning and attention becomes increasingly pressing.

In this sense, the brain or nervous system would become like an amalgamation of dialectically interacting phase states. Such states might be extremely receptive to sympathetic vibrations (i.e., the phenomenon of resonance) from a variety of other dimensions that are in a compatible or synchronous phase state.

The foregoing suggests the temporal dimension might serve as an ideal medium through which information about phase state, phase relationship and phase quanta could be exchanged among a variety of quite different (in terms of the spectrum of ratios of constraints and degrees of freedom that characterize them) dimensional mediums. In other words, given that the temporal dimension can be conceived of as sharing a common boundary (in the form of a set of phase relationships) with virtually every other dimensional structure, one easily could suppose that a great deal of information concerning the phase states of different dimensions might be transmitted via the temporal dimension. One could further suppose that such transmitted phase information might become entangled with whatever dimensional dialectic activity exhibited an organizational or structural or ordered resonance.

If the foregoing suppositions are true, then, one of the common currencies of communication of information in the universe might be phase quanta, phase relationships and phase states. All of these phase modes are manifestations of the sort of constraints and degrees of freedom to which the temporal dimension helps give expression during its dialectic with other dimensions.

Daniel Kripke and David Sonnenschein have run a series of studies indicating that many people seem to go through waking cycles, lasting approximately 90 minutes, in which they have reverie or fantasy experiences of a spontaneous nature at the beginning and/or end of such cycles. While these reverie episodes exhibited some degree of resemblance to REM-stage dreaming, they were not accompanied by the characteristic rapid eye movements of REM-sleep. Therefore, these reverie rhythms are not considered to be waking counterparts to REM-stage dreaming.

Both REM-stage dreaming, as well as the waking reverie cycles, are examples of ultradian rhythms. These are rhythms lasting less than the 24 hour period of the more easily detectable circadian rhythms. A number of chronobiologists believe there are a number of ultradian rhythms occurring in human beings. Moreover, these chronobiologists believe such ultradian phenomena might form a number of related and interacting, rhythmic families.

Another example of an ultradian rhythm involves the idea of 'sleepability'. Sleepability refers to the ability of a person to go to sleep at a given time. Researchers have discovered there are temporal windows opening up on a regular basis.

An individual can go to sleep more easily when these windows are open than when they are closed. Generally speaking, these temporal windows open approximately every 90 minutes.

There also appear to be temporal windows of wakeability. These are periods of time during the sleep cycle when the individual can awaken more easily relative to other periods of the sleep cycle. One example of a wakeability window occurs during the REM-stage of sleep. Wakeability appears to be another example of an ultradian rhythm.

Despite the fact the foregoing examples of ultradian rhythms, along with a number of other instances of such rhythms, have cycles lasting approximately 90 minutes, there does not seem to be any master biological clock synchronizing all of these oscillating systems. In other words, the similarity of cycle length notwithstanding, all of these ultradian rhythms appear to be independent of one another.

Another example of how ultradian rhythms might play an important role in shaping the structural character of human behavior concerns evidence that suggests there are significant differences in the storage-efficiency of short-term and long-term memory. This evidence indicates memory storage-efficiency is dependent on the time of day one is given certain kinds of memory tasks.

Apparently, short-term memory reaches a peak of efficiency somewhere between 10-11 A. M.. Long-term memory, on the other hand, seems to reach a peak of efficiency later in the day.

For instance, children who were read a story at 9:00 A.M. were able to recall fewer details of that story than were children who were read the same story at 3:00 P.M.. The data seems to indicate there is a 15 % difference in storage-efficiency.

If the foregoing finding holds across the board, then, it might have fairly substantial implications for how one structures the school day. For example, although teachers obviously would like students to remember everything being taught, some material might be more essential or critical than other course material. The experimental data alluded to above indicate the more essential course material might be saved for the latter portion of the afternoon when it has a better chance of staying in long-term memory.

The foregoing data concerning memory storage-efficiency, however, might have to be modulated somewhat by other kinds of experimental findings. A certain amount of evidence has been uncovered that differentiates between two broad categories of temporal identity in human beings.

The members of one group have been labeled "owls". The individuals in the other group are referred to as "larks". As the respective names suggest, owls tend to have their period of peak activity late in the day, whereas larks manifest a period of peak activity during the early part of the day.

Interestingly enough, a major biochemical difference between the two groups has to do with the amount of epinephrine secreted by individuals in each group during the morning hours. Epinephrine, that is associated with biological stimulation, is secreted in greater quantities, during the morning hours, by the larks.

One wonders if there is a way for the two experimental results outlined above to be combined so that all categories of individuals could gain the greatest benefit from the effect such rhythms have on the potential for learning, alertness and so on? For instance, should one assign students to classes according to the character of their temporal identity?

One also wonders if larks will learn more efficiently in the afternoon as the first study cited above suggests, or whether their temporal identity will overshadow the apparent enhancement of memory efficiency associated with mid-afternoon learning. Or, could one explain the apparent enhancement of memory efficiency in mid-afternoon learning by the presence of a larger number of owls, relative to larks, in the sample subjects? Whatever the answer to these questions might be, biological rhythms, together with their complex expression in the form of temporal identity, would seem to be important areas to explore in relation to the educational process.

While the biological rhythms occurring in humans are innate, their structural character is not instinctual in any narrow sense. There is some degree of flexibility inherent in these rhythms.

Therefore, although they play a significant role in shaping various aspects of behavior, they do not rigidly control behavior. Quite frequently, the manner in which biological rhythms manifest themselves is itself susceptible to being shaped, to a certain extent, by directed awareness.

For example, experimental work has established that when human beings undertake a task requiring some degree of concentration for an extended period of time, they go through a cycle of, first, enhanced efficiency, that is, then, followed by a deterioration of efficient engagement of the given task. Then, this cycle repeats itself.

The length of each cycle is approximately 90 minutes. Thus, such a cycle is an ultradian rhythm.

Apparently, the cycle is set in motion by an individual's decision to engage some task requiring conscious attention. Within certain limits, each new engagement decision resets the ultradian efficiency clock so that another cycle is initiated.

Obviously, if a change in the direction of conscious attention is made too frequently, this, presumably, would have a dampening effect on the efficiency cycle. In other words, one would never be able to get far enough into the task in order to make the heightened awareness payoff. Consequently, there would seem to be some minimal amount of time that would have to be spent in the cycle to get the most out of it.

Furthermore, under some circumstances, there might be other sorts of forces shaping the ultradian cycle of efficiency. For instance, there are cases in which one becomes deeply engrossed in what one is doing because one finds a given issue or task extremely intriguing, interesting, challenging, stimulating, rewarding, and so on.

Under these sorts of circumstances, the 90 minute cycle might not be in effect. In other words, there might be thresholds involving interest/reward/challenge that, in being exceeded, lead to the shutting down of the aforementioned ultradian cycle that normally governs mental alertness.

Alternatively, if the ultradian rhythm concerning mental alertness is in effect (i.e., not shut down or switched off), the down aspect of the cycle might be greatly attenuated as it is swamped by other, more powerful cycles. As a result, there might not be much deterioration of mental alertness during such circumstances.

A further possibility is the following consideration. Within the context of the task, work or issue being engaged, there might be a number of new, interesting twists and turns, each of which resets the efficiency cycle.

However, because all of the twists and turns are bound together within the framework of a thematically directed latticework of interest/reward/challenge, the change in focus does not become disruptive to, or interfere with, or act as a suppressor of, efficient engagement as would be the case if the twists and turns were unrelated to one another. Indeed, such a latticework might operate as a strange or chaotic attractor in which the various re-settings of the ultradian mental alertness cycle give expression to a self-similar (and, therefore, linked) series of rhythms.

This latter point concerning the possibility of the synergetic effect of introducing twists and turns within a given task framework has some potentially interesting implications for educational theory and the planning of classes, homework, assignments and so on. Possibly, if one can find the right kind of twists and turns within the context of a certain task framework, one might be able to provide the individual with a means to reset the ultradian efficiency clock on a regular basis, and, thereby, within certain limits, keep the individual at peak efficiency for a longer period of time.

The foregoing considerations seem to suggest that not only are there biological rhythms, but there also are what might be referred to as epistemological and/or hermeneutical rhythms. Furthermore, these biological rhythms and epistemological/hermeneutical rhythms dialectically interact with one another in a process of mutual vectoring or tensoring.

In the light of the foregoing considerations, when something is learned might be as important as what is learned. The phase orientation one has as one begins to engage a given topic, issue, task, and so on, might significantly affect the structural character of the outcome of such an engagement. In other words, certain phase relationships, that play central roles in shaping learning and understanding, might be more amenable to heuristically valuable phase shifts or transitions during some phase states than during other phase states.

Each individual might be shaped by a variety of temporal windows affecting the efficiency with which, and way in which, learning and understanding occur. These temporal windows are a function of the dialectic among a variety of biological and epistemological/hermeneutical rhythms. If course material is engaged by an individual when a propitious ratio of such temporal windows is open, learning might be easier and more is not conducive to learning and understanding.

Similarly, before one can understand certain aspects of an issue, one might have to acquire the right sort of phase orientation with respect to such an issue. That is, one might have to get into, or be brought into, phase with the material as well as the educational setting through which the material is being introduced. Consequently, an important part of the educational process might be to assist the individual in constructing the right sort of phase state or phase orientation though which a constructive exchange of phase quanta (i.e., learning, understanding, etc.) is more likely to occur.

In short, an individual's temporal identity gives expression to both biological rhythms, as well as, hermeneutical rhythms. Indeed, temporal identity is a manifestation of the structural character that is generated, in part, by the dialectic of biological and hermeneutical rhythms. In addition, temporal identity consists of oscillating ratios of constraints and degrees of freedom. These oscillating ratios are generated by the different levels of scale of dimensional dialectics that give expression to a human being.

One of the interesting things about an oscillator is the way it, simultaneously, can serve as a clock as well as a source of signals, information or messages. In this respect, there might be a sense in which both biological and epistemological/hermeneutical rhythms form oscillating systems that are somewhat like the clocks of Einstein's special theory of relativity.

In other words, they often give measured versions of rhythms, time, synchronization, signals and so on which are influenced by local conditions instead of being reflections of temporal absolutes that are unaffected by methodological considerations. At the same time, just as is the case in special relativity, there are elements of universal laws (involving rhythmic structures in the present case) which are being preserved during the process of methodological engagement. Thus, aspects of both variability and invariance are manifested in the chemical and hermeneutical oscillating systems that characterize human beings.

Although chemical clocks or chemical oscillators were first discovered in 1921 by William Bray, they were not systematically studied until the late 1950s and early 1960s by A. M. Zhabotinsky and B. P. Belousov of the Soviet Union. Essentially, a chemical oscillator (sometimes referred to as a Belousov-Zhabotinsky reaction) will, if left to itself, spontaneously shift between several states in a periodic fashion. Usually, the periodicity of a chemical clock is noticeable because that periodicity is visually manifested as a color transition in the chemical system that is oscillating.

As is the case for any oscillating system, a chemical clock is sustained by a process of energy flow that enables the energy to: (a) be stored, at least temporarily, as potential energy, and (b) be converted from a potential form to an active or kinetic form of energy. One of the ways in which this process of energy flow occurs in chemical systems is by means of a series of cyclical transitions between the oxidized and reduced states of certain molecules in such systems.

Chemical oscillators are capable of producing a wide range of effects, including complex phenomena of communication. In other words, some networks of chemical/biochemical processes exhibiting various sorts of oscillating properties are capable of giving rise to a variety of systems that generate, store and transfer information.

The Acrasiales fungi or slime mold is, relative to human beings, a simple example of a chemical/biochemical clock that, under the right sort of circumstances, manifests many of the characteristics of a system of communication. Under environmentally favorable conditions, the slime mold exists as a single-celled amoeba.

However, when environmental contingencies become problematic (such as when food becomes scarce), the formerly independent slime molds begin to draw together and become transformed into a stalk. In time, this stalk yields spores that, eventually, break off and are dispersed by wind currents to more favorable environmental circumstances. When these more favorable conditions are reached, the spores undergo reproduction. This results in a new colony of slime molds being established.

The series of transformations and transitions undergone by slime molds is driven by a chemical oscillatory system in which cyclic adenosine monophosphate (cyclic AMP) plays a leading role. For unknown reasons, one of the slime molds in the colony begins to secrete cyclic AMP in rhythmic pulses. These pulses have the effect of entraining the other slime molds' production and secretion of cyclic AMP so that all of the members of the colony begin to secrete cyclic AMP in unison.

The over-all effect of the community production of cyclic AMP is to lead all of the individual cells to congregate around the initial cyclic-AMP-secreting- amoeba cell. The congregated colony, then, undergoes the series of transformations outlined previously in which there is a sequential expression of the base, stalk and spores stages of the slime mold.

Cyclic AMP is referred to as the 'second messenger'. It has this label because of its role of interacting with neurotransmitters that are considered to be the first-line messengers.

Generally speaking, when a given neurotransmitter attaches to a receptor site, one of the effects ensuing from this is the synthesis of cyclic AMP inside of the target cell. Cyclic AMP is, then, distributed throughout the cell. Apparently, its presence helps to communicate some of the message that has come to the cell in the form of a given neurotransmitter.

Among other things, cyclic AMP seems to help amplify, by an order of quite a few magnitudes, the relatively weak signal of the first messenger neurotransmitter. In addition, cyclic AMP tends to extend the period of duration during which the message conveyed by the first messenger is actively propagated. In other words, even though the neurotransmitter might have departed from the receptor site that initiated the synthesis of cyclic AMP, nonetheless, the cyclic AMP continues to serve as a sort of proxy for the message/signal carried by the neurotransmitter.

The second messenger, cyclic AMP, operates more slowly, relative to the pace at which many other neural processes take place. Consequently, the activity rate of cyclic AMP might lend itself to helping to maintain those mental states that are more enduring such as memory, learning and consciousness.

In 1955, M. Calvin and A. T. Wilson detected, for the first time, an instance of a biochemical oscillator. The oscillator forms part of the process of photosynthesis. More specifically, the oscillator is located in the portion of the cycle known as the dark reactions.

Approximately ten years later, another example of a biochemical oscillator was discovered. During the process of glycolysis, the primary means by which cells in many different organisms catabolically degrade glycogen, there are several enzymes involved in the breakdown of glucose that form an oscillating system.

Cyclic AMP and its associated catabolic enzyme, phosphodiesterase, might form an oscillating system somewhat comparable to the systems existing in glycolysis and the dark reaction of photosynthesis. Moreover, cyclic AMP might play a fundamental role in entraining a variety of biological rhythms of the body and mind. This possible role emerges in the light of its pervasive, almost ubiquitous, rhythmic activity in so many parts of the body.

There is substantial evidence (and chronobiology is but one part of this evidence) to indicate there are underlying sets of oscillating systems in the form of various kinds of ratios of constraints and degrees of freedom that leave their imprint on the structural character of behavior. The ebb and flow of concentration gradients for cyclic AMP might form a part of some of these systems.

In many cases, the underlying oscillatory activity seems to be in the form of chaotic attractors. This is so since the behavior associated with such oscillatory activity often tends to be self-similar rather than self-same.

Various kinds of biological and hermeneutical oscillating systems in human beings might form a series of horizonal (pertaining to the horizons of experience that shift in relation to one's focus) attractor basins that engage, and are engaged by, the self-similar activity of focal attractor basins. Sometimes this dialectic is dominated by one or more horizonal attractor basins that simultaneously bring focal activity into their sphere of influence.

The effect of such influence would be to color, orient and shape that focal activity from a number of different vectored directions. At other times, the activity of the focal attractor basin dominates and selects the horizonal attractor basin or basins that it wishes to interact with, be colored by, be oriented by, and so on.

In both cases, however (that is, irrespective of whether the activity of the focal attractor plays an active/shaping role or passive/malleable role), the activity of the focal attractor basin has the capacity, within certain limits, to fine-tune the way it is engaged by, or engages, the different horizonal attractor basins. In other words, the activity of the focal attractor basin has the capacity, within certain limits, to make adjustments in the manner in which it is being modulated by the different attractor basins. Moreover, the activity of the focal attractor basin has the capacity, within certain limits, to make adjustments in: (a) the manner in which it is oriented toward horizonal attractor basis; as well as (b) the extent to which it wishes to open itself up to the influence of a given horizonal attractor basin.

In the light of the foregoing comments, one way to construe brain activity is in terms of the way such activity helps generate a variety of horizonal attractor basins of varying biological rhythms. These biologically dominated horizonal attractor basins are capable of shaping and modulating behavioral currents involving motivations, emotions, sensations, dreams and so on. Indeed, early in life, innate biological horizonal attractor basins dominate focal activity and form the primary components of the horizon of focus.

As the individual develops, the activity of the focal attractor basin begins to take on an increasingly active role across a wide range of issues and situations. As a result, the hermeneutical operator begins to pick up steam and generate a variety of hermeneutical themes, attractor basins, and so on, that might become increasingly independent of, though not necessarily entirely unrelated to, purely biologically driven attractor basins. These hermeneutical attractor basins also become part of the horizon.

Consequently, part of the maturational process shows a change in the ratio of purely biological rhythms to hermeneutical rhythms. This change in the ratio of hermeneutical to biological rhythms might be reflected, to some extent, in various stages of development.

At this juncture, a useful exercise might be to pursue a discussion concerning some of the differences, with respect to developmental issues, that exist between the perspective being advanced in the present dissertation and some of the views of Jean Piaget who has had a considerable impact on certain aspects of educational theory. Hopefully, such an exercise will help to develop, somewhat, different facets of the position being advocated in this article, as well as lay down a foundation for the sections following this one.

The following discussion is not intended to be exhaustive. It is intended to be illustrative of some of the differences in perspective that exist between Piaget and myself.

Piaget believed the intelligence of an organism is rooted in a set of structures that had the potential capacity for unfolding or developing under appropriate circumstances of interaction between the organism and the environment. However, he did not believe the organism was merely a passive entity in this developmental process. He maintained, instead, that development was a complex activity involving a tension between assimilation and accommodation as the organism sought to restore equilibrium

Piaget collectively referred to the developmental dialectic outlined above by means of the term action. Action encompasses all the variations on one, fundamental theme - namely, the way in which the organism both restructures and is restructured by its interaction with the environment.

Piaget considers action to be inherently intelligent activity. Piaget also maintains, however, that action is inherently stage-governed. This latter characteristic means action gives expression to intelligent activity with qualitatively different operational or structural characteristics at various points of development.

Moreover, for Piaget, the idea of stage incorporates a sequential element in which some stages precede other stages in a fixed, biologically given order of development. Thus, according to Piaget, stage 3 operations will not begin to establish themselves until stage 2 operations have been mastered. Similarly, stage 2 operations will not begin to emerge in any consistent, pervasive sense until stage 1 operations have been established.

During the sensorimotor stage of operations, the child physically interacts with the world through various parts of the body, such as mouth, hands, eyes, ears and so on. This interaction results in a series of schemata being formed that constitute, in a sense, action mappings linking the child with his or her world.

These schemata become progressively more sophisticated and integrated with the passage of time. Out of these mappings emerge the child's initial conceptions of space, time, objects, causality and so on.

The next stage of development is referred to as the concrete stage of operations. During this stage, the individual gradually acquires an understanding of certain principles of conservation and operational reversibility. During this stage there is also a further consolidating and expanding of various themes that had been introduced in the sensorimotor stage.

Moreover, although the individual's action is still very much focused on concrete, physical aspects of interaction with the environment, there is an emerging theme of interiorization of action. In other words, objects are mentally operated on, not just physically operated on. Acquisition of, and utilization of, the idea of operational reversibility, for example, is one expression of the increasing tendency toward the interiorization of action.

The final stage of development, known as the formal stage of operations gives expression to the transition from a largely concrete mode of interacting with the environment to a largely formal or symbolic way of dealing with the environment. This stage of development also marks the continuation of the trend toward the interiorization of action that began to play a substantial role during the concrete stage of operations. In the formal stage, the individual becomes increasingly able (a) to operate on symbolic and/or linguistic representations of the physical world, as well as (b) to pose purely hypothetical if-then, questions in an attempt to grasp the structural character of the world.

Piaget stipulates, however, that one cannot bifurcate these various stages into isolated, independent units. There is a certain amount of overlap from one stage to another. As a result, harbingers of themes assuming more focal prominence in later stages will make appearances in earlier stages.

Thus, for example, one sees remnants of the formal stage of operations in the emergence of various aspects of language functioning during late sensorimotor/early concrete operational stages. Or, one sees the introduction of operational reversibility during the concrete operational stage, despite the fact that operational reversibility does not reach its full potential until the formal stage of operations is in full bloom.

According to Piaget, there is a further theme of development running parallel to the intellectual side of action. This further theme concerns the issue of egocentrism. Egocentrism refers to the way, and extent to which, the individual tends to see, feel and understand things strictly from his or her own perspective.

However, Piaget indicates egocentrism is not a matter of selfishness. He attributes it, instead, to the individual's assumption that everyone else sees, feels and understands things pretty much in the same way as he or she does.

Piaget believes this assumption is rooted in the individual's inability to differentiate self from environment. However, as the individual begins to grasp (and apply) the structural character of reversible operations in (to) a wider and wider variety of contexts, the influence of egocentrism gradually diminishes until it reaches its lowest point in the formal stage of operations.

There are three major trends in Piaget's stage theory of development. One trend concerns the aforementioned tendency away from egocentrism as one proceeds through the various operational stages. A second trend involves the manner in which there is an increase of interiorization of action schemata over time, as one moves from purely surface, immediate physical modes of interacting with the world, to interiorized modes of interacting with the world. These latter modes take the form of various kinds of mental schemata. Mental schemata place distance or buffers between the individual and his or her environment. Finally, there is a trend that moves from reliance on overt, concrete activity to a reliance on formal, symbolic operational activity when interacting with the world, both social and physical.

All three of the thematic trends outlined above need to be examined critically. For instance, one might disagree with Piaget's contention that there is a tendency toward increasing interiorization of action schemata. One might just as easily argue such interiorization is present from day one and that the generation of action schemata of whatever stage presupposes such a capability.

In fact, if one does not make the foregoing sort of assumption concerning the presence of interiorized, mental activity from the very beginning, one is faced with a problem. One must provide an account of how purely physical/biological action schemata become transformed into interiorized phenomenological schemata.

Either one has this capacity from the very beginning, or one has to explain its emergence as a function of processes that do not seem capable of accounting for its emergence or its existence. This is a problem Piaget never adequately resolves in any clear-cut fashion.

A second trend of development in Piaget's perspective, concerning the alleged movement away from egocentrism as one increasingly comes under the influence of formal stage operations, also seems rather argumentative. For example, all through the history of ideas, as well as in the midst of everyday life, one repeatedly comes across cases of people who appear to be operating at extremely sophisticated levels of formal operations, yet, these people either: (a) cannot comprehend why everyone doesn't see things the way they do, or (b) insist everyone must accept their point of view as being the only correct way of thinking about a particular issue.

Both (a) and (b) seem to be obvious expressions of, or variations on, the egocentric theme. Consequently, the fact that an individual is thoroughly entrenched in the formal stage of operations does not necessarily serve as a guarantee that such an individual won't also manifest considerable egocentric behavior. Indeed, egocentric tendencies tend to be imbued with emotional and motivational currents that often prove intractable to rational efforts to transform or constrain them.

One could take exception, as well, with a third trend of development emphasized by Piaget. In this third trend there is, supposedly, a progressive move away from the immediacy of physical operations on the objects of experience, and toward a more symbolic mode of operations with respect to the objects of experience.

From the perspective of the present article, the core feature of thinking is rooted in the hermeneutical operator (which gives expression to the dialectic of: reflexive awareness, identifying reference, characterization, interrogative imperative, inferential mapping, and congruence functions). This operator is present in thinking from the very beginning of post-uterine existence (and, quite possibly, much earlier than this). It is responsible for the generating, shaping, transforming, and organizing of the structural character of the individual's understanding of various aspects of the phenomenology of the experiential field.

All components of the hermeneutical operator are present from the beginning of life outside the womb (and, perhaps, even in the womb). Nonetheless, the passage of time is required for the individual to develop facility with the use and application of that operator system.

As a result, in the beginning, identifying reference might be vague, rather than refined. Reflexive awareness might be sporadic and fleeting. Characterization might be distorted, rather than accurate.

In addition, certain kinds of questions might not be asked, or the wrong kinds of questions might be asked, or questions might be asked that are in the service of self-interest rather than a desire to understand. Furthermore, inferential mappings might be more a matter of imaginative projections or speculations, rather than a matter of entailment. Finally, congruence functions might be limited to localized, narrow, analog reflections rather than be allowed to develop, and be extended to, latticework analog relationships.

In any event, formal, symbolic operations of the sort Piaget has in mind constitute only one mode of utilizing or approaching the hermeneutical operator. Indeed, there are an indefinite number of possibilities for combining different components of the hermeneutical operator to generate a latticework of phase relationships intended to reflect, in analog form, different aspects of the structural character of various facets of reality on different levels of scale.

Mathematical/logical systems of symbolic operations are extremely limited in the sorts of problems with which they are capable of dealing. Morality, religion, art, meaning, mysticism, historiography, purpose, interpretation, and so on, all appear to fall beyond the horizons of Piaget's brand of formal operations.

Piaget also speaks of three different kinds of fallacy that are manifest in the thinking of children in the first stage of operations. He calls these fallacies: realism, artificialism and animism.

The fallacy of realism comes in three varieties. One form of this fallacy is when the child confuses a mental state, such as a thought or dream, with the thing for which the mental state is a representation.

A second form of the fallacy of realism is manifested when there is confusion in the child between internal and external. For example, children go through a stage when they think that a dream is external to themselves. Only later do they believe the dream comes from within them.

The third form of realism fallacy is when the child attributes substantive reality to a thought or dream. In other words, rather than maintain that thoughts and dreams are insubstantial in nature, they suppose thoughts and dreams are made of some sort of substantive material or substance.

There are several considerations that emerge when reflecting on the foregoing fallacy of realism. First of all, one might argue that many scientists and mathematicians are guilty of the version of the fallacy of realism in which there is confusion between the individual's idea of something and the thing that is being represented through that idea.

The model is not the thing (or event, process, state, condition, etc.) being modeled. Yet, one often hears from scientists and mathematicians that if the model has a certain property, then, reality also must have such a property.

As far as the second fallacy of realism is concerned, one needs to raise the following question. Where, in fact, do dreams occur?

Of course, the prevailing, generally accepted position on this issue is to contend dreams occur in the head and are a function of neurobiological activity. However, there is absolutely no evidence demonstrating this to be the case.

In fact, whatever data exists with respect to this point could be interpreted in a variety of ways. To be sure, there is a strong correlation between dream activity and certain neurophysiological states, but there is nothing to indicate the neurophysiological states are the cause of the dreams, rather than vice versa, or rather than both being caused by some further factor not yet understood.

Finally, the third fallacy of realism concerns the way a child mistakenly, according to Piaget, attributes some sort of substantive reality to dreams when, according to the prevalent belief system of modern civilization, dreams are insubstantial in character. As was true in connection with the second fallacy of realism, Piaget's biases are clearly in evidence in the third fallacy of realism.

Many cultures (that of the Oglala Sioux Indians being one that comes readily to mind) believe dreams have a substantive reality that extends beyond the individual's experience of that dream. Only because of his scientific prejudices, could Piaget attempt to maintain that the insubstantial nature of dreams is beyond question and that anyone who thinks otherwise is committing a fallacy.

The fallacy of artificialism refers to the tendency of children in a certain stage of development to maintain that everything in existence is an artifact that has been made for a specific purpose. Thus, nature is invested with purposeful activity in which all things are inclined to seek out some goal or purpose.

The idea something could happen just as a result of random occurrences or as the result of purely mechanical cause and effect sorts of events does not seem to enter the mind of children who commit the "fallacy" of artificialism. Moreover, this sort of fallacy involves a confusion between physical events and moral events such that the former are often seen as serving, or giving expression to, some underlying moral purpose.

Again, Piaget might be letting his own biases influence him in his interpretation of things. Although the child's understanding of the precise manner in which everything is purposeful might not be correct, the principle that purpose (as is reflected in the teachings of, say, most religions and mysticisms) is central to the character of the universe cannot be rejected out of hand as Piaget seems to be doing.

Randomness is not a fact. It is an interpretation of events.

Furthermore, to assume certain events can be reduced to a purely mechanical and/or biological set of forces, is, again, to impose an interpretation onto those events. Piaget is presuming that the child's account of things is very primitive and unsophisticated, when, in point of fact, it might very well not be mistaken - at least, in principle, although the details of the child's interpretation of that principle might be erroneous.

According to Piaget, the newborn infant begins life with a set of reflexes (such as crying, sucking, swallowing and so on) which are, within certain limits, capable of adapting themselves to current circumstances. Piaget uses the term accommodation to refer to this capacity for, and process of, modifying biological or psychological structures in order to adjust to a situation.

Assimilation, on the other hand, is Piaget's term for referring to those manifestations of an organism's action schemata that operate on some aspect of the environment or the phenomenology of the experiential field. These schemata are employed in order to modify aspects of the environment for the organism's own purposes, ends or goals.

For example, initially, the sucking reflex accommodates itself to the situation presented to it, namely the mother's breast. Within a short time, however, the infant introduces a number of variations on the initial sucking theme.

These new variations are the result of the infant's operations on, and modifications of, the sucking reflex. Such constructed variations on any biologically given issue are instances of assimilation in action.

According to Piaget, an action schemata -- in this case, the sucking scheme -- is not a matter of any particular instance of sucking activity. An action schemata encompasses the stable elements that persist across a wide variety of sucking activities. In a sense, these stable elements define or characterize, the fundamental components that all sucking activities have in common, their individual differences notwithstanding.

The next step up the developmental ladder occurs when primary circular reactions begin to emerge. These represent systematic co--ordinations of different action schemata or behavioral patterns into a unified whole.

At first, of course, the co-ordinations are very rough. Subsequently, however, they become refined and the integration of action patterns is mastered by the individual.

Primary circular reactions are supplemented by secondary circular reactions. In this latter kind of activity, the infant begins to use (although not necessarily in any self-conscious or intentionally purposeful way) the structures generated through primary circular reactions. These structures are used to probe various aspects of the environment.

Over time, the results and consequences of such probing activity begin to register with the child. Thus, secondary circular reactions build up a sort of action-schemata-network that is made up of: (a) primary circular reactions, (b) the use of circular reactions as probes in relation to experience, and (c) a gradual awareness of the results ensuing from such probing.

Tertiary circular reactions tend to arise in contexts in which the individual is exploring aspects of experience that are not easily assimilable, if at all, to already established action schemata that usually deal with, or handle, similar situations. For example, activity of the individual that is directed toward finding a way of resolving problems involving existing action-schemata tend to be subsumed under the heading of tertiary circular reactions.

Eventually, toward the end of the child's second year of life, the child will show signs of employing tertiary circular reactions that do not depend on a preliminary period of trial and error as a prelude to solving a problem. In these instances, a solution to a problem appears to emerge from the performance of purely mental operations, without any mediating physical activity.

Consequently, by the end of the sensorimotor period or stage of development, the child has begun to exhibit the essential feature of operational thinking. This essential feature is the capacity to manipulate and modify action schemata without necessarily having to resort to overt, physical activity.

The emergence of operational thinking in the child, according to Piaget, marks a major transition in the character of the way the child engages experience. On the one hand, the child is no longer restricted to thinking about events strictly in terms of what has been observed to be the case with respect to such events.

The child can begin to think about objects and events in terms of their potential for being other than they have been observed to be. In other words, the potential for manipulating and modifying a situation (through the intervention of the child's mentally operating on that situation and, thereby, conceptually constructing something different than what had been the case) assumes increasing importance in the thinking of the child.

A second facet of the transition in thinking brought about by operational activity is the child's growing capacity to think about the world in an integrated, unified and connected way. Piaget believes that prior to operational thinking, the child treats experience as a sort of loosely connected sum of events.

After operational thinking makes its appearance, however, the child develops a set of concepts involving object permanence, space, time, causality, and so on. These new concepts form the basis of the individual's understanding of, and interaction with, the world.

One of the formative influences on Piaget's thinking was Jules Henri Poincare. Among other things, Poincare held that the idea of space was an innate part of human thinking. Moreover, he believed our innate sense of space exhibited the properties of a mathematical group.

Piaget assimilated Poincare's approach to space to his own way of thinking about things. Thus, rather than treating space as an a priori concept, as Poincare had, Piaget maintained that the individual's concept of space was a construct that was the integrated result of a whole series of physical and interiorized activities involving the child's interaction with the surrounding environment.

Piaget not only modified Poincare's position concerning the a priori nature of space, he was interested in extending his idea concerning the individual's construction of reality to a whole set of basic concepts previously considered to have a priori origins. In other words, Piaget's proposal, if accepted, would overturn Kant's position concerning, in addition to the idea of space, the a priori nature of concepts such as time, causality, and so on.

Piaget referred to these constructed concepts as practical groups. In fact, one of his ways of determining if an individual had attained a given concept is whether or not one could show that the individual's manipulation of a given concept was isomorphic with a group representation of that same concept.

Most of Piaget's research concerns: (a) an account of the emergence (around the age of 7-8 years) of concrete operational thinking in the child, together with (b) an account of how such thinking is different from pre-operational thinking activity. Essentially, for Piaget, the attainment of the stage of concrete operational thinking is marked by a consistent (as opposed to sporadic) capacity to exhibit certain kinds of operational activities while physically and mentally manipulating various aspects of reality. Among these operations, Piaget gives special attention to the properties of identity, reversibility and compensation.

Identity refers to the way in which the quantitative character of some substance remains exactly the same despite superficial changes of appearance undergone by that substance as the result of some sort of manipulation. Thus, when a certain quantity of liquid is poured from a short, fat beaker to a tall, thin beaker, the quantities' identity remains the same despite the apparent differences in appearance of the two beakers.

Reversibility concerns instances in which a process can be reversed without changing the basic identity of that which is being subjected to the reversal process. For example, if one pours from beaker A into beaker B, and, then, one pours from beaker B back into beaker A, this is an instance of reversibility since the basic quantitative character of the liquid has not changed.

Finally, compensation is an operation involving two or more actions that have the effect of canceling one another, or compensating for one another. If, for instance, one pours a liquid from a wide, but not very tall, beaker into a tall, but not very wide, beaker, the effect of the height of the second beaker compensates for, or cancels out the effect of, the width of the first beaker. If one is able to grasp the character of this relationship, then, according to Piaget, one has performed -- either physically or mentally, the operation of compensation

Essentially, Piaget's concept of thinking consists of a set of transformations or operations. This set of operations is applied to a certain aspect of on-going experience in order to bring about a modification of some sort.

Piaget maintains one's knowledge of a given situation or aspect of on-going experience is a function of the kinds of transformations that one applies to that situation or aspect of experience. In other words, if one understands the structural character of the series of transformations responsible for shaping a given experiential state, then, one knows the nature of that state. Consequently, for Piaget, having an understanding of the transformational history of the genesis of a given structure is the key to acquiring knowledge of that structure.

When one speaks of the construction of reality, as Piaget frequently does, this does not necessarily mean one generates the character of reality or that one is transforming reality. There are two broad possibilities here.

In one case, the individual does, literally, construct or invent 'reality' since the structural character of his/her construction is a deviation from, or distortion of, the nature of reality. As a result, the individual has imposed something alien onto reality.

The other kind of construction process, however, does not involve inventing, in any distortive or deviant sense. On the other hand, this sort of construction process might involve the development of some form of analog stand-in for the original aspect of reality that is being represented by the construction.

In this latter sense of construction, the individual is working toward developing a set of congruence functions. Ideally, these congruence functions will generate structures of understanding capable of accurately reflecting the structural character with respect to some aspect of reality and to which identifying reference is being made through means of the construction. In this sense of construction, the individual is taking reality as the set of blueprint guidelines that is to become the basis for constructing his/her own analog model of those ontological blueprints.

Although both senses of construction seem to be implicit in Piaget, the distinction is not always clear cut. Often times, one gets the impression his use of the idea of 'constructing reality' is as if reality were being invented anew. As a result, one tends to lose sight of the way in which reality can be mirror imaged in the form of an analog or representational model through which the individual actually grasps, on some level of scale, the structural character of a certain aspect of reality.

Central to Piaget's notion of intellectual development is the individual's active engagement of, and operating on, different aspects of the 'world'. A second key factor in Piaget's conception of intellectual development revolves around the capacity to coordinate such activity into patterns or schemata or action structures.

However, Piaget does not account for the origins of this capacity to coordinate. Furthermore, Piaget fails to account for how the individual is able to progress from one kind of coordinating activity at a given stage of intellectual development, to another, qualitatively different kind of coordinating activity at some other stage of intellectual development.

Piaget does speak of a "tertium quid" process that is claimed to be an expression of: genesis without structure and structure without genesis. Unfortunately, this process remains something of a black box mechanism since its inner workings remain elusive throughout Piaget's writings.

From the perspective of the present article, a given stage of development consists in a preoccupation with, or dominance by, one or more attractor basins. Some of these attractor basins might be indigenous to biological givens. Other such attractor basins might be generated as a function of the way the individual engages, and is engaged by, a variety of cultural and social themes. In both cases, the attractor basins shape, color, orient, and help organize focal activity and its accompanying hermeneutical operator.

The transition to a new stage of development is characterized by the spontaneous or induced emergence of a new category of attractor basin(s) that begins to replace the sphere of influence of the previously established basin(s). However, one need not suppose this transition occurs because of any innate sequence of stages that unfold over time. Or, if there are such innate, sequential influences, they might not always play a dominant role, or they might be capable of being modulated by other non-sequence oriented systems.

From the very beginning there might be a spectrum of ratios of constraints and degrees of freedom for focal activity to select from, as well as by which to be influenced. However, from a point of view of information processing, theory building, issues of simplicity, perceived priority of needs, and so on, certain ratios might come to form the germ of attractor basins more readily than do other ratios of constraints and degrees of freedom during the early stages of development.

Thus, for example, one might expect that - on the basis of both priority of needs, as well as ease of access and manipulation -

sensorimotor interests and inclinations might precede either concrete or formal operations, even though the capacity for, and inclinations toward, both of the latter sort of operations already are present in the infant. Using similar reasoning, one might suppose that an individual's concrete interests and inclinations would tend to precede or marginalize the individual's tendencies toward formal operations, until sufficient experiences of a formal kind had been acquired, processed, and used.

If so, then, stockpiling of experiences, processing time, and level of difficulty or ease of access with respect to various kinds of operational thinking might be the dominant themes in determining the sequence in which cognitive stages of thinking are encountered. Biological maturation also, of course, plays a role here, but not necessarily in the sense that the sequence of cognitive stages are inherently pre-established in the way that Piaget argues is the case.

In addition, once under the sphere of influence of a given biological and/or hermeneutical attractor basin, the individual gets use to seeing, understanding and being oriented to things in particular ways. Thus, there is a sort of inertial property associated with such attractor systems.

Over time, the individual builds up a backlog of experience with, and sophistication in developing and using, properties and features such as information processing, hermeneutical dialectics, conceptual models, and so on. As a result of building up a backlog of experience, the individual has an opportunity to explore some of the other ratios of constraints and degrees of freedom that are available to the individual. As these other ratios are explored, tried out, constructed, refined and so on, they form the germs of new attractor basins.

By and large, however, these later emerging, attractor basins often are over-shadowed by already existing attractor basins that have associated with them a hefty amount of inertia. Therefore, for a period of time, sensorimotor activity tends to dominate both concrete and formal operations - though there are traces of the latter two sort of operational activity which continue to emerge, just as, for a time, concrete operational activity tends to dominate formal operational activity, although, nonetheless, there are episodic instances of formal operational activity manifesting itself despite concrete operational domination.

On the other hand, the new attractor basins often have the advantage of improving the quality of the individual's dialectical interaction with the environment. This is accomplished through extending and deepening the individual's range of competent interaction with the environment, as well as by providing a series of strategies providing better, faster as well as more satisfying ways of approaching and resolving a whole host of issues and problems.

Consequently, the old and new attractors compete, in a sense, for the attention of focal activity. The gradual process of transition from one stage to another reflects this competition.

In addition, the process of transition reflects the changing character of the way focal activity orients itself toward, as well as permits itself to be influenced by, different attractor basins. This changing nature in the qualitative character of focal engagement activity might be as much a function of having the time to sift through incoming data and information, as well as the time to develop models and strategies for handling such data, as it reflects motivational, emotional, and intellectual inclinations that are inherent in the individual.

Ideally, the attractor basins that are most efficient, most heuristically valuable, and most far-reaching in their capacities to solve problems or deal with the world in an effective manner would come to dominance. However, the inertia of already existing attractor systems must be overcome in the process, and this does not always occur, for any number of reasons.

Thus, the developmental history of an individual will reflect the manner in which the dialectic involving biological givens, the hermeneutical operator, and cultural/social vectors is given expression. Some of the themes of such dialectic will be shared universally by all people. Some of the themes of the aforementioned dialectic will be shared by the members of a given culture or community. On the other hand, some of the themes of the dialectic will be unique to a given individual.

In short, the point of view taken in this article argues that the hermeneutical operator is at the heart of many kinds of intellectual activity on many different levels of scale. Moreover, such an operator is present from the very beginning of life - although experience, language, education and various kinds of intellectual/emotional challenge are required to act as catalytic agents to permit the operator to generate structures of differential character, over time, through the operator's dialectic with various facets of ontology. Finally, the apparent stages of intellectual development might be as much a reflection of the problems surrounding the processing of information and the purely procedural or methodological need to grasp some steps before others, as it is a reflection of biologically indigenous features in the character of intellectual development.

According to Piaget, neither biological nor environmental factors, in and of themselves, can lead to the emergence of the formal stage of operations. What is required, in addition, is for thought to reflexively operate on itself. When this occurs, the individual sets in motion a process that works toward a final, stable equilibrium.

This sort of equilibrium is final for Piaget because he believes formal operations constitute the highest and most powerful kind of thinking that is available to the individual. Moreover, this stage, once it is acquired, is fully in equilibrium since, according to Piaget, whenever any event serves to disturb such a system, then, spontaneous, compensating, operational activity is set in motion in order to resolve the problems generated by the disturbance.

One of the problems with Piaget's conception of the formal stage of operational thinking is his assumption that it constitutes the final and highest form of equilibrium that is possible for human beings. Carl Jung, to name but one individual, was of the opinion that during the second half of life there was a crisis faced by the individual in which there was a major need to integrate the shadow aspect into one's personality.

This crisis manifests itself as a fundamental disturbance of equilibrium. Moreover, the crisis required the individual to seek solutions through the process of individuation. This does not easily fit in, if it does at all, with Piaget's belief that the logical-mathematical operational mode of thinking constitutes the final word in the equilibration process.

Furthermore, virtually every mystical tradition points in the direction of an essential disequilibrium that distorts all understanding and thinking. Such a state of imbalance will persist until it is resolved through the development of supra-rational capabilities involving insight, intuition, patience, compassion, forbearance, trust, sincerity, gratitude and, most importantly, love.

According to the mystics, true equilibrium is only achieved when these other modes of operational activity are fully developed. Although discursive thinking of a logical sort does have a role to play in all of this, it is hardly the dominant, or the central, consideration.

Finally, once again, one needs to raise the fact there are purely rational modes of operational activity that are every bit as important as are formal logical/mathematical modes of operational thinking but that cannot be reduced to these latter forms of thinking. Hermeneutical thinking, for instance, neither needs to conform to, nor does it need to reflect, systems of formal logic or mathematics.

It can have a structural character that is quite different from these latter systems of thinking, yet, such non-formal thinking cannot be said to be, in any way, inferior to formal mathematical-logical thinking. In fact, non-formal modes of thinking are capable of engaging a whole variety of moral, religious, political, artistic, historical, legal, philosophical, literary, and interpersonal issues, while still producing heuristically valuable results. However, formal logic and mathematics haven't been able to make the slightest, plausible dent in such issues.

Piaget does emphasize that all levels of operational thinking exhibit the property of being able to manipulate mental structures in a purely mental manner, without any sort of physical activity serving as intermediary. Moreover, part of such mental manipulation involves the capacity to think in terms of the possibility and potential inherent in some given structure, rather than being restricted only to what has been observed.

Nonetheless, Piaget maintains that the primary means of exploring and exploiting such possibility and potential is through the hypothetical-deductive method as expressed in terms of systems of formal logic and mathematics. Very little, if any, credence is given to the possibility there might be equally viable, if not more productive, alternative means of exploring and exploiting the possibilities encompassed by various ontological and experiential structures.

Piaget draws a distinction between wisdom and knowledge. According to Piaget, wisdom refers to that which results when there is a dialectic between personal values and objective knowledge. Such results are thought of by him as largely philosophical in nature. Knowledge, on the other hand, presupposes determinate criteria of truth and rigorous standards of methodology. The end result of the combined effect of these criteria of truth and standards of methodology is science.

Piaget's characterization of wisdom is rather arbitrary, if not biased. Traditionally, wisdom has meant having a certain orientation to the truth - namely, one that permitted the individual to be able to successfully apply the truth to the problems of everyday life.

Wisdom was not just a matter of having a certain kind of understanding, it also was the ability to implement that understanding in ways that had great heuristic value in resolving moral, political, philosophical and interpersonal difficulties. As such, wisdom is not just a matter of the combining of personal values with objective knowledge. It represents the penetration of insight into the very soul of knowledge and the drawing of practical value from that insight.

According to Francois Jacob, a biologist, organisms generate a biological, space-time analog of reality. The structural character of this analog will depend on a variety of factors such as: the way in which an organism is sensorially hooked into the environment, as well as the manner in which such information is processed, transformed, organized, shaped, stored, oriented, and so on, once the sensory data has gone through the initial process of transduction.

Depending on the species and the circumstances, and, depending on what sort of sensory modalities an organism has available to it, an organism might generate a variety of spatial analogs of external reality. Thus, for example, one can speak in terms of acoustic space and aromatic space, as well as visual space or proprioceptive space.

Furthermore, temporal cues often shape the structural character and orientation of such spaces. For example, in the superior olivary complex, fairly subtle comparisons are made concerning time differentials for a given sound reaching each ear. These temporal differences are used to help construct acoustic space.

Each kind of sensory process will give expression to a characteristic ratio of temporal and spatial vectored currents. All of these currents are woven together to produce a complex analog representation of external reality.

Acoustic space, visual space, proprioceptive space, and so on, are fundamental currents that shape and orient an organism's mode of analogically representing various aspects of reality. However, in human beings, one cannot reduce reality to a set of sensory analogs. In fact, sensory analogs become incorporated into even more complex hermeneutical analogs of reality.

Hermeneutical analogs are representations emphasizing various modes of valuation, signification, purposefulness, meaning, interpretation and understanding. Each mode of conceptualizing, understanding, theorizing or methodology gives expression to a characteristic ratio of hermeneutical constraints and degrees of freedom that feature, but are not reducible to being functions of, a variety of sensory modalities.

The spatial-temporal structures derived from sensory modalities constitute an important source of both constraints and degrees of freedom for the generation and construction of hermeneutical analogs. They are a source of constraints in as much as one has to be able to reconcile various aspects of one's hermeneutical analog with the structural character of various spatial-temporal analogs.

If one cannot produce such a re-conciliation on some level of scale, then, one has to begin questioning the tenability of either the sensory analog or the hermeneutical analog or both. On the other hand, the spatial-temporal analogs constitute a source of degrees of freedom since they are starting points for exploration, inquiry, experimentation, analysis, reflection and so on.

One of the most fundamental vectors shaping temporal identity is memory. Psychologists have distinguished two broad categories of memory: namely, short-term and long-term memory.

In human beings, short term memory last for about 10-15 seconds. In other species, short-term memory can cover a longer time period. For instance, the fruit fly has a short term memory of approximately 45 minutes, and the bee has a short-term memory of about five minutes.

In each of these cases, if what is stored in short-term memory is not converted into a long-term memory format, then, the data is lost to the organism. Moreover, short-term memory is quite vulnerable to various kinds of interference, and such interference disrupts the contents of short-term memory so that they are either permanently lost or they become garbled.

Just as there is a temporal set of constraints that characterize short-term memory, there also is a sort of quantitative constraint on the amount of data that can be stored in short-term memory. This is George Miller's magic number of 7 plus or minus 2.

In other words, approximately seven units of information -- give or take a few such units -- can be stored in the temporary buffer constituting short-term memory. However, depending on the meaningfulness of what is being stored in short-term memory, and depending on the kind of mnemonic strategy one employs, a unit of information can vary, to some extent, with respect to its size.

One other facet of short-term memory has a significance that is relevant to the discussion of temporal issues. This aspect concerns the way in which short-term memory retains the temporal character of the sequence in which events transpire.

Although there is considerable debate in the psychological literature, the currently prevailing view suggests there are three kinds of long-term memory. These categories of long-term memory are referred to as: semantic, episodic and procedural.

Semantic memory appears to be somewhat time-independent in the sense that it is concerned largely, if not exclusively, with the sort of data that gives expression to facts relating to numbers, mathematical expressions, formulas, addresses, laws, rules, dates, and so on.

Moreover, semantic memory often has a symbolic form that can be divorced from temporal contingencies.

Episodic memory is quite different from semantic memory in this latter respect. In episodic memory, temporal relationships play an important role. The contents of this kind of long-term memory revolve around biographical events that occur in the life of the individual. What one did, where one did it, when one did it, who one did it with, what was done to one, and so on are all instances of the kind of material stored in episodic memory.

Episodic material plays a fundamental role in the individual's development of a sense of temporal identity. As the evidence concerning patients who suffer from -- for example, retrograde amnesia -- indicates, the loss of episodic memory tremendously alters the way the individual interacts with the surrounding environment.

In addition, there can be tremendous flexibility, from individual to individual, surrounding the formation of this aspect of temporal identity. Each individual generates and establishes his or her own set of phase relationships with a given event or episode. Therefore, even though one-and-the-same event might be engaged by two, or more, individuals, the arrangement, number, shape, orientation and so on, of the set of phase relationships formed in each case, can vary greatly.

In a sense, the foregoing considerations are reminiscent of the methodology of Einstein's special theory of relativity. In that theory, observers in different inertial frameworks engage one-and-the-same event, arriving at different values for times, velocities, lengths, mass, and so on, as a result of the variable character of the phase relationships that their respective methodologies generate during the event-engagement process.

Procedural memory revolves about skill learning sorts of issues in which one has to acquire certain steps or procedures in order to gain mastery over a variety of physical, mental or social activities. Driving a car, rules of etiquette, playing a game, learning a new language, and so on, are all examples of skills requiring a substantial amount of procedural memory if they are to be mastered with any degree of competence or expertise.

This category of memory is somewhat like semantic memory in as much as one does not have to remember the context in which one learned a skill in order to have mastery of that skill. All that matters is retaining certain facts or data about how to do something.

On the other hand, there is a sense in which procedural memory is somewhat like episodic memory since the temporal sequence of the steps or procedures is important to retain. If one does not learn the correct sequence of steps for a given technique, if one does not grasp the rhythmic character(s) of a given procedure, if one does not develop the requisite set of phase relationships concerning a given skill , then, one will not be able to acquire either competency or expertise in the performance of the associated procedures, techniques or skills.

Procedural memory might be considered to be a sort of sub-category of semantic memory in which temporal issues assume a certain degree of ascendancy. Procedural memory also might be considered to be a sub-category of episodic memory in which biographical features become largely horizonal, with little focal importance. In either case, there would be two sorts of long-term memory rather than the three categories that are currently favored in many psychological circles.

A further possibility is as follows. There is a sense in which only one kind of long-term memory exists, but it consists of a ratio of time-relevant to time-irrelevant factors. However, because there can be different ratios of these factors, this gives the appearance of different categories of memories under different circumstances.

On the view being put forth here, semantic memory would be characterized by a ratio with a, relatively speaking, low time-relevant component and a high time-irrelevant component. Episodic memory, however, would have a ratio with a high time-relevant component but, relatively speaking, a low time-irrelevant component.

In neither of the above cases can one suppose a given component of the ratio is zero. There always will be a certain number of time-irrelevant themes present in memories that are largely time-dependent, just as there will always be a certain number of time-relevant themes present in memories that are largely time-irrelevant in character.

Finally as previously indicated, procedural memory constitutes a case combining elements of both episodic as well as semantic memory. Therefore, the temporal ratio for procedural memory will exhibit aspects of both time-relevancy as well as time-irrelevancy.

One advantage of conceptualizing things in the foregoing manner is that instead of having to come up with experimental evidence supporting the existence of three mechanisms of memory, one only has to come up with evidence for one mechanism of memory. Moreover, the character of the mechanism one is looking for is, at least in general terms, fairly well specified.

In other words, the mechanism being sought must provide for a set of ratios of constraints and degrees of freedom capable of varying with respect to themes of time-relevancy and time-irrelevancy. Another feature of this mode of conceptualizing things is the way in which it places temporal phase relationships squarely in the picture of all manifestations of memory, whether short-term or long-term.

A further possibility that might follow from the foregoing conceptualization of the structural character of memory has potential implications for educational issues. More specifically, phase relationships become very important to the efficiency with which things are learned and remembered.

For example, one possibility why 'suggestopedia' or super-learning works, when it does work, is because of the emphasis laid -- albeit, perhaps, unconsciously -- on temporal phase relationships as a means of unifying the different components of the learning situation. When everything is in phase, then, memory or learning becomes more efficient both in terms of coding as well as in terms of decoding.

In any event, one might think about the possibility of seeking to improve the efficiency with which learning occurs by trying to alter the character of the time-relevancy to time irrelevancy ratio. This could be done by manipulating the set of phase relationships linking an individual with the learning situation.

Some phase relationships might be more conducive to the fixing of a memory than are other sorts of phase relationship. If so, the former kind of phase relationships will form the currents that will have to be manipulated through amplification, or by suppressing other kinds of phase relationship that might prove to be a source of interference.

People who suffer from Korsakoff's syndrome or from some other cause of anterograde amnesia might represent something of a problem for the theory of structural memory as a ratio of time-relevant to time-irrelevant components introduced earlier. People who suffer from some form of anterograde amnesia would seem to suggest cases in which the aforementioned ratio is zero since short-term memory apparently cannot be converted into either semantic memory or episodic memory.

On the other hand, people who suffer from Korsakoff's syndrome are able to learn certain kinds of new skills such as how to do a puzzle, although they will not remember how they came to learn to do the puzzle. This suggests procedural memory is, to some extent, still intact in such people.

Given that sufferers of Korsakoff's syndrome still have some degree of procedural memory, the existence of such memory capabilities could be seen as being consistent with the aforementioned ratio theory concerning the structural character of memory. In fact, the existence of such memory capabilities in the sufferers of Korsakoff's syndrome would seem to suggest the importance of phase relationships in helping to fix memory.

Procedural memory is required when a task has, relatively speaking, a time-relevant component and a time-irrelevant component that are roughly equivalent. The source of the time-relevant component is the phase relationships that establish the sequence of the steps that are necessary to solve a given puzzle. The source of the time-irrelevant component is the contents of the steps or procedures, taken individually and apart from the role that they play in a set of steps or procedures.

This fixing of a sequence in long-term memory would not have to involve an understanding of the relationship of the sequence of steps to the solution of the puzzle (i.e., a means-ends relationship). Quite possibly, the individual would have no recollection of having solved the puzzle before.

On the other hand, the increased speed with which the puzzle is solved over a number of trials would indicate a learning curve is present. This learning curve would be a function of: (a) the individual's capacity to transfer the phase relationships of short-term memory into long-term, procedural memory, and (b) the individual's capacity to transfer the content of individual steps, apart from their role in a sequence, to long-term, procedural memory.

Procedural memory cannot be reduced to either (a) or (b). Time-relevant components depend on time-irrelevant components for themes of structural content. In other words, specific ratios of time-irrelevant constraints and degrees of freedom establish a set of thematic parameters out of which phase relationships can emerge.

On the other hand, time-irrelevant components are shaped by time-relevant components, since transitions and shifts in phase relationships are established through these latter components. Consequently, in procedural memory both a time-relevant and a time-irrelevant component are needed.

In cases of anterograde amnesia, the ratio of the two components (i.e., time-relevant to time-irrelevant) is the key to being given access to long-term memory. If, in a given learning task, the requirements for the time-relevant component of the ratio are too high, as in the case of episodic memory, then entry into long-term memory will be blocked or inhibited.

Alternatively, if, in a given learning task, the time-irrelevant component is too high, as in the case of semantic memory, then,, again, entry into long-term memory will be blocked or inhibited in the individual who is suffering from anterograde amnesia. In each case, the ratio provides the wrong sort of dialectical arrangement of phase relationships and structural content.

The question, then, becomes this: why are the memories of people suffering from anterograde amnesia still open to certain kinds of time-relevant to time irrelevant ratios, but not to other kinds of such ratios? Certainly, this is a question that has to be answered if one is to work toward having a full theory of the transition process between short-term memory and long-term memory. It is also a question that has to be answered if one is to develop a greater understanding of the problem of anterograde amnesia.

There is a second question that might be closely related to the foregoing question. Do the memory problems displayed by those who suffer from Korsakoff's syndrome have any implications for normal, everyday sorts of difficulties encountered by people when they try to commit something to memory? In other words, maybe the reason why there is often a hit or miss, almost random-like, character to whether we retain something or not has to do with the kind of phase relationships one has with the material that is to be learned.

Some kinds of phase relationship might be more conducive to the retention of material than are other sorts of phase relationship. Something of this sort already has been suggested when mentioning the data that indicated that children who were read a story in the mid-to-late afternoon seem to retain material in long-term memory better than do children who are read stories earlier in the day.

Closely aligned with the issue of whether or not the structural character of a phase relationships plays a central role in fixing something in long-term memory, is another issue. Maybe the ratio of time-relevant components to time-irrelevant components is of critical importance in determining whether or not something will or will not be fixed in memory and, therefore, learned.

The present inability to provide an answer to the foregoing question does not invalidate the ratio theory of the structural character of memory. In fact, if anything, the ratio theory proves to be a heuristically valuable tool since it not only has generated the question, but, as well, it provides an orientation or approach for engaging, exploring or probing such a question in the context of broader issues of memory, learning, structural character, phase relationships and focal/horizonal dialectical interaction.

According to Campbell, logic is essentially atemporal. This sort of perspective reflects a recurring theme in thinking about the nature of logic. From the 'traditional' perspective, logic generally is construed as some sort of universal set of principles that holds in all times and in all places and is, therefore, independent of spatial and temporal considerations.

Perhaps, this traditional perspective should be challenged. More specifically, one might have a fruitful line of exploration, if not explanation, if one were to suppose logic is intimately connected to certain aspects of temporality.

For example, logic could be conceived as a reflection of the structural character of the phase relationships to which a given point-structure, neighborhood, or latticework gives expression. By tracing out, or mapping, the way different aspects of the internal character of a given structure are related to one another, or by tracing out or mapping the way different aspects of various structures interact with one another, or by mapping the way the spectrum of ratios of constraints and degrees of freedom of a given structure dialectically engage the spectrum of ratios of constraints and degrees of freedom of other structures, one comes to grasp the 'logic' of these structures.

One of the reasons why, throughout years of philosophical discussion, the study of logic seems to have promised so much and, yet, failed so miserably, as well as proven, for the most part, to be so heuristically infertile an area of exploration, is because it has been treated as, or construed as, a static, unchanging entity that is atemporal. In point of fact, however, logic might be dynamic, dialectical and very temporal. This is the case since logic gives expression to the manner in which structures relate to themselves or to other structures, as a function of the transitions, shifts, transformations, alterations and so on, occurring in the manner in which spectrums of ratios of constraints and degrees of freedom interact with one another.

While there might be certain constants associated with the dialectical interaction of structures, these constants occur in a context of change, transition, transformation and so on. One cannot understand the structural character of dialectical interaction by looking at only the constants. One also must look at the ratio of constants to parameters of variability.

The story of structural character and phase relationships is told through the way this ratio changes over time. In order to look at the ratio of constants to parameters of variability, one must map the way in which constraints dialectically play off against degrees of freedom in a given set of circumstances. Such mapping gives expression to the logic present in a given dialectical and structural context.

Viewed from the foregoing perspective, logic is not a search for, or study of, universal, static, constant, unchanging relationships among premises, situations and so on. Logic is a search for, or study of, the inferential mappings of the phase relationships manifested through a spectrum of ratios of constraints and degrees of freedom that exist within a given point-structure, neighborhood, latticework or set of latticeworks. Logic is the study of the orientation and vectored/tensored character of the phase relationships linking the themes of constancy and variability in and among, particular structures. Logic becomes a study of the manner in which phase relationships shift during the transitions and transformations brought about by the dialectics of structural engagement.

In addition, part of logic might involve the phenomenon of entrainment. During the entrainment process, certain aspects of a given idea's (or value's or principle's or rule's) spectrum of constraints and degrees of freedom establish a state of phase relationships with certain aspects of other ideas, values, principles, rules, and so on. The entrainment process serves to generate a synchronous set of phase relationships that have a particular orientation. This orientation is what gives expression to the logical character of a relationship.

In fact, the grasping of logical relationships might have something to do with the detection of the structural character of such entrainment processes. In other words, one is able to see how the entrainment process maps out an orientation among a set of phase relationships. By locating the logical counterparts to, or analogs for, a zeitgeber (i.e., time-giver), one is able to trace the phase currents generating hermeneutical orientation.

In a sense, traditional logicians have been seeking to do something akin to what Einstein accomplished in the special theory of relativity. Traditionally, logicians have attempted to identify and preserve universal laws of logic that are manifested during all transactions of thinking.

This is similar to the manner in which Einstein's methodology attempted to identify and preserve certain universal physical laws in relation to transactions involving different inertial frames of reference.

Unfortunately, among other things, logicians have never been able to locate a constant like the speed of light in a vacuum that could anchor their systems as the velocity of light did for Einstein in his special theory of relativity.

William James' spoke of the notion of the specious present, so-called because of the tendency of people to construe the present as a mathematical-like point that has position but no size or quantity or structure. According to James, this sort of characterization is an illusion. It leads people to believe one can neatly separate the present from the past, when, in point of fact, the present overlaps with the past.

Thus, from James' perspective, the present is not a mathematical point. The present is a unit of duration that carries a certain amount of the past with it.

Treating the present as a unit of duration had certain implications for James. If one were to maintain that conscious experience were merely a sequence of autonomous events, there would be no psychological justification for connecting or relating experiences, one to another.

Yet, if the present is a unit of duration combining certain elements of the present as well as the past, then, one could not represent consciousness to be a succession of independent points of sensation, emotion, ideas, images and so on. There are linkages among these experiences because of the way the structure of the present encompasses certain aspects of the past.

Although James did not make use of the phenomenological and hermeneutical idea of the horizon, such a concept fits in quite nicely with his position concerning the treatment of the present as a unit of duration that includes elements of the past. In fact, the idea of the horizon allows one to modify the structural character of James' notion of the present as unit of duration.

More specifically, not only does the present contain elements of the past, it also, in a sense, contains elements of the future. This is due to the way one is hermeneutically oriented toward, and prepared to engage, whatever occurs next.

The present also can be said, in a sense, to contain elements of the future due to the goal-directed strategies or plans that one is in the process of implementing. The following discussion gives a concrete texture to the contention that the present contains, in a sense, elements of the future.

One of the problems that intrigued Karl Lashley was the phenomenon of serial behavior. More specifically, he wanted to know how human beings are able to generate behavior consisting of a rapid sequence of movements.

For example, when a person speaks a language, this involves a coherent, sequential assemblage of different semantic components, syntactical elements, as well as movements of the tongue, mouth, and so on. All of this complex activity occurs very quickly.

Another example is when an individual plays a musical instrument. This usually requires the performing of a rapid series of intricate movements of hands and/or mouth and, sometimes, feet. So, the question that Lashley and others asked was: what makes rapid serial behavior possible?

The prevailing theory of serial behavior, up to the time of Lashley, considered such a process to be an example of a feedback process. According to the feedback hypothesis, once a sequence of behaviors begins, each unit of the sequence induces the next step in the series to occur.

Lashley discovered, however, that in certain cases (e.g., the playing of a piece of piano music) the time interval between steps in the sequence of playing notes was too short to fit in with what would be predicted on the basis of a feedback hypothesis. Lashley concluded some mechanism or process besides a reflex chain would have to be invoked in order to account for serial behavior.

Lashley theorized that a series of actions, probably, formed a unified sequence under the command of some sort of integrated motor control system, the whole of which was set in motion by the first note. Nevertheless, he could not explain how this took place.

The answer to Lashley's unresolved problem was uncovered in the 1980s. More specifically, a system of biochemical oscillators has been discovered that is responsible for regulating rhythmic sequences of movement.

These biochemical oscillators drive an integrated motor system. Such motor systems of oscillators have been found in an extremely varied number of species.

In the terminology of this activity, the aforementioned system of motor oscillators can be construed in terms of the activity of a focal attractor basin working in conjunction with horizonal informational elements of the past and future. Indeed, the structural character of the present is given expression in terms of the phase relationships it has with those elements of the past and the future that are spread along the horizon. The dialectic of focal attractor basins with horizonal attractor basins manifests the property of duration to which James' position alludes, and such duration is what links together the different aspects of serial behavior.

Evoked potentials refer to specific kinds of electrical activity in the brain that arise in response to the presentation of certain stimuli. Evoked potentials can be distinguished from background electrical activity by means of various techniques of analysis involving computers and mathematics.

Different waveforms of evoked potential have been associated with different contexts of stimulation. For example, an evoked potential waveform known as P300 occurs whenever an individual is surprised by one of the events in a sequence of stimuli. Another evoked potential is known as a contingent negative variation or, in less technical terms, the expectancy wave.

As the latter expression suggests, an evoked potential occurs when an individual is led to believe a certain kind of stimulus will occur at a given point in time or at a given point in a series of events. As the time approaches for the stimulus to appear, the contingent negative variation waveform increases in amplitude. The size of the amplitude increase will be a function of various factors in the personality, past history and current circumstances of the individual in whom the expectancy wave potential is being evoked.

An individual's perception of internal time consciousness can be affected by the structural character of the contingent negative variation waveform that is present. Generally speaking, the larger the amplitude of this wave - that is, the greater the individual's expectations concerning the time of occurrence of a given event, then, the more rapidly will run the individual's perception of events in internal time consciousness relative to some external measurement of the temporal duration of such an event. As a result, during the course of some event, the individual will feel external time measurement of the event is running very slowly relative to the individual's perception of the rate at which internal time consciousness measurement of the event is taking place.

The experimental work of Robert Hicks, a psychologist, seems to indicate the appearance of the expectancy wave can be traced to the activity of cells in the frontal lobes of the cerebral cortex. Apparently, these cells either: (a) are responsible for the synthesis and release (when activated by the action potential) of the neurotransmitter dopamine; or, (b) are sensitive to the presence of dopamine (i.e., they have receptor sites on their membranes that are dopamine-specific and that modulate the cells activity when dopamine occupies these sites). Hicks and others have found that the perception of events in internal time consciousness can be affected by giving the individual drugs that either increase the synthesis and release of dopamine or that prevent dopamine from occupying the relevant receptor sites on the membranes of dopamine sensitive cells.

Thus, for example, amphetamines, that lead to increased synthesis and release of dopamine, have the effect of speeding up the perception of events in internal time consciousness relative to some external mode of temporal measurement concerning those events. On the other hand, Haldol, that is a neuroleptic (i.e., a class of drugs used in the treatment of certain psychotic conditions), blocks the action of dopamine through competitive inhibition. As a result, the individual's perception of events, as measured by internal time consciousness, slows down relative to some external mode of temporal measurement with respect to those events.

Jeremy Campbell ties the expectancy wave phenomenon to the biological clock in the frontal lobes of the cerebral cortex. In other words, he believes the cells responsible for generating the sense of the 'passing moment of the present are the cells giving expression to the individual's perception of internal time consciousness. Therefore, according to Campbell, such cells are responsible for the individual's experience of the present as having a certain kind of structural character of duration.

Even if one accepts the proposal that increases or decreases in the levels of dopamine in the receptor sites of the membranes of certain cells in the frontal lobes are associated with the modulation of the individual's perception of internal time consciousness, this does not explain what is responsible for the process that leads to the increase of dopamine production, or to the increase of substances that will block the action or synthesis of dopamine. In other words, the presence or absence of dopamine is only a step in the causal sequence resulting in the modulation of an individual's perception of internal time consciousness.

Dopamine does not initiate this causal sequence. It merely is one of the effects of such an initiation process.

Consequently, in order to say one understands what sets an expectancy wave in motion or why a given expectancy wave has the amplitude it does, one is going to have to fill in quite a few missing facts. Moreover, these facts that are missing are not a matter of insignificant details. They go to the very heart of what is really going on in the case of the emergence of a contingent negative variation waveform of a given structural character.

Equally important, as far as problems with the dopamine hypothesis are concerned, is the following consideration. That theory provides no account of how the individual becomes conscious of the presence of such an evoked potential waveform of given character.

All that has been shown, at best, is there is an association between the presence of such a wave and the character of the individual's perception of internal time consciousness. The existence of the wave and the individual's awareness of the wave might be two separate things.

If one treats consciousness as a separate dimension (rather than an emergent by-product of a certain level of complexity of neuronal activity), then, the phenomenology of the experiential field or the phenomenological manifold can be dialectically linked to the waveforms of evoked potentials by means of phase relationships - both in terms of being shaped by such wave forms, as well as in terms of giving rise to such wave forms. Because both neural activity and the phenomenological manifold share a common bond by virtue of their respective links with the temporal dimension, they have an opportunity to exchange phase quanta during states in which phase relationships are established between these dimensions.

Moreover, phase relationships are established through focal, intentional activity whose structural character is a joint function of physical/material processes (i.e., neural activity) as well as phenomenological awareness and reflexive awareness. Consequently, focal awareness is like a complex vortex or twistor that forms at the intersection of a dialectic involving, among other things, dimensions such as awareness, intelligence, materiality, energy and time.

As such, neural activity can act as an attractor that draws focal activity into its sphere of influence, just as focal activity can serve as an attractor when it draws certain aspects of neural functioning into its sphere of influence. However, in each case, the process of 'drawing into a sphere of influence' occurs on the level of phase relationships and will subsequently be manifested in an appropriate structural form of the dimensional medium to which a given set of phase quanta has been transmitted.

Phase relationships do not occur at a physical, material locus. They occur in the temporal dimension as a function of the ordered, sequential, rhythmic, oscillatory character of the way in that a given structure, taken as a spectrum of ratios of constraints and degrees of freedom, temporally relates to different aspects of itself.

Said in a slightly different way, phase relationships are a matter of the way in which the different ratios of constraints and degrees of freedom of a given spectrum are temporally ordered with respect to one another. The aspect of being 'temporally ordered with respect to one another does not just refer to what comes before and after. It also encompasses the dialectic of these ratios.

As a result, the character of the phase relationships established through this dialectic are capable of shaping the manner in which the ratios will be activated. Indeed, even in the case of a single ratio, the dialectic between the constraints and degrees of freedom of that ratio will generate phase relationships capable of causing the ratio to undergo transitions, thereby altering the manner in which the structure, to which the ratio gives expression, is manifested.

Underlying all of this dialectical and phase relationship activity is the order-field by means of which a variety of dimensional currents are given expression. These dimensional currents are different ways in which the order-field manifests itself in an structural fashion. In other words, each dimension constitutes one of the ways in which an order-field has of giving expression to itself.

Every dimension has a structural character that is, in a sense, prime. In other words, the structural character of the dimension cannot be reduced or factored further to some set of sub-dimensions. Consequently, a dimension cannot be shown to be a function of either another dimension, or some combination of such dimensions. Each dimension brings something unique to dimensional dialectics, and the order-field generates, shapes, organizes and regulates the unique structural currents of different dialectic of dimensions.

Some of the unique structural currents of the temporal dimensions are given expression through phase relationships and phase quanta. Phase relationships and phase quanta, in turn, shape, color, orient and organize the structural character of temporal identity across a variety of levels of scale, ranging from: the biological to the social, and from thinking to awareness and memory.

Chapter 19: Neuroscience and the Mind

Glial Mysteries

A traditional view of the brain's role in cognitive functioning is that the latter is due to the interaction of billions of neurons, as well as being a function of the dynamics transpiring within the trillions of synapses that constitute the interstitial, fluid-filled spaces that ebb and flow among neuronal shores. Surely, the sheer complexity generated by the activity of billions of neurons and trillions of synapses should be able to account for capabilities such as thinking, memory, language, imagination, creativity, genius, awareness, and so on.

One historical figure believed that the secrets of cognition could be induced to reveal themselves if the right sort of scientists were able to study just the right kind of brain … a brain associated with the sort of mental brilliance, insight, understanding, and creativity that manifests itself only very rarely. The name of the foregoing 'cogninaut' is Dr. Thomas Hardy, and the brain he believed held the keys to unlock the mysteries of the mind belonged to Albert Einstein … and, so, Dr. Harvey stole the brain of the recently deceased Einstein.

Dr. Harvey held at least several delusional beliefs in conjunction with the aforementioned "scientific" project. First, he believed – arbitrarily and, probably, quite falsely – that he had the right to abscond with the body part of a deceased human being, and, secondly, he believed – arbitrarily and, probably, quite falsely – that he had the right to decide with whom he would share portions of Einstein's brain.

Scientists – at least some of them -- often seem to think they have the right to tinker with the universe in any way they see fit … another belief that is both arbitrary and, quite probably, false. Instead of looking for the source of Einstein's genius, Dr. Harvey should have been searching for the source of, if not cure for, delusional thinking … 'physician heal thyself'.

For more than forty years, Dr. Harvey parceled out bits and pieces of the great man's brain. Apparently, those who were the recipients of such largesse failed to demonstrate the moral sense to neither ask for, nor accept, such a gift.

Surely, those who were granted access to remnants of Einstein's brain were aware that Einstein had not given Dr. Harvey permission to dispose of the brain of the Nobel Prize winner in any manner Dr. Harvey saw fit. Surely, those researchers knew that – somewhat like Herr Doktor Frankenstein – they were akin to people who might benefit from the grave-robbing inclinations of another human being.

On the other hand, perhaps they didn't know any of the foregoing. Maybe, they just presumed that Dr. Harvey had the requisite permission and authority to do what he did.

Or, perhaps, they were incurious about the whole situation and were simply anxious to get on with their careers and ambitions. Or, maybe they thought impolitic questions might get in the way of being able to be in touch with Einstein in a way that few others had … a unique kind of one degree of separation.

Curiosity seems to have no limits except when it comes to determining the possible boundaries of moral propriety. For all too many scientists, knowledge of every kind is desirable except the sort of knowledge that might inform such dauntless explorers about whether what they are doing is right or wrong.

If people wish to argue that right and wrong are relative issues, then the burden of proof would seem to rest entirely with them. Moreover, if they are unable to prove that such a position is not an arbitrary perspective, then, some variation of the precautionary principle ought to govern the way forward.

In other words, one should be able to show that little, or no, harm will ensue with respect to oneself and/or in relation to others (including the environment) from one's intention to act. If one cannot do this, then, perhaps, one should refrain from proceeding on in circumstances fraught with such arbitrariness, uncertainty, and ignorance.

If Einstein had given his permission to Dr. Harvey and posterity to use his body as they deemed fit for the benefit of science and medicine, this certainly would lessen -- and, possibly, even extinguish -- culpability. However, to the best of my knowledge, such permission was not given, and history unfolded in one way rather than another.

Did any good come from Dr. Harvey's decision? Well, to answer that question, one would have to have a reliable means of deciding upon, calculating, and evaluating the criteria for what constitutes goodness.

Benefitting from something does not necessarily make that from which one benefits an expression of goodness … though it might seem that way to the beneficiary. Presumably, all those who received brain snippets from Dr. Harvey benefitted in one way or another, but whether, or not, there was any demonstrable sort of good that emerged through the research done on Einstein's brain is a more complicated issue.

For example, whatever knowledge is acquired through scientific exploration must be weighed against the "collateral damage" that is done as a result of such a process of acquisition. What is acquired in the way of knowledge must also be weighed against the possible harm that might arise from the application of that knowledge.

Let's take a quick look at one example that is rooted in the case of Einstein's stolen brain. In 1985, an article by Dr. Marian Diamond and colleagues appeared in *Experimental Neurology*, a journal focusing on cutting-edge research in neuroscience. The title of the article was: "On the Brain of a Scientist: Albert Einstein."

The basic idea of the research underlying the journal piece revolved around the hypothesis that Einstein's genius was a function of the interplay of at least three regions of the brain believed to be responsible for (1) association, (2) abstraction, and (3) imagery. Consequently, she and her colleagues requested that Dr. Harvey send them tissue samples located in both the left and right hemispheres (to check if hemispherical dominance in the brain played any role), and, in addition, those samples should include sections from the prefrontal region (abstraction), the inferior parietal region (imagery), and the association cortex.

After receiving the requested samples, Dr. Diamond and her fellow researchers sliced the tissues into ultra-thin segments and dyed the latter to be able to highlight the presence of neurons in order to distinguish them from other facets of the brain tissues that were being studied. The samples from Einstein were then compared with similar tissue specimens (i.e., involving the same three regions of the brain in both hemispheres) from eleven, male, control subjects of variable ages between 47 and 80 (presumably deceased).

Somewhat surprisingly, perhaps, Dr. Diamond and her associates discovered absolutely no differences in any of the samples examined in relation to the character of the neurons found either in Einstein or in the eleven other control subjects. There appeared to be as many neurons in the sliced sections of the control subjects as there were in the samples from Einstein.

Apparently, genius was not a function of the interaction of the neurons in the association cortex, the prefrontal cortex, and the inferior parietal region, nor did hemispherical dominance appear to play any role with respect to genius. Indeed, if genius were a function of such dynamics, one would expect to find significant neuronal differences between the brain of Einstein and the brains of eleven individuals who had not been known to exhibit any signs of genius during their lives, but this was not the case.

The foregoing results notwithstanding, Dr. Martin and her colleagues did find one substantial difference between the brain tissue samples of Einstein and the tissue samples from the individuals serving as experimental controls. More specifically, the researchers discovered that in each of the brain regions studied, there were, on average, nearly twice as many non-neuronal, glial cells in the samples from Einstein as there were in any of the control subjects.

The largest differential in numbers of glial cells involved the inferior parietal cortex in the dominant, right hemisphere. This region (the inferior parietal cortex) of the brain is believed by many neuroscientists to be responsible for visual imagery, complex thought, and abstraction, and, therefore, the possibility emerged that, maybe, genius was a function of glial cells rather than neuronal activity.

There is at least one caveat to keep in mind with respect to the foregoing findings. More specifically, for reasons that are as inexplicable now as they were during the times of Camillo Golgi and Santiago Ramón y Cajal in the late 1800s and early 1900s, only a small number of neurons – possibly less than one in a hundred – are able to take on the stain of the dye used to highlight the presence and properties of a neuron.

Conceivably, therefore, the secret to genius might reside in the 99%, percent of the neurons that didn't show up during the staining process. One cannot compare what one cannot see.

Although the neurons that were visible in the aforementioned comparisons seemed to be roughly the same, there might have been substantial differences with respect to the neurons that didn't show up in the staining process. Moreover, given that it is the interaction of neurons that is considered by many neuroscientists to be the source of cognitive capabilities (including genius) – dynamics that are not captured by the static images that are expressed through staining – then, perhaps. the interaction of unknown millions of neurons (the ones for which staining doesn't work) might still hold the key to the difference between the brain of a genius and the cognitive functioning of individuals who are not geniuses.

Alternatively, maybe the interaction between the -- on average -- twice as many glial cells in the regions of Einstein's brain being studied (relative to the control individuals) together with the 99% of the neurons that couldn't be seen via the staining process might be able to account for the presence of genius. The problem is that we really don't know how neurons, on their own, or, glial cells, on their own, or, glial cells in conjunction with neuron cells, generate genius.

Possibly, genius is the result of one or more forces that lie beyond the horizons of glial and neuronal activity. Possibly, glial and neuronal cells play supporting roles for some other phenomenon that plays a more central role in the manifestation of genius.

The results published by Dr. Diamond and her colleagues in *Experimental Neurology* are interesting but quite inconclusive as far as being able to identify the nature of genius and how the latter arises out of brain activity. The significance of the, on average, twice as many glial cells in the three regions of Einstein's brain relative to the brains of the control subjects is suggestive but nothing more … unless, and until, one can show what glial functioning has to do with the manifestation of genius, or abstraction, or imagery.

In the light of the inconclusive nature of the foregoing findings, one has difficulty understanding how someone might try to argue that the contents of the journal article concerning Einstein's brain justified the theft that helped make that article possible. In fact, even if much more determinate and significant data concerning the nature of genius had emerged from the research by Dr. Diamond and her colleagues, the calculus of justification still seems rather elusive and arbitrary.

Notwithstanding the foregoing considerations, there are several mysteries to be explored in conjunction with the relationship between glial and neuronal functioning. For instance, if one were to hypothesize that glial cells and neurons interacted to give expression to cognitive functioning, how – if at all -- do the two kinds of cells communicate with one another?

Neurons communicate with each other through a combination of electrical and chemical signals. The electrical component for a given neuron is a function of ionic currents set in motion by, among other things, the impact of electrical and chemical signals on a given neuron from adjacent neurons, while the chemical signaling component involves, among other possibilities, the activity of neurotransmitters (e.g., serotonin, dopamine, GABA – gamma amino butyric acid) that are released from tiny packets or vesicles located near the axon terminals or synaptic boutons found toward the end of tube-like processes (axons) that carry information away from the soma or body of a neuron.

Every resting neuron has an electrical potential running across its membrane that is created by the charge differential existing between, on the one hand, the ions found along the interior portion of a neuron's membrane and, on the other hand, the ions located along that neuron's exterior membrane. The aforementioned electrical potential is variable but often runs in the vicinity of -70 millivolts.

The net, interior, ionic charge found in a resting neuron is negative relative to the exterior of the cell. The net, exterior, ionic charge tends to be positive.

Left to themselves, ions (such as potassium) tend to diffuse out of the neuron (i.e., going from an area of relatively high concentration to an area of relatively low concentration of potassium ions) via certain membrane channels that have been opened up by conformational changes in membrane proteins, while ions (such as sodium and chloride) tend to diffuse into the interior of the neuron via membrane channels created by conformational changes in still other kinds of membrane proteins. However, the existence of the aforementioned resting electrical potential running across the membrane of a neuron tends to resist the inclination of ions to diffuse along their respective concentration gradients.

When a resting neuron receives electrochemical signals from other neurons (via the cellular extensions – known as dendrites – that send information toward the soma or cell body of a neuron), the resting neuron will either respond to those signals by depolarizing its resting membrane potential or the neuron will continue on in its default mode. If the neuron depolarizes, a series of events occur that, among other things, sequentially open and close various membrane channels that affect the flow of ions into and out of the cell all along the axon process, resulting in an electric current being sent down the length of the axon toward the axon terminal/synaptic bouton.

Once the action potential (depolarization) takes place, the generated electrical signal induces vesicles in the axon terminal to release various neurotransmitters that are contained in those packets. The released neurotransmitters diffuse across the synaptic, fluid filled spaces that border the neurons, and, then, the neurotransmitters go on to attach to the dendrite portions of other neurons, and, these post-synaptic neurons, in turn, will either respond to, or ignore, the incoming signal.

How a neuron "decides" whether, or not, to respond to incoming signals is not known … although it seems to have to do – at least in part – with whether, or not, certain thresholds are exceeded. How the neuron 'knows' when those thresholds have been exceeded is not known.

What the individual and collective electrochemical signaling dynamics of neurons have to do with cognitive functioning (e.g., consciousness, language, thinking, creativity, etc.) is not known … although scientists have been trying to figure this out for more than a hundred years. Furthermore, how such a system of signaling came into being is not known.

Glial cells operate quite differently than neurons do. Unlike neurons, glial cells do not undergo depolarization, and, therefore, there is no action potential-like electrical signal involved in the dynamics of glial cells.

Glial cells come in four varieties (and neurons also give expression to different shapes, sizes, and functions). One of those four kinds of glial cells is known as a Schwann cell.

There are three varieties of Schwann cells. These are referred to as: Myelinating, nonmyelinating, and terminal Schwann cells.

Whether, or not, the foregoing three types of cell are actually all variations on some sort of basic underlying Schwann cell-type is uncertain. This is because none of the three kinds of cells are shaped like one another, and, as well, they have completely different functions from each other.

Historically, all of the foregoing cells were referred to as Schwann cells in order to identify them as being something other than a neuronal form of cell. However, given the differences among those cells, they might constitute entirely different classes of glial cells, and, if so, then, there are, possibly, as many as seven – not four -- kinds of glial cells.

Notwithstanding the foregoing considerations, myelinating Schwann cells interact with certain kinds of neurons in the peripheral nervous system by either attaching to the latter or by enveloping neurons. In either case a kind of electrical insulation forms around the neurons.

The resulting sheath is referred to as myelin. The process of surrounding neurons in the foregoing ways is known as myelination.

Thus, myelinating Schwann cells and certain kinds of neurons have the potential to develop a close physical association with one another … although not all neurons become myelinated, or if they do become myelinated, this does not necessarily happen at the same time as might be the case with other neurons. However, with respect to those neurons that do become myelinated, one might ask whether, or not, such a physically contiguous relationship enables any sort of information to be exchanged between the two kinds of cell, or is the relationship between them more like that of a car and a garage in which the latter has a functional relationship with the former, but no exchange of information appears to take place between the car and the garage (unless, of course, an electronic garage door opener has been installed and can be activated by a remote control device from, say, within the car)?

Dr. R. Douglas Fields and his lab technician, Beth Stevens (who later became his graduate student), wanted to explore whether, or not, some sort of communication took place between neurons and the Schwann cells that attached to neurons or enveloped neurons. So, the two researchers devised an experiment for determining whether, or not, there might be some form of signaling process that involved both kinds of cells under certain circumstances.

Aequorin is a photoprotein that is secreted by certain kinds of jellyfish and produces a blue light when it becomes attached to calcium. Dr. Fields incorporated the basic idea of the aequorin-calcium dynamic into his experiment by using a synthetic dye that was calcium sensitive.

First, DRG neurons – or Dorsal Root Ganglions – were bathed in the foregoing synthetic calcium sensitive dye. Subsequently, the neuron would be stimulated with a weak electrical current via an implanted electrode.

When the cell was stimulated in the foregoing fashion, the cell would depolarize. During the process of depolarizing, various membrane channels sequentially opened up, permitting calcium ions to flow into the cell.

The calcium ions interacted with the synthetic dye within the cell. This resulted in flashes of light.

Next, Schwann cells were introduced into the culture containing calcium ions together with the DRG neurons that had been bathed in a synthetic calcium sensitive dye. As occurred in the previous step of the experiment, the neurons were given a weak electrical charge to induce an action potential that, in turn, caused the opening of membrane channels in the DRG neurons.

Once again, as calcium ions flowed into the DRG neurons and interacted with the calcium sensitive dye in the neurons, flashes of light occurred. The more calcium ions that entered the neuron, the brighter the light from the neurons became and, as well, transitions in the color of the light would take place.

A short while later, the light emanating from the Schwann cells also began to change in color. Apparently, the Schwann cells were responding to the electrical signaling that was taking place in the DRG neurons, and, as a result, the Schwann cells were induced to open their membrane channels that, in turn, increased the flow of calcium ions into the interior of the Schwann cells, and, therefore, led to an increased brightness in the light being given off through the interaction of calcium with the synthetic calcium sensitive dye.

Some sort of signaling process appeared to be taking place between the firing of the DRG neurons and the presence of the Schwann cells. What, exactly – if anything – was meant by such signals or how the Schwann cells were picking up on those signals was unknown, but, evidently the Schwann cells (glial cells) were, in their own way, responding to the electrical activity of the DRG neurons.

However, whether, or not, the possibility of signaling is reciprocal is unknown. That is, while the Fields/Stevens experiment appeared to demonstrate that Schwann cells have some sort of 'awareness' with respect to the electrical activity of nearby neurons, their experiment did not show whether, or not, neurons were sensitive, in some fashion, to the activity taking place in glial cells.

Notwithstanding the foregoing considerations, glial cells have been shown to respond to neuronal activity in other ways. For example, glial cells help regulate what takes place in the synaptic fluid-filled spaces (roughly 25 billionths of a meter) that separate presynaptic neurons (the neurons from which neurotransmitters are released) and postsynaptic neurons (the neurons to which neurotransmitters become attached following their release from the axon bulb of the presynaptic neurons).

If the release of neurotransmitters into the synaptic areas plays a central role in the brain's system of communication, then presumably, there must be some means of making sure that the synaptic messages don't become entangled with one another or don't interfere with one another, and, in the process, introduce confusion into the information that is being communicated. In other words, once a presynaptic neuron releases its neurotransmitter message, then, there needs to be a means of resetting the synaptic blackboard back to a blank state so that the next message can be received.

The resetting mechanism comes in the form of astrocytes that constitute a second kind of glial cell (You already have been introduced to another form or kind of glial cell – namely Schwann cells). Astrocytes are found bordering the synaptic regions separating neurons.

The membranes of astrocytes contain proteins that act like pumps that suck out the neurotransmitters that continue to mill about in a given synaptic area bordered by such cells. Once astrocytes remove neurotransmitters from a synaptic region, the glial cell modifies the neurotransmitters into an inert (or non-communicating) form, and, then, returns such inert neurotransmitters back to the neuron axon terminal where the neurotransmitters are re-configured and re-packaged so that they, once again, become active and ready for subsequent release into synaptic space to deliver some other message.

If astrocytes are too quick to remove neurotransmitters from a synaptic region, the intended neuronal message might not be delivered at all, or if delivered, the message might be too faint to be understood or to have the right kind of impact on the postsynaptic neuron. On the other hand, if astrocytes permit neurotransmitters to linger on in a given synaptic region, successive messages will become conflated and garbled.

In addition to removing neurotransmitters from synaptic spaces, astrocytes also provide energy for neuronal activity by metabolizing lactate molecules and generating ATP derivatives from that process. This energy is provided to meet the needs of neurons under various circumstances.

Although only a very small portion of brain activity has been described in the opening pages of this chapter, let's briefly reflect on the information that has been provided thus far. First, by means of a set of specialized membrane proteins, neurons are able to regulate the influx and efflux of ions into, and out of, such cells, and, in the process, an action potential – or electrical current – is initiated.

The action potential causes vesicles in the axon bulb or terminal of the presynaptic neuron to break open and release the neurotransmitters contained within those packets. The freed neurotransmitters diffuse across the synaptic space (approximately 25 billionths of a meter) and attach to certain membrane proteins on the postsynaptic neuron.

Next, astrocytes bordering the synaptic region into which the neurotransmitters have been released pump out the molecules that remain in the synaptic area … but the pumping is done in a manner that does not occur either too quickly or too slowly. Moreover, the astrocytes help regulate neuronal activity by providing energy as necessary.

In addition, astrocytes deactivate the neurotransmitters that have been pumped out of the synaptic region on which the glial cells border and then those cells return the deactivated neurotransmitters to neurons. The neurons to which the neurotransmitters have been returned re-activate the molecules, and, in addition, re-package them within vesicles that are located in the axon bulb of the neuron.

From an evolutionary point of view, one wonders how the appropriate sequences of DNA base pairs came into being that encoded for all of the foregoing capabilities involving, among other things: (1) Specialized membrane proteins whose dynamics help underwrite the generation of an electrical current; (2) neurotransmitter-containing axon bulb vesicles that could be opened as a result of an action potential running down the axon process of a neuron; (3) a set of neurotransmitters that could have an array of effects on the postsynaptic neurons to which they become attached following diffusion across a synaptic space; (4) astrocytes that supply energy to neurons as needed and that also have membranes containing proteins that pump out excess neurotransmitters from a synaptic space, and, as well, have the capacity to deactivate neurotransmitters and, then, ship them back to neurons; (5) neurons that re-activate deactivated neurotransmitters and re-package them to form axon bulb vesicles. Evolutionary biologists not only fail to understand how the encoding for any of the foregoing capabilities came into being, but, as well, evolutionary biologists do not know how any of that encoding came to have meaning within the context of brain activity so that appropriate messages could be sent and 'understood' in order to give expression to a functioning brain.

In addition to the two kinds of glial cells already touched upon – namely, astrocytes and Schwann cells -- there are two other editions of glial cells – microglia and oligodendrocytes. Microglia cells help to protect the brain from disease or injury, as well as assist the brain – to varying degrees -- to recover from the effects of the foregoing sorts of problems, while oligodendrocytes help to myelinate neurons within both the spinal column and the brain (as indicated previously, Schwann cells tend to operate primarily in conjunction with the peripheral nervous systems – that is, the nerves and ganglia found outside the brain).

However, despite what biologists do know – in considerable detail – concerning the physiology of cellular dynamics (both in relation to neurons and glial cells), none of those researchers have been able to causally connect such cellular dynamics to phenomena involving consciousness, intelligence, language, creativity, and so on. In other words, although scientists might know a great deal about how the brain functions at a cellular level, none of what is known in that respect has been woven together in a way that shows how such cellular dynamics are capable of underwriting a viable account of just how the brain (allegedly) generates consciousness, intelligence, language, creativity, and so on.

Possibly one way of engaging the foregoing unknowns is to hypothesize that quality is a function of quantity. For example, researchers have given variable responses concerning the relative, quantitative ratios of non-neuronal cells (i.e., glial cells) to neuronal cells that might exist within the nervous system.

Some individuals believe glial cells outnumber neurons by a factor of 10. Other researchers suspect that the ratio between the two might be closer to 100 to 1 in favor of glial cells, while still other scientists maintain that the ratio between the two classes of cells might be fairly even.

Finally, certain researchers contend that the ratio between glial cells and neuronal cells depends on the part of the nervous system one is considering. This variability ranges from: Approximately, four astrocytes to every neuron in the frontal cortex of a human being (interestingly, dolphins and whales, exhibit a 7 to 1 ratio in this region of the brain), to: A hundred or more myelinating glial cells to each neuron in the case where just one axon might be sheathed or myelinated by many glial cells.

Irrespective of how one calculates the ratio of non-neuronal to neuronal cells within the nervous system, determining the relative ratio of the two classes of cells doesn't seem to advance understanding any further with respect to how the interaction between non-neuronal and neuronal cells generates higher cognitive functions such as consciousness and intelligence. While considerable evidence exists that indicates that glial cells certainly assist, support, regulate, protect, repair, complement, and help shape the dynamics of neuronal activity, nonetheless, none of what is currently known about glial functioning demonstrates how that functioning is capable of generating – on its own or in conjunction with neuronal dynamics – the higher cognitive functioning of human beings.

For example, let's return to Einstein's poor brain. Earlier in this section, information was given indicating that Dr. Diamond and her colleagues discovered that the inferior parietal cortex in the dominant hemisphere of Einstein's brain contained many more glial cells than did the inferior parietal cortices in any of the control subjects.

The higher numbers of glial cells in Einstein's brain were probably mostly astrocytes. Some number of oligodendrocytes (myelinating glial cells in the brain and spinal column) and, possibly, a smaller number of microglia cells were also likely to be present among the increased number of glial cells in Einstein's brain.

As the earlier discussion alluded, microglia are part of the immune system of the central nervous system. Those kinds of cells are estimated to constitute 10-15% of the total glial population.

Additional oligodendrocytes might help the electrochemical dynamics of neurons take place more quickly and/or more efficiently. However, understanding how greater efficiency in the dynamics of electrochemical signaling enhances a person's capacity for genius, complex thinking, imagery, and abstraction is not self-evident.

Microglia that are journeying to the site of infections in the brain do have the capacity (in the form of certain kinds of enzymes) to slice their way through a morass of neurons by dissolving the matrix proteins that hold neurons together. These same protein-dissolving enzymes are also used by microglia to help rewire the synaptic circuitry by disconnecting neurons from such synaptic spaces as part of the process of developmental transitioning or as part of a repair mechanism for injured brain circuitry.

Nonetheless, while the presence of microglia in the inferior parietal cortex might help to keep the brain healthy or might assist in the rewiring of certain synaptic circuitry under various circumstances, once again, it is not self-evident how having additional microglia in the inferior parietal cortex of the brain will generate the sort of capacity for imagery, complex thought, and abstraction that many people consider to be at the heart of genius.

Schwann cells -- one of the four kinds of glial cells -- operate in the peripheral nervous system outside the brain. So, this leaves us with astrocytes as the last remaining candidate among glial cells as a possible source of genius.

As discussed previously in this chapter, astrocytes do supply energy to neurons. Moreover, as previously outlined, astrocytes also play a key role in regulating the synaptic regions that border neurons by both controlling the length of time neurotransmitters remain in a given synaptic region as well as by removing neurotransmitters from those fluid-filled spaces, deactivating those molecules, and, then, returning them to neurons for further processing.

In addition, astrocytes regulate the concentration of certain ions that congregate along the outer membranes of neurons. More specifically, potassium ions are released by neurons into the extracellular fluid surrounding the neuron when the latter depolarizes and generates an action potential or electrical current along its axon process.

In order for the neuron to return to its resting membrane potential and, thereby, be in a position – when properly stimulated -- to generate another action potential, the potassium that has been released into the extracellular fluid surrounding the neuron must be removed from the vicinity of the outer membrane of the neuron. Astrocytes perform this function by absorbing many of those potassium ions.

In fact, astrocytes are connected to one another through a network of gap junctions or transmembrane protein channel ways constructed from connexins that constitute a family of structural proteins (connexin structural proteins form these channel ways in vertebrates but innexin proteins – quite different from connexin proteins -- form those channel ways in invertebrates). Among other things, potassium ions -- which have been absorbed from synaptic regions -- flow through the aforementioned network of gap junctions.

Since astrocytes do not function like neurons (i.e., there is no action potential), the excess potassium ions do not interfere with the functioning of astrocytes. Moreover, there are certain astrocytes that have specialized features enabling them to clamp onto small blood vessels and transfer potassium ions into the blood stream that have been flowing through the network of gap junctions of connected astrocytes and, in the process, remove excess potassium ions from the brain.

Without astrocytes performing their removal services in conjunction with potassium ions and neurotransmitters, neurons would not be able to, respectively, recharge or send and receive clear messages. Nonetheless, once again, one is still not quite sure how the presence of additional astrocytes (even a lot of them) will generate or enable a greater capacity for abstraction, imagery, or more complex thought.

In passing, one might hypothesize that while astrocytes do not seem to be responsible for complex cognitive functioning, the action of SSRIs (selective serotonin uptake inhibitors that were discussed in the first chapter) might interfere with the capacity of astrocytes to remove potassium ions and neurotransmitters (such as serotonin) from synaptic regions and, as a result, the brains of some people might respond to the excess concentrations of potassium and neurotransmitters as if they were being poisoned, and, thereby, help to bring about a condition involving some aspect of the phenomenon of 'medication madness' that has been addressed by Dr. Peter Breggin.

Let's consider another dimension of astrocyte dynamics. For example, when a woman becomes pregnant, the neurons and synapses that regulate lactation undergo a reconfiguring as a result of glial cell activity.

Something of a mystery is involved in trying to understand how glial cells 'know' when, where, and how to reconfigure or rewire the neuronal/synaptic circuits responsible for lactation. Something of an even bigger mystery is involved in trying to understand how living organisms came to acquire the capacity to induce astrocytes to perform this kind of magic in a functional way and at the right time and place

There are still other mysteries. During pregnancy, oxytocin (consisting of just nine amino acids) is produced by, and released from, specialized cells (known as magnocellular neurons) located in the hypothalamus.

The axons of these hypothalamic magnocellular neurons extend from the hypothalamus to the pituitary gland. At an appropriate point, the oxytocin is released from the axon terminals of magnocellular neurons and diffuses into the extracellular fluids that lap against capillaries that absorb the relatively small peptides and, then, deliver those molecules to the blood stream that takes the oxytocin for a ride before distributing them to appropriate places in the body … although how the criteria for what constitutes "appropriateness" arose and how the capacity to recognize when such appropriateness is at hand constitutes, yet, another mystery.

Oxytocin helps to induce the smooth muscles of the uterus to contract during birth. Moreover, oxytocin also helps to induce the flow of milk in mammary glands.

In addition, the presence of oxytocin also is correlated with the enhanced sense of bonding that a mother feels toward her baby. Experiments have been done in which the activity of oxytocin is blocked in rats, and the rats that are treated in this fashion tend to shun the babies that are born to them, while rats that are not pregnant, but have been injected with oxytocin, will become motherly to any baby rats that are placed in the vicinity of the non-pregnant mothers that have been treated with oxytocin.

Astrocytes play a role in the regulation of the flow of oxytocin. More specifically, the cells accomplish this by, among other things, reconfiguring their shape in and around the axon terminals of the magnocellular neurons and, thereby, permit the specialized neurons to freely release oxytocin to be absorbed, first, by capillaries, and, then, be fed into the blood stream for subsequent distribution.

How the oxytocin peptide came to be coded for by magnocellular neurons is not known. How the same oxytocin molecule came to mean three different things in three different circumstances (lactation in the mammary gland, contraction in the uterus, and a feeling of enhanced bonding of a mother for her baby) is not known.

What induces astrocytes to reconfigure themselves at the appropriate time and place in order to change neuronal and synaptic dynamics is not known. How such a capacity for integrated functioning arose is not known.

As previously noted, astrocytes have important roles to play in monitoring and regulating neuronal and synaptic dynamics. Beyond what already has been said about such processes, there are several additional ways in which astrocytes impact neuronal and synaptic functioning.

First, Stéphane Ouellet, a French neuroscientist, has demonstrated that voltages decrease in certain synaptic regions of the hypothalamus when astrocytes undergo reconfiguration with respect to some of the properties of such cells These reconfigurations involve transitions in shape as well as the manner in which various projections of astrocytes extend into, and withdraw from, various synaptic spaces.

Secondly, just as neurons release neurotransmitters, so too, astrocytes release a number of gliotransmitters that are capable – each in its own way -- of modulating some of the membrane receptors of neurons. The release of gliotransmitters affects what transpires both within certain neurons as well as affects what takes place in the synaptic regions bordered by the neurons that are being impacted by gliotransmitter activity.

Glial cells are implicated in all kinds of regulatory dynamics involving neurons and synapses. These regulatory activities range from: Pregnancy, birth, and mothering behavior, to: Sleep, fine motor movement, gender blindness and thirst. However, none of the foregoing sorts of regulatory activities can be tied – in a concrete, demonstrable, causal way – to the emergence of genius, or a heightened capacity for: Abstraction, complexity of thought, or the quality of imagery that are manifested in mental phenomenology.

Clearly, astrocytes are affecting – if not helping to regulate -- neuronal activity and synaptic dynamics. What is less clear is how astrocytes are being induced to affect/regulate neuronal activity and synaptic dynamics in one way rather than another, and what is even less clear – to the point of being downright murky -- is how all of this integrated, regulatory capability came into being in the first place.

Naturally, when the dynamics of glial cells are compromised, there are ramifications for the rest of the brain and for mental functioning. For example, there is a protein known as GFAP – glial fibrillary acidic protein – that is found in astrocytes, but this protein is also given expression in various other kinds of cells as well.

The functional role that GFAP plays within those cells is not fully understood. At a minimum, GFAP appears to lend structural support to such cells, and GFAP is found in all healthy astrocytes.

However, in conjunction with certain kinds of pathological conditions (e.g., Alexander disease), the quantity of GFAP in astrocytes proliferates. In turn, an excess amount of GFAP is correlated with the emergence of a glut of Rosenthal fibers within astrocytes that are somewhat similar to the fibrillary tangles found in the neurons of individuals with Alzheimer's.

In the 1947 clinical case in London, England that had led to the naming of the diagnostic condition that came to be known as Alexander disease, the postmortem examination showed that the brain of the patient (a fifteen-month old male baby) had degenerated extensively due to the presence of rod-shaped bodies (Rosenthal fibers) within the astrocytes of the baby's brain. Over a period of some eight months when the child was alive, the proliferation of Rosenthal fibers led, in succession, to a substantial enlarging of the baby's head, a deterioration of cognitive functioning, very high fever, convulsions, and, finally death.

Obviously, while the presence of a certain amount of GFAP within astrocytes is a good thing, too much of that protein is problematic. Under certain conditions of pathological stress, the production of GFAP is increased, and this seems to open the door for additional problematic events (such as the appearance of Rosenthal fibers) to enter the picture.

As indicated previously, the role or roles that GFAP plays within healthy astrocytes is not fully understood. Nonetheless, when something goes wrong with the metabolic pathways through which GFAP is generated, trouble ensues.

The fact that GFAP can be shown to play a role in undermining healthy cognitive functioning does not necessarily mean that the presence of GFAP in the right amounts is responsible – at least in part -- for such capacities as abstraction, imagery, and complex thinking, anymore than a properly functioning radio is responsible for the content of the programming that an effectively operating radio enables a person to hear. The appropriate amount of GFAP within astrocytes helps those cells to operate properly, just as, among other things, an appropriate number of, say, transistors helps enable a radio to function properly.

Notwithstanding the foregoing considerations, in 2002 a group of Japanese scientists discovered evidence that GFAP appeared to play a more varied role than just lending cellular structural support for astrocytes. Nobufumi Kawai and a number of research associates experimented with mice by removing the gene that coded for GFAP in the astrocytes of those mice.

The foregoing experiment left neuronal functioning intact. Nonetheless, the memory of the mice that were missing the GFAP gene seemed to be adversely affected, and this was an experimental result that tended to conflict with the widely accepted idea that memory was a function of neuronal activity.

The possibility that astrocytes might play a much larger role in the functioning of memory than previously had been thought was further strengthened by a project somewhat similar to the foregoing one, but this experiment was carried out by a different set of Japanese researchers led by Hiroshi Nishiyama. This latter research group found that when they removed the gene known as S100 from mice, these experimental mice were able to run a maze more quickly than mice that were not genetically engineered in this same fashion.

Apparently, the mice without the S100 gene had become smarter in some way. Perhaps, their capacity for remembering had been enhanced to a certain degree.

On the other hand, maybe the genetic modification that involved the removal of the S100 gene didn't either improve memory or make those mice smarter. Possibly, the removal of the gene permitted the mice to bypass a processing step that would normally have slowed them down slightly.

The S100 gene gives expression to a calcium-binding protein. Perhaps, the missing gene didn't necessarily make the mice smarter or provide them with improved memories but, instead, the missing gene might just have allowed certain aspects of brain functioning to take place more efficiently, and, in the process, permitted the maze to be completed more quickly.

What is actually taking place in the brain is hard to know without studying the S100 gene and determining what, precisely, its role (or roles) is (are) in astrocyte functioning. Furthermore, whatever might have been gained in terms of how quickly a maze was completed might also be counterbalanced by whatever could have been lost with respect to overall functioning -- losses that might not show up immediately – due to the absence of the S100 gene.

Astrocytes do have the capacity to both excite and inhibit neuronal activity via gliotransmitters that are released. Given the right set of neuronal and synaptic conditions, exciting or inhibiting certain neurons via gliotransmitters could both lead to speeding up the running of a maze, and, similarly, the absence of the GFAP and SA100 genes could have inhibitory or excitatory effects upon neuronal and synaptic functioning that, respectively might undermine or speed up functioning.

Yet, none of foregoing possibilities necessarily has anything to do with the generation of mental functioning such as association, abstraction, and so on. Rather, the impact of the missing genes might only be indirect as far as mental functioning is concerned.

That is, speeding up biological processes in the brain, or helping to enhance/stabilize those processes, or undermining such dynamics in some way could all impact the time it took to run a maze without necessarily requiring one to suppose that an organism's capacity for intelligence or memory had been altered in order to be able to explain changes in the time it took to complete a maze. The foregoing possibility is similar to the way in which changes in the architecture of a radio receiver might impact the clarity of the signal that is being received without necessarily having anything to do with the content of that signal.

Aside from the GFAP molecule, both glial cells and neurons use other kinds of molecules (such as glutamate and ATP) in order to transmit signals throughout the brain. For example, when cellular vesicles containing ATP are induced to release their contents -- through the presence of glutamate molecules that are binding to certain membrane proteins -- ATP will, in turn, become attached to certain astrocyte membrane proteins and, thereby increase the flow of calcium atoms within those glial cells. This, in turn, will lead to the further release of, among other molecules, ATP … and so on.

Aside from serving as a source of energy, ATP (adenosine triphosphate) also is a source of adenosine. In other words, when ATP is stripped of its phosphate groups, adenosine remains, and on its own, adenosine can serve as an inhibitory neurotransmitter or signal.

For instance, when a neuron fires, sometimes that neuron might release glutamate into a given synaptic region. The presence of glutamate in such an extracellular space might induce astrocytes bordering that space to release ATP.

After being released, ATP might be stripped of all of its phosphate groups, leaving just adenosine. As previously noted, astrocytes are connected to one another through a network of gap junctions or transmembrane protein channel ways, and such gap junctions give astrocytes the potential (e.g., via the flow of, say, adenosine through those junctions) to impact on (in an inhibitory manner) the dynamics of neuronal and synaptic activity in relatively distant localities.

Moreover, in 2005, Philip Haydon and a number of research associates showed that when astrocytes are induced to increase the flow of calcium due to transitions in the synaptic activity associated with hippocampal neurons, the aforementioned calcium ions will flow through the gap junctions formed by networks of astrocytes and subsequently induce distant astrocytes in that network -- through the release of certain gliotransmitters at those sites -- to strengthen the synaptic circuits associated with portions of those hippocampal neurons.

The notion of long-term potentiation (LTP) is considered to go to the heart of the modern theory of memory and learning. Long-term potentiation refers to the process of strengthening synaptic circuitry through the manner in which neurotransmitters and gliotransmitters cause voltage changes in synaptic spaces … changes that result in lasting patterns of reconfigured circuitry, and the synaptic circuitry that has been induced to persist (i.e., be strengthened) is said to give expression to the memory of something that has been learned.

Although astrocytes have the capacity to strengthen or inhibit synaptic circuits -- both locally and in, relatively speaking, more distant locations – through the release of ATP, glutamate, and calcium ions, nevertheless, determining what, exactly, is being strengthened or inhibited is not necessarily a straightforward matter. All of the aforementioned glial, synaptic, and neuronal activity can be correlated with various kinds of sensory and cognitive functioning, but whether, or not, such strengthening and inhibiting of synaptic circuits is generating cognitive functioning (in the form of abstraction, imagery, memory, and association) is not necessarily a foregone conclusion … anymore than properly functioning radio circuitry can said to be responsible for the signal content to which such circuitry gives audible expression.

Even if it were clear (which it is not) that the activity of synapses, astrocytes, and neurons gave expression to mental phenomenology, there would still be at least one outstanding set of mysteries that would need to explained. More specifically, what is organizing, coordinating, and integrating the flow of all the neurotransmitters, gliotransmitters, calcium ions, and other brain molecules so that such a flow of materials will strengthen or inhibit one specific idea rather than some other idea, or will strengthen or inhibit one particular image rather than some other sort of imagery, or will strengthen or inhibit this or that association rather than some other kind of association, or will give expression to one type of genius rather than some other manifestation of genius?

In other words, how do the astrocytes know that synaptic circuits to strengthen or inhibit in order for an organism to be able to learn or remember one kind of thought, image, or association rather than some other thought, image, or association? And prior to the process of strengthening or inhibiting such circuits, what establishes those circuits to begin with as giving expression to a specific idea, association, image, or abstraction that might, or might not be subject, subsequently, to strengthening or inhibiting?

For someone to claim that glial cells play a role in the strengthening and inhibiting of synaptic circuits is one thing, and there is considerable evidence to support such a claim. Nevertheless, for someone to claim that glial cells -- by themselves or in conjunction with neurons -- construct synaptic circuits that constitute ideas, imagery, and abstractions might be quite another thing, and, in fact, there is little evidence to demonstrate the truth of such a claim.

Signaling is occurring, and communication is taking place, and information is being processed in conjunction with the interaction of glial cells, neurons, and synaptic spaces. However, the precise nature of what is being signaled, communicated, or informationally processed is not really known even though it all can be correlated, to one degree or another, with various kinds of sensory processing and cognitive functioning.

Consider the following. There is a form of brain scanning technology known as diffusion tensor imagining (DTI) that is capable of assisting researchers to differentiate among, and follow the pathways of, myelinated axons amidst the jungle of white matter tracts in the brain where only axons and glial cells (consisting of oligodendrocytes and astrocytes) exist.

DTI technology keys in on the behavior of water in the brain. The DTI scanner sends out magnetic impulses, and water within the scanned areas begins to oscillate in response to those impulses.

As a result, the affected water radiates radio waves that are picked up by the DTI scanner. These electromagnetic signals are translated by the scanner into the form of colored representations of water's behavior in the brain.

Water can flow along myelinated axons, or it can flow across those axons. The more tightly packed myelinated axons are (and this packing includes the presence of astrocytes), the more likely it is that water will flow <u>along</u> those axons rather than <u>across</u> them.

Research has shown that the more water flows <u>along</u> axons (indicating that they are tightly packed), the more intelligent a person is. In color-coded terms, the redder that the DTI-representation of water's movement in the brain is, the higher the IQ of the individual being studied will be, while the bluer or cooler the DTI-representation of water's movement in the scanned areas of a person's brain is, the lower the IQ of that individual will be (indicating that more water is moving across axons rather than along them, and, therefore, also indicating that myelinated axons are not as tightly packed).

Does the foregoing research indicate that intelligence is caused by the manner in which, and degree to which, astrocytes and oligodendrocytes pack in and around axons? Not necessarily.

Radios can be built with different qualitative capabilities – from being fairly simple to being far more sophisticated. Among other thing, the kinds of signals that can be detected, the precision with which those signals can be differentiated, and the character of the sound that can be produced in conjunction with those signals depends on the quality of the radio's construction.

However, the signals that are being received by a given radio are quite independent of that device. The quality of the radio will determine to what extent, and in what ways, those signals can be detected and translated into audible sounds, but the radios do not generate the signals being received.

Similarly, one might liken the packing of myelinated axons to radio quality. The more tightly packed a white tract of the brain is, the better will be the quality of its capacity to receive and translate incoming signals, but, nonetheless, a distinction needs to be made between a receiving device and the signals being received through such a device.

Normally speaking, one doesn't refer to a radio as having a high IQ just because it is capable of receiving certain kinds of signals. Consequently, it might not necessarily be the case that tightly packed myelinated axons in white tract areas of the brain are the source of intelligence even as those areas might have the capacity for receiving and modulating a wider and more precise array of incoming signals than white tract areas that are less tightly packed.

Densely packed white tract areas of the brain consisting of axons, oligodendrocytes, and astrocytes are correlated with higher IQ. Nonetheless, there is no causal evidence indicating that the materials making up those densely packed areas are responsible for intelligence … even though those biological materials might play some sort of supporting or subsidiary role in relation to the manifestation of intelligence.

The degree of myelination issue is also associated with another facet of higher cognitive functioning. In human beings, the last segments of the brain to become fully myelinated are in the forebrain, especially those aspects of the forebrain that are associated with impulse control, complex processes of reasoning, and considered judgment.

Can one conclude that myelination is responsible for impulse control, complex processes of reasoning and good judgment? Once again, the answer is: Not necessarily.

A radio that possesses uninsulated wires will tend not to function as well as a radio that possesses wires that are insulated. But while those wires might have a role to play with respect to the quality of reception, they have nothing to do with generating the signal that is being received.

A wide variety of neurological disorders – perhaps most of them -- are due to disruptions in glial functioning as a result of the presence of toxic substances, disease processes, and infections of one kind or another. The fact that cognitive impairment emerges due to the presence of dysfunctional glial cells does not necessarily mean that glial cells are responsible for cognitive functioning since it could be the case that dysfunctional glial cells merely interfere with independently produced cognitive processes, or glial cells might lend support to independently produced cognitive functioning when glial cells operate properly.

Nonetheless, in neither of the foregoing cases are glial cells necessarily the source of cognition even as they play supporting roles with respect to the visibility of that cognitive functioning in consciousness. This would be similar to the manner in which the components of a radio operate in relation to certain kinds of electromagnetic signals that are generated outside of that device.

Human beings who suffer from clinical depression, schizophrenia, and childhood neglect all show deficiencies in the development of white matter (glial cells) within the brain. On the other hand, animals such as rhesus monkeys and rats that have been reared in what are considered to be experientially enriching environments (a somewhat arbitrary notion) tend to show evidence of increased white matter -- or glial cells -- in, respectively, the corpus callosum and visual cortex.

Once again, one should not automatically conclude that glial cells are responsible for higher cognitive functioning any more than better components in a radio are responsible for the character of the radio wave content that is being received. Nevertheless, the number and kinds of glial cells that are present might appreciably affect the performance of cognition, just as the number and kinds of components that are present might appreciably affect the quality of a radio's performance with respect to the signals that are being received from outside the radio.

Many people have assumed, on the one hand, that the individual and collective activity of glial cells, neurons, and synaptic circuits and, on the other hand, cognitive/mental functioning are one and the same. However, just as there is a difference between a radio and the ordered program content the radio receives (in the form of radio waves) and renders audible through the radio's circuitry and its speakers, there also might be a difference between the receiving capacity of brain activity/circuitry and the source of the content of the mental programming that is strengthen, inhibited, or otherwise modulated by that brain activity/circuitry in order for such programming to be rendered 'visible' to human consciousness.

Let's restate the foregoing ideas in a slightly different way. A great deal of brain activity can be tied to the monitoring (i.e., receiving signals in relation to certain kinds of biological, homeostatic functioning) as well as the regulating and modulating of bodily functions (in response to received signals) that are responsible for keeping an organism alive. Moreover, a great deal of additional brain activity can be tied to the receiving and modulating of sensory signals (e.g., visual, auditory, aromatic, tactile, and proprioceptive) that also play a role in helping to keep an organism alive.

Why not also suppose that a great deal of the remaining activity of the brain involving both neurons and glial cells (especially astrocytes and oligodendrocytes) also involves the effective monitoring (receiving) and modulating of other kinds of stimuli that are impinging on human beings? This latter kind of stimuli might consist of informational content (for example, such data might involve imagery, ideas, or symbolic abstractions) that are different from the kind of data that is processed through the usual sensory channel ways.

In short, much of the activity of the brain entails the monitoring (receiving) and modulating of a variety of signals from different sources that occur both within and without the body. Consequently, why suppose that the dynamics of neurons and astrocytes in, say, the inferior parietal cortex (the alleged, possible locus of genius) operate any differently. In other words, why not suppose that cells -- for example, in the inferior parietal region of the brain – receive, monitor and modulate certain kinds of incoming stimuli (for example, ideational or symbolic vectors) that are not sensory in the usual sense?

There is no direct, causal evidence indicating that the interactional dynamics of astrocytes and neurons generate abstraction, imagery, or complex thinking. The data is correlational in character.

However, what if we were to consider the brain as being, <u>primarily,</u> a very complex receiver and modulator of signals? Under such circumstances, claiming that neurons and astrocytes interact – e.g., in the inferior parietal cortex -- to receive and modulate signals of certain kinds (e.g., ideational or symbolic) becomes consistent with the activities of other facets of the brain that are dedicated to the receiving, modulating, and regulating of signals of one kind or another that are being communicated to, and received by, the brain.

Throughout history, human beings gradually have become aware that more and more kinds of signals are acting on us … from: gravitational influences and electromagnetic radiation, to: weak forces, strong forces, and, possibly, even dark matter/energy. What if there are other, currently unknown, forces flowing through us that are detected and received by certain sections of the brain, just as, say, the sensory cortex detects and receives various kinds of vibrational energies that flow to and through us from certain dynamics of the physical environment?

From second to second, all manner of ideas, intentions, intuitions, insights, images, and emotions appear on the screen of consciousness. We have been led to believe – by many scientists and philosophers -- that we are the authors of such phenomenological occurrences, but what if this is not the case … either partly or completely?

We don't know how ideas, intuitions, imagery, or emotions are possible. The etiology of the phenomenological contents coursing through consciousness is elusive and has been since human beings first began to focus on such matters.

Currently, many people believe that the brain somehow generates those ideas, intuitions, and so on. But, maybe, the brain doesn't generate such content (or, maybe, the brain generates only a fraction of that content) and, instead, merely receives it and frames it and modulates it as those kinds of signals flow through us from who knows where and according to who knows what kind of dynamics.

The foregoing possibilities seem relatively alien because we have been induced (via education, other forms of socialization, or some set of self-serving motivations) to filter experience according to certain ideological inclinations toward receiving, framing, and modulating the mental/emotional currents running through us. But, every generation has its mythologies (even so-called scientific ones), and a person often has to struggle against the tidal forces of those mythologies in order to continue to search for the actual truth of things.

Chapter 20: Mirror Neurons

For much of human history, the only way to explore the issue of other minds was through philosophical reflection. Beginning in the early 1980s, the foregoing situation began to change … maybe.

In 1981 the neurophysiologist Giacomo Rizzolatti -- along with a group of fellow researchers in Parma, Italy – was studying the F5 area of macaque monkeys. This region of the brain is embedded in the premotor cortex that is a facet of the neocortex that is considered to be responsible for organizing and implementing actions.

Despite the fact that the F5 area consists of millions of neurons, it's focal concerns seem to be fairly narrow. More specifically, the neurons and synapses of F5 encompass actions of the hand -- such as selecting, transporting, holding, and pulling.

The F5 cells being studied by Rizzolatti and his colleagues were referred to as motor cells. Those cells specialized in the initiating of movement and, at the time, such cells were considered to be quite independent of cognitive functioning involving, say, sensory processing that was believed to be handled by other kinds of specialized neurons.

As sometimes happens in the lab, several fortuitous incidents occurred in Parma that began to alter the way researchers thought about how the brain operated. First, one of Rizzolatti's research associates – Vittorio Gallese – was reaching for something in the laboratory and a computer connected via electrodes to one of the macaque monkeys that was being studied began to register data, and during a separate occasion, another of Rizzolatti's colleagues – Leo Fogassi – reached for, and, then, grasped a peanut, and, once again, the computer hooked up to a macaque monkey began to chatter.

At the time, no one in the laboratory understood what was taking place. However, over time (several decades) the Parma researchers came to the conclusion that F5 cells were not only capable of initiating movements of the hand, but, as well, those cells were able, somehow, to perceive when such movements were taking place in other organisms (such as humans) even though the hands of the macaque monkeys were not involved in those movements.

In addition, over a period of time, the Parma group discovered there were other regions of the premotor cortex that involved motor activities different from hand movements that behaved in a similar fashion to the F5 region. In other words, if a macaque monkey observed the actions of a human being moving, say, his or her leg, then motor neurons in the region of the motor cortex of such macaque monkeys that were capable of initiating those kinds of actions would fire even though the macaque monkey was not moving that part of the body.

The Parma researchers were also exploring a subset of neurons in the F5 region that seemed to become active when an object was close enough to be selected, held, and grasped. Thus, movement – either on the part of the monkey or in relation to the activities of a human being – did not have to be taking place in order for such neurons to fire … it was enough that an object was sufficiently accessible for that object to be able to induce such neurons to fire.

The neurons that exhibited an inclination toward a certain kind of activity (such as grasping) came to be known as canonical neurons. Moreover, the process of inducing those neurons to fire is known as canonical neuron activation.

Thus, in three different circumstances, there were neurons in the F5 region of the premotor cortex that tended to fire. (1) When objects were sufficiently close to a macaque monkey to be grasped, then certain canonical neurons in the F5 region might fire even if the monkey didn't reach for the object. (2) If a macaque monkey saw the hand of a laboratory researcher reach for or pick up an object, then, neurons in the F5 region tended to fire. (3) Finally, if the macaque monkey used its hand to reach for, grasp, or hold an object, then neurons in the F5 region also fired.

Another group of neurons in the F4 region of the premotor cortex tended to fire when movements of the monkey's face, neck, or arm were involved. However, the neurons in that region also fired when the foregoing areas of the body were merely touched even though no movements of those parts of the monkey's body were involved, and, thus, once again, neurons that previously had been thought of in narrow terms of just helping to initiate specialized motor functioning seemed also to be connected, in some way, with the capacity to respond to sensory stimulation as well as motor movement.

In short, the Parma discoveries concerning the F4 and F5 regions of the premotor cortex appeared to indicate that data concerning sensation and movement were closely linked with one another. In fact, sensation, perception, understanding (of a sort), and movement were all being fused together in some fashion in those two regions of the premotor cortex.

The foregoing research makes a distinction between canonical neurons and mirror neurons. F5 canonical neurons are active in situations when, say, graspable objects are nearby but are not grasped, whereas mirror neurons are active when a macaque monkey sees someone else grasp an object but is not doing so itself.

Nonetheless, both kinds of motor neurons are involved in a process of perceptual reflection in relation to the environment. Canonical neurons reflect what is graspable in the environment, whereas mirror neurons reflect the kind of action that is taking place through another organism in that environment.

Canonical neurons reflect nearby objects that constitute possible candidates for grasping. Mirror neurons reflect actual movements of a hand (someone else's hand) in conjunction with objects that might be nearby or far away.

Moreover, there are different sets of canonical neurons and mirror neurons within the premotor cortex that are involved in reflecting different kinds of movement possibilities (in the case of canonical neurons) and different kinds of observable movements in other organisms (in the case of mirror neurons). For example, different neurons in F5 will fire when the grasping of a <u>large</u> object is involved than when the object to be grasped is relatively <u>small</u> (and vice versa).

Sometimes the same mirror neurons in the F5 region fire irrespective of whether the monkey itself seeks to grasp something or observes another monkey or human grasp that same something. These neurons are referred to as 'strictly congruent mirror neurons'.

However, there are other kinds of mirror neurons that fire when the movements performed or observed are only similar to one another rather than being identical. These neurons are referred to as 'broadly congruent mirror neurons'.

Given the foregoing perspective, one might wonder about how the DNA coding came about that gives differential expression to canonical neurons and mirror neurons. One also might wonder about how the DNA coding came about that gives differential expression to neurons that respond to large objects but do not respond to smaller objects (and vice versa).

In addition, one might wonder about how the DNA coding came about that gives differential expression to strictly congruent mirror neurons and broadly congruent mirror neurons. Finally, one might wonder about how the DNA coding came about that gives differential expression to the kinds of movements that are monitored in F4 regions rather than F5 regions (and vice versa).

Beyond the foregoing considerations, one might also wish to pose questions about the actual dynamics of any given instance of a mirror neuron or a canonical neuron in action. For example, how do such cells "know" when to fire?

What organizes the set of excitatory and inhibitory signals to form a synaptic circuit that gives expression to mirror neuron activity rather than canonical neuron activity (or vice versa), and how does this underlying source of organization acquire the capacity to 'know' how to accomplish this? What organizes the set of excitatory and inhibitory signals to form a synaptic circuit that gives expression to strictly congruent mirror neuron activity rather than broadly congruent mirror neuron activity (or vice versa), and how does this underlying source of organization acquire the capacity to 'know' how to accomplish this?

How do we know that a mirror neuron or a canonical neuron actually perceives that for which it is firing rather than merely being informed by some other mode of understanding/awareness that is actually monitoring those movements and merely relaying appropriate information to such neuronal groups? How are synaptic circuits associated with mirror neuron or canonical neuron activity translated into phenomenological representations?

None of the foregoing questions and considerations is intended to find fault with the idea that macaque monkeys and human beings have the capacity to perceive possible movements in relation to nearby objects or to be aware of the movements of other organisms that are visible. Instead, the issues being raised in the foregoing several paragraphs all have to do with trying to understand the identity and nature of that which is responsible for the sorts of capacities being discussed.

Are neuron groups mirroring the movements of other organisms? Or, do neuron groups merely serve as physiological markers indicating that such mirroring activity is taking place in some other fashion just as the audible sounds arising from speakers serve as physical/material markers that signals are being organized and sent out from elsewhere and, then, received by a radio?

Does understanding arise from the pattern of neurons that are firing? Or, is the pattern of neurons that are firing a function of, or follow from, an existing understanding of some kind?

A graduate student working in the lab run by Giacomo Rizzolatti at the University of Parma conducted a series of experiments that appear to shed some light on the foregoing considerations. The name of the graduate student is Alessandra Umiltà.

Ms. Umiltà first set a baseline for comparison by running an experiment that already had been done. In other words, she charted the activity of mirror neurons in F5 when a monkey observed a person grasping an object.

In a second experiment, Ms. Umiltà had an associate make a hand movement as if that person was grasping an object … but there was no object present to grasp. The monkey's mirror neurons in F5 did not respond to that movement.

Next, Ms. Umiltà placed an object on a table, and, then placed a screen between the monkey and the object that prevented the monkey from being able to see the object that had been placed on the table. Once this had been done, she had a colleague reach behind the screened- object as if to grasp it.

Did the mirror neurons in the monkey's F5 region respond to the foregoing movements of Ms. Umiltà's associate? Some of them did, and some of them did not … the split was roughly 50/50?

In the final experiment, the table in front of the monkey was initially bare. Subsequently, a screen was placed on the table, but there was no object being blocked by the screen.

An associate of Ms. Umiltà once again reached behind the screen as if reaching for and grasping an object. However, the mirror neurons of the monkey did not respond to the hand movements of the assistant.

In the latter two experiments, the monkey could not see what was taking place behind the screen. In the earlier experiment, there was a graspable object behind the screen, whereas in the latter experiment there was no object behind the screen.

In the next to last experiment (outlined earlier), roughly 50% of the mirror neurons in F5 fired when Ms. Umiltà's associate reached behind the screen where there was an object. When the final experiment of the series was conducted, none of the mirror neurons responded to the associate's hand movements going behind a screen.

A strong case might be made for the idea that understanding was informing F5 mirror neuron activity rather than the other way around. When the monkey understood that an object was behind the screen, then roughly 50% of the neurons fired because there was no way to determine whether, or not, there was any grasping of an object that was taking place behind the screen.

This indeterminacy (an epistemological condition) was reflected by the fact that roughly half of the mirror neurons did fire. However, when the monkey was observing a scene in which it understood that no object was on the table other than the screen, then this understanding informed the monkey's F5 region and, as a result, no mirror neurons fired when the associate's hand went behind the screen.

The monkey's F5 neurons were mirroring its phenomenological understanding of the experimental conditions. The monkey's F5 mirror neuron activity was responding to the monkey's state of understanding concerning the context in which hand movements were taking place.

Is it possible that the F5 neuron activity was generating understanding in of itself? Yes, it is, but there are a variety of questions swirling about that sort of an approach to things.

For example, how do synaptic circuits know how to reconfigure themselves to establish an understanding that reflects the presence of an object rather than the absence of an object (or vice versa)? And, if synaptic circuits do not know how to reconfigure themselves in this fashion, then, what is it that does know how to reconfigure synaptic circuits in the F5 region so that those circuits will reflect what is transpiring on, say, a given table in the laboratory?

How do synaptic circuits know how to reconfigure themselves to differentiate between a context in which an object exists behind a screen that someone might or might not be grasping and a context in which an object does not exist behind a screen? How do synaptic circuits inform neurons not to fire when an object is not present but induce them to fire when an object is present? How do synaptic circuits understand the meaning or significance of their own circuitry, and how did synaptic circuits acquire the capacity for such understanding and self-awareness?

If one were not using neuronal activity and synaptic circuitry in the F5 regions as a way of trying to explain how certain kinds of knowledge and understanding are possible, one still would be confronted with variations on the foregoing questions. No matter how one proceeds methodologically, one would like to be able to understand the nature of the processes through which macaque monkeys and human beings are able to perceive, know, and understand a given set of circumstances, but be that as it might, trying to claim that F5 neurons and related synaptic circuitry account for perception, understanding, and knowledge is not a self-evident or slam dunk sort of hypothesis.

There are a lot of questions that need to be answered in relation to a neuronal/synaptic circuit account of understanding, and, currently, none of those questions has been addressed in a satisfactory manner. No one knows how neuronal activity and the reconfiguration of synaptic circuitry in, say, the F5 region of the premotor cortex produces knowledge, understanding and perception with respect to mirror/reflection dynamics involving hand movements, and no one knows what the organizing principles are that shape neuronal activity and synaptic reconfigurations concerning those movements, and no one knows how neuronal activity and synaptic reconfigurations generate phenomenology in conjunction with those movements, and no one knows how the DNA coding that underwrites such activity and reconfigurations came to have the capacity to give expression to an array of states of differentiated understanding in the form of neuronal activity and synaptic reconfigurations of one kind rather than another kind in relation to hand movements.

The firing of mirror neurons in the F5 region and the reconfiguring of synaptic circuits associated with those neurons clearly have roles to play with respect to the dynamics of perceiving and understanding hand movements. However, the roles played by such neuronal activity and synaptic reconfigurations might be entirely secondary and supportive rather than primary and generative … just as the capacity of a radio is entirely secondary and supportive to the primary and generative character of the signals being received by that radio.

The neuronal activity and synaptic reconfigurations taking place in the F5 region might be the physical/neurological markers indicating that organizing signals are being received from elsewhere … like a radio receiving signals from a radio station. Those organizing signals carry all of the information that shapes and orients neuronal and synaptic activity in the F5 region, and like a radio, the neuronal activity and synaptic reconfigurations translates that organizing signal being received from outside the F5 region in a manner that permits the latter part of the brain to reflect the presence of such signals.

Thus, mirror neurons do reflect something. However, the something being reflected is not the external context of, for example, hand movements in relation to objects on a table, but, rather, what is being reflected in the F5 region is the presence of an organizing signal from beyond the horizons of the F5 region that gives expression to an understanding of what is transpiring in the laboratory concerning objects, screens, a table, and moving hands, and, as such, neuronal activity and synaptic reconfiguration in the F5 region are reflecting the presence of that understanding rather than generating it.

Consider an experiment by Leo Fogassi, one of the members of the Parma laboratory. Dr. Fogassi was interested in whether, or not, mirror neurons were capable of distinguishing between different kinds of intentions that were associated with hand movements that were roughly the same.

In one experimental trial, a monkey would reach for an edible item placed relatively near to the monkey, grasp that object, and, then, deliver the edible item to the monkey's mouth. In another experimental trial, the monkey would reach for an inedible object located where the previous edible item had been placed in the earlier trial, grasp the inedible item, and, then, deliver that object to a container.

In each trial, the monkey would: See, reach for, grasp, and, then, deliver an object to a receptacle (either a mouth or a container). In both experimental trials, the monkey would receive something edible – either in the form of an edible object being grasped and delivered to the monkey's mouth, or in the form of an edible reward that would be given to the monkey following the delivery of an inedible object to a container.

Approximately $1/4^{th}$ to $1/3^{rd}$ of the neurons being recorded fired irrespective of experimental trial conditions – that is, irrespective of whether, or not, a monkey was delivering an edible object to its mouth or the monkey was delivering an inedible object to a container. However, nearly three-quarters of the neurons being monitored responded with greater intensity when the monkey was delivering food to its mouth, while only approximately $1/4^{th}$ of the neurons being monitored fired more intensely when the monkey was delivering an inedible object to a container … despite the fact that such an action would lead to being rewarded with an edible item.

In a follow up series of experiments, a human being sat in front of a monkey and performed movements similar to what the monkey had done in the earlier set of experiments. In other words, a human being would either: Grasp an edible object and, then, deliver that object to his or her own mouth, or the human being would grasp an edible object and place it in a container.

The only difference associated with the two actions of the human being was the presence of a container. In those experimental trials in which a human being would grasp and, then, eat an edible item, no container would be present, but in those experimental trials in which a human being would grasp and, then, place that edible item in a place other than his or her mouth, a container was present.

The foregoing experimental trials reflected what took place in the earlier trials involving a monkey doing what, now, was being performed by a human being. That is, the same set of neurons that fired intensely when a monkey grasped an edible item and placed that item in its mouth were also firing intensely when the monkey observed a human being doing the same thing, while the same set of neurons that fired intensely when a monkey grasped an item in order to place that object in a container also fired intensely when the monkey observed a human being doing the same thing.

According to some individuals, the foregoing set of experiments conducted by Leo Fogassi lent support to the hypothesis that mirror neurons gave expression to the brain's capacity for being able to understand the mental states of other organisms (e.g., monkeys or human beings). However, as noted previously, the activity of certain neurons in the F5 region does not necessarily generate such understanding as much as the activity might just reflect the presence of the epistemological or hermeneutical orientation of that kind of intentionality that might be generated through some other dynamic outside of the F5 region.

Intention is a state of vectored understanding. The dynamics of mirror neurons do not necessarily generate intentionality as much as that activity might reflect the presence of an intentionality that has arisen in some other fashion (within or outside of the brain), and, if so, the neuronal activity of mirror neurons in the F5 region is being shaped by the presence of that kind of understanding rather than generating it.

Once again, if one is going to entertain the hypothesis that mirror neurons are responsible for the neurological capacity to understand, say, the mental state of a human being or monkey, then there are a gaggle of questions that need to be answered in relation to the issue of just how the dynamics of mirror neurons are able to generate differential states of intentionality concerning, in this case, edible objects and containers. For instance, how do mirror neurons 'know' when, and under what circumstances, to become intensely active in conjunction with edible food items destined for the mouth rather than objects that are destined for a container? How do neurons in the F5 region of the premotor cortex in a monkey 'know' how to be equally active irrespective of whether the monkey is eating an item or watching someone else eating something? Why do approximately 1/4th to 1/3rd of the F5 motor neurons fire irrespective of whether an object is delivered to the mouth or to a container?

How do states of intense mirror neuronal activity translate into a phenomenological representation of that state of activity, and if there is no phenomenological understanding concerning the activity of those mirror neurons, then, in what sense can one say that mirror neurons are differentiating between various kinds of intentionality? How do mirror neurons acquire their capacity to focus on – and reflect -- one set of movements rather than some other set of movements?

Some fifteen years before mirror neurons were discovered, Andrew Meltzoff, an American developmental psychologist, discovered in the 1970s that even very young infants (as little as 41 minutes old) had the capacity to imitate the actions of other human beings. Steps were taken in the experiments of Dr. Meltzoff -- such as closely monitoring the life of the infant right up to the point of the experiment -- to ensure that the infant would not be exposed to the external actions that Dr. Meltzoff and his colleagues wanted to see how, or if, the infant might respond to such actions.

Demonstrating that infants could imitate the behavior of other individuals caused quite a stir. Prior to the work of Dr. Meltzoff, much of developmental psychology was dominated by the work of Jean Piaget who maintained, among other things, that children learned to imitate during the second year of life.

The revolutionary facet of Dr. Meltzoff's experiments was not just the time when children first started to exhibit imitative behavior, but even more revolutionary was the nature of the relationship between learning and imitation that was being proposed. Piaget believed that the capacity to imitate was acquired through a process of learning, whereas Meltzoff's experiments indicated that the capacity to imitate was the process through which infants/children learned.

The capacity to imitate has been linked to language learning, socialization, acculturation, and the development of conceptual understanding. Many psychologists now believe that the notion of mirror neurons fits in quite well with the idea of imitation, and, from such a perspective, mirror neurons have been hypothesized to serve as a neurological basis through which certain facets of language learning, socialization, acculturation, and conceptual development are made possible.

For example, fMRI (functional magnetic resonance imaging) studies have been done that demonstrate that there are regions within the human brain that are anatomically comparable to regions in the brain of macaque monkeys as far as the presence of mirror neurons are concerned. These similarities in anatomical structure involve the F5 premotor cortex regions of the frontal lobe that have been discussed throughout this section of the third chapter, as well as mirror neurons that are located in an area known as PF in the parietal lobe.

One of the regions containing mirror neurons in the frontal lobe of human beings is Broca's area … an area involved in the production of speech. This fact has led some psychologists to propose that speech/language is, in part, a function of mirror neurons … for instance perhaps mirror neurons in Broca's area underwrite the ability of infants and children to imitate the speech sounds heard from other human beings.

Imitation is a fairly complex process. It presupposes the ability to be aware, to some degree, of the environment as well as a capacity to focus in on some particular facet of that environment, and, thereby, be able to differentiate one part of the environment from other aspects of that same environment.

In addition, imitation requires the presence of some level of interest or motivation that directs focus toward one dimension of the environment rather than some other dimension of that environment. Moreover, a form of interest or motivation must be present that is capable of sustaining attention for as long as are necessary with respect to whatever purposes are being served by the act of imitation.

Finally, if imitation is to serve as a means of learning, then, what is imitated must be remembered. Consequently, a capacity to forge a link of some kind between the activity of certain mirror neurons (the alleged process of imitation) and the memory of what is being imitated must be present.

How do mirror neurons accomplish all of the foregoing? What are the concrete molecular dynamics that make such capacities possible?

How did mirror neurons acquire the capacity to accomplish all of the foregoing? How did DNA come to acquire the organizational wherewithal to give expression to such capabilities?

There is experimental evidence indicating that the firing of mirror neurons in both macaque monkeys and human beings can be correlated with certain kinds of imitative behavior. Beyond such correlations, however, there is very little evidence indicating how the molecular dynamics of mirror neurons and associated synaptic reconfigurations (along with the underlying DNA coding) is capable of explaining the nature of imitative behavior.

One should not construe the foregoing considerations to mean that I believe that no compelling account of imitative behavior as a function of mirror neurons is possible. Someone, someday, might come up with the evidence to prove such an explanatory model, but that kind of evidence does not currently exist.

At the present time, the causal link (as opposed to the correlational link) between mirror neurons and imitative behavior is just an unproven hypothesis. We don't know whether the capacity to imitate somehow informs mirror neurons to fire in one pattern rather than another (much like an incoming radio signal from an external source informs a radio to give auditory expression to that signal in one way rather than another), or whether the activities of mirror neurons themselves give expression to the process of imitation … and if so, then how.

Over the last 140 years, there has been a concerted effort by many scientists to force-fit mental functioning (such as the capacity for imitation) into a reductionistic framework in which mental phenomenon are explained as a function of the dynamics of neurons, synapses, and molecules. As has been pointed out earlier, as alluring as such a reductionistic framework might be, nailing things down has proven to be quite elusive, and in place of an explanatory account we only have a lot of unanswered questions (some of which have been asked in the foregoing discussions.

A great deal of evidence has accumulated – and at an accelerating pace – during the aforementioned 140-year period concerning the neurophysiology of the brain. Nonetheless, very little, if any, of that data has accomplished much more than give rise to some interesting and intriguing speculations (e.g., mirror neurons) concerning how mental phenomenology is generated as a function of neuronal, glial, and synaptic activity. To be sure, the dynamics of neurons, glial cells, and synaptic circuitry all have their roles to play, and on a physiological level a great deal is understood about how those kinds of processes work in relation to neuronal, glial, and synaptic functioning, but what is still missing from all that data is a plausible account of how those physiological processes generate mental activity and phenomenology.

The idea that the interacting dynamics of neurons, glial cells, and synaptic circuits cause: Consciousness, thought, language, reason, understanding, intelligence, creativity, and so on is not the best available scientific theory that we have to explain the phenomenology of the mind. At the present time, such a theory is no more scientific than is the notion that all of life can be accounted for through evolutionary principles since the evidence necessary to prove that kind of an account has not been discovered yet … although such evidence might be discovered somewhere down the empirical road.

The truth of the matter is that, currently, we do not understand what makes the phenomenology of mind possible. We do know that physiological diseases, infections, seizures, and ablations can interfere with that phenomenology just as a defective radio can interfere with the reception of signals from a radio station or radio tower, but a properly operating, neurophysiological system does not necessarily mean that such a system is responsible for the presence of consciousness or thought anymore than a properly operating radio necessarily means that the radio is responsible for the signals it is receiving.

Chapter 21: Memory

Daniel Tammet has been described as a prodigious savant – that is, an individual who, at a very early age, exhibited extraordinary intellectual, musical, and/or creative gifts. At any given point in history, there are only a very limited number of these kinds of individual who are known to exist (In today's world of more than seven billion people there are estimated to be between 50 and 100 individuals who cognitively operate in this manner).

In 2004 Mr. Tammet set a European record for being able to recite the first 22,514 numbers of π (3.14159 ...). This number is irrational (i.e., it cannot be expressed as a common fraction), and the number-sequence that gives expression to it does not involve any discernible, repeating patterns.

Mr. Tammet did not just spontaneously spout the record, 22,514 numbers. He spent a number of weeks preparing for that feat.

During the period leading up to his achievement, he focused on training an intriguing mental capacity he possessed. More specifically, he sees numbers as flowing, complex, colored, lit, textured, audible, multidimensional forms, and he used this ability to teach himself how to navigate his way through the numerical sequences of π.

In fact prior to the public demonstration of his facility with the numbers of π, Mr. Tammet composed a symphony of numbers made up of notes and chords of colors, shapes, lights, sounds, and complex dimensional forms. As he performed his musical composition in the privacy of his mind, he was led through the number sequence that gives expression to π (or, at least, the first 22,514 of those digits).

Consequently, in effect, Mr. Tammet was remembering more than numbers. He was remembering colors, shapes, sounds, textures, currents, meanings, and multidimensional forms ... which makes his feat of memorization even more impressive than just being able to recall several tens of thousands of measly numbers.

In effect, Mr. Tammet had constructed a mnemonic technique for remembering the numbers. He was remembering how to remember.

Memory involves learning. Learning involves memory.

He had to learn a symphony of sounds, textures, colors, lights, shapes, and multidimensional forms. Once he had learned -- or taught himself -- the multimedia symphony, he could remember the number sequence of π.

Learning involves grasping the character, nature, properties, or structure (or an aspect thereof) to which a given experiential context appears to give expression. Memory involves anchoring what has been learned in a way that renders the latter accessible to awareness under various circumstances.

The multimedia symphony constructed by Mr. Tammet served as an anchoring process. When he ran through the symphony, the numbers flowed into awareness.

Mr. Tammet has little difficulty – relative to the rest of us -- remembering a numerical sequence that is 22,514 digits long. Nevertheless, he has quite a bit of trouble identifying (i.e., remembering) the faces of some people he has known for years.

Why does his mnemonic technique work for numbers but not for faces? Mr. Tammet doesn't appear to know the answer to such a question for if he did he likely would have provided an account for such differential abilities, but based on my reading of his book: *Embracing the Wide Sky*, he either doesn't know the answer to the foregoing question or, for his own reasons, he has decided to keep that answer under wraps.

Why does Mr. Tammet perceive numbers through colors, shapes, textures, sounds, and multidimensional forms? What makes such a capacity possible?

Mr. Tammet doesn't know the answer to either of the foregoing questions (at least not yet). Moreover, no one else knows the answer to those sorts of questions either.

Do Mr. Tammet's perceptions of numbers take place within his mind or within his brain or both? Does the memory of what is perceived in conjunction with, say, numbers reside in his mind or in his brain or in both?

Mr. Tammet doesn't know the answer to such questions. Furthermore, no one else knows the answer to those kinds of questions either.

Do the dynamics of Mr. Tammet's brain give expression to the phenomenology of his mind? Or, does the mind somehow send signals that are received by the brain and -- like a radio -- the brain, then, translates those mental signals into discernible patterns involving neuronal, glial, and synaptic activity.

Mr. Tammet does not know the answer to the foregoing questions. And, at the present time, no one else knows how to answer those questions either.

There are certain individuals who have memories that are just as impressive as that of Mr. Tammet even as the memories of these other individuals appear to operate somewhat differently than does the memory of Mr. Tammet. For instance, the Russian neuropsychologist, Alexander Luria released a book in 1968 entitled: *The Mind of a Mnemonist: A Little Book about a Vast Memory* that discussed one of his patients – referred to as ‘S’ – who had the capacity to remember incredible amounts of information (often seemingly quite meaningless data) to which the patient had been exposed for only a relatively short period of time, and when tested many years later ‘S’ could, without review, recall the material in question (remember, Mr. Tammet spent a number of weeks creating a mixed-media symphony in order to remember 22, 514 digits of π).

There are other individuals who exhibit a capacity that is known as ‘highly superior autobiographical memory (HSAM). If you give them a date, they can tell you what day of the week it was, and, as well, they can proceed to relate a variety of facts about that day concerning their own lives as well as some of the news of the day that occurred on that occasion.

People who demonstrate the HSAM capability do not have photographic memories. Thus, unlike ‘S’ above, they cannot be given a list of words or data to memorize and, then, many years later reproduce that list upon demand, but, on the other hand, such individuals don’t seem to have exerted any kind of special effort to remember the things that they can remember in a largely errorless fashion many years later.

MRI anatomical studies have been done in conjunction with HSAM individuals. For example, the uncinate fascicle white tracts in the brains of HSAM individuals – these white tracts consist largely of glial cells and axons that pass information between the frontal and temporal cortices -- seem to be better connected than are the uncinate fascicle tracts of individuals without the HSAM capacity.

The foregoing finding has been suggestive since clinical work has indicated that damage to the uncinate fascicle has been correlated with impairment of autobiographical memory. However, conceivably, the more enhanced connections of HSAM individuals might be a result from the activity of such a capacity (similar to the way muscles get larger and better toned through exercise) rather than the cause of the HSAM capacity. Moreover, even if those white tracts are the cause of HSAM, nonetheless, precisely how the uncinate fascicle white tracts of HSAM individuals make such a capability possible is not known at the present time.

Another kind of memory phenomenon is known as “flashbulb memory”. Flashbulb memories” involve allegedly very clear and accurate remembrances of events that tend to be emotionally laden.

As I am writing these words, the anniversary of the death of John Kennedy is just three days away. Around the time that President Kennedy was assassinated, I was playing squash at the Cambridge YMCA.

After finishing the game, I remember walking up the stairs toward the street-level common room where a fairly large number of people were watching television. I asked what was going on and was informed that the President had been shot.

I don’t remember with whom I had been playing squash. I don’t remember if I won or lost the game. I don’t remember who answered my question, and I don’t remember what happened after my question was answered.

I do remember walking up those stairs and seeing people watching the television. It was a flashbulb-like memory.

Is my foregoing recollection correct? Possibly, but it also might be a false memory.

Many people suppose that flashbulb memories are unusually clear and accurate. However, this is not always the case.

One person who has studied this sort of memory is Dr. Heike Schmolck. One of her experiments involved exploring people’s recollection of the O.J. Simpson verdict.

After locating individuals who had watched the giving of the Simpson verdict on television, she asked her subjects a series of questions concerning the verdict. The same questions were asked of the same people: Three days after the verdict, fifteen months following that event, and, again, 32 months later.

Dr. Schmolck discovered that after 15 months had passed, only 50% of her subject's responses reflected their original descriptions and approximately 11% of those responses entailed serious discrepancies relative to their original descriptions. 17 months later (at the 32 month mark), the degree of agreement between the latest memories of her subjects and the earliest accounts of those subjects (three days after the Simpson verdict had been delivered) degraded another 21% (to 29%), and 40% of the 32-month responses involved serious discrepancies relative to their original responses.

The foregoing study certainly indicates that memories tend to fade over time. Nonetheless, I am not certain that Dr. Schmolck's study is about flashbulb memories ... although some of her subjects might have had flashbulb memories concerning their recollection of witnessing the Simpson verdict.

Dr. Schmolck maintains that oftentimes our memories become corrupted in one way or another over time. Furthermore, she indicates that the longer the period is between some given event and the recall of that event, the more likely it is that some facet or facets of our memory have been re-configured by our brain.

Given the extent to which memories fade, degrade and become corrupted, one wonders if one should refer to such phenomenological entities as 'memories' at all. Determining where the truth of memory ends and its corruption begins is not necessarily an easy thing to establish.

A few years ago, my wife and I took a trip back to the town of Rumford, Maine were I had lived, for the most part, up until the age of 11. We visited the street where I grew up.

I remembered how shocked I was concerning the length of the street -- where my family's house had been located – before it forked and divided up between a road that curved down toward a local variety store and the other fork that continued on toward the end of the neighborhood development. I remembered the pre-fork portion of the street (the portion that went by my childhood house) as being much longer than it appeared during the visit.

Last summer my wife and I, once again, traveled back to Rumford. As was the case during the last trip, we visited the street where my childhood home had been, and, this time I was shocked over how much longer the street seemed to be relative to my experience when my wife and I had visited my childhood town a few years earlier.

Which, if either, of the foregoing memories concerning the length of the street is correct? Was the portion of the street prior to the fork relatively longer or was it relatively shorter, or was it somewhere in between?

I have a memory of the street in question as being somewhat longer. I also have a memory of that street being much shorter.

Moreover, I have a memory of being shocked on both occasions. The memories of my sense of shock were sort of like flashbulb memories that are still fairly vivid, but I remain uncertain about the actual length of the street that runs by my childhood home … the portion of the street that is prior to the infamous (for me) fork in the road.

We have beliefs and opinions about some of our memories. Sometimes, those memories are more a function of beliefs than they are of things remembered … that is, sometimes we remember what we believe about the past rather than remembering the actual nature of the past about which we harbor beliefs.

Studies have been done concerning memory that indicate many people tend to retain the gist of events from their past but, over time, they tend to lose sight of many of the details of those events. One wonders how synaptic circuits differentiate between the gist of something and the actual details of that same something, and one wonders whether one can label beliefs -- about what we consider the gist of an event to be -- as 'memories' rather than merely being beliefs.

Confabulation is a process of fabricating or distorting one's understanding about the past and treating that understanding as an actual memory rather than an invented narrative. The fabrication is done without any overt intent to deceive other people … although, certainly, the first casualty of confabulation is the person who is doing the confabulating since like false beliefs concerning past events, the process of confabulation distances an individual from the nature of reality.

Jean Piaget -- who played an influential role in assisting the field of developmental psychology to work toward becoming a scientific discipline -- had a vivid childhood memory of being the subject of an attempted kidnapping. His account is quite detailed.

He remembers an assailant lunging out from some bushes that were near where he and his nanny were walking. He remembers that his nanny struggled (successfully) with the assailant and was scratched by the latter individual in the process.

Piaget remembers the policeman who interviewed them after the incident. He remembers the faces of the people who were milling around the vicinity where he and his nanny were standing shortly after the event.

It was an intriguing story, and therein lays the problem. The story had been made up by Piaget's nanny and was not an actual recollection of a past event.

The nanny did not confess the truth concerning the alleged attempted kidnapping until many years later and only after undergoing a religious conversion that induced her to come clean about her past. Yet, in the meantime – and this is the most interesting aspect of the incident -- Piaget seemed to have remembered the entire affair in considerable detail as an actual event and not as a story invented by his nanny.

When he was a child, Piaget and his nanny developed a consensus 'reality' concerning the alleged kidnapping incident. The nanny knew that the event was fabricated, but Piaget confabulated a 'memory'.

Sometimes (for example, consider the previously discussed issues of: HIV causes AIDS, SSRIs, Antineoplastons, and the theory of evolution), scientists seem more like they are involved in the process of confabulation than they are engaged in the process of science. They appear to sincerely believe (to give them the benefit of a doubt) that the narratives they are spinning constitute accurate reflections or memories of the available evidence when, on closer examination, their narratives seem more like confabulations involving that evidence.

Like Piaget and his nanny, sometimes scientists become committed to various editions of a consensus reality that has been cobbled together from mutually agreed upon fabrications of the data. Like Piaget and his nanny, sometimes such confabulations take on the appearance of reality because those appearances serve the interests of the individuals who have created such a worldview and not because those appearances give expression to the truth concerning the reality to which a given confabulation, or consensus reality, or worldview problematically alludes

Claiming that memory is a function of neurophysiology might be a modern form of confabulation or a form of consensus reality that is rooted in something other than the truth of things. If nothing else, there are many lacunae in the account (narrative) being given by scientists in relation to the phenomenon of memory.

For more than fifty years prior to his death in 2008, Henry Molaison was known only through the initials HM. The use of initials was intended to keep his identity hidden from the general public because, in his own modest way, HM became quite famous in the world of psychology.

In 1953, at the age of 27, Henry Molaison had surgery that was intended to treat a severe, potentially terminal form of epilepsy that had been creating havoc in Henry's life. During that surgical procedure the hippocampal region of his midbrain was removed.

The surgery cured his epilepsy, but he paid a price for this newly discovered relief. He lost the ability to establish new memories that lasted for more than a very, very short period of time.

HM could remember a great many things that had happened prior to his surgery (notwithstanding, of course, the troubles we all have in relation to recalling the past). However, HM could not translate present experience into long-term memories or learning.

If someone came into HM's room, introduced himself, or herself, to HM, provided some information to HM, left the room, and, then, re-entered the room a few minutes later, HM would have forgotten having been introduced to the individual and would have forgotten that a conversation had taken place prior to the 'stranger' having re-entered the room.

Under certain conditions, HM could learn new things – say a person's name. However, he wasn't able to anchor what had been learned in the form of a, more or less, permanent memory, and, therefore, he couldn't remember experiential events that took place in his presence beyond a few minutes.

As a result, HM suffered from anterograde amnesia. He couldn't form or recall new memories.

Prior to HM, the prevailing theory of memory maintained that experiential learning (whether episodic, factual/declarative, or procedural) was stored as memories in the two, hippocampal bodies (one hippocampus resides in each hemisphere) that are located under the cerebral cortex. As such, the hippocampus was considered to be primarily a place where memories were made, and, then, stored.

However, as psychologists began to work with HM (and one wonders how the issue of informed consent was handled since HM would forget whatever he might have given consent to within a very short period of time), theories about the role of the hippocampus in relation to the phenomenon of memory began to undergo a substantial change. More specifically, the neocortex came to be seen as the place where permanent memories were stored, and one of the roles of the hippocampus was to assist the transition of short-term memories into the long-term storage facility residing within the neocortex.

In addition, many psychologists now believe – again, as a result of studies carried out in conjunction with HM -- that the hippocampus also plays a role in helping to preserve old memories. According to psychologists, as we age, little used information tends to fade because the synaptic configurations that are considered to store that information begin to break down.

Over time, HM exhibited a substantially greater degree of deterioration in remembering information that he once knew (such as the meaning and spelling of common words) than control subjects did who were similar to HM in age, education, and so on but who, unlike HM, possessed intact hippocampi. As a result, some psychologists hypothesized that the difference between HM and the control subjects could be explained as being due to the absence of hippocampi that, from time to time, might help HM refurbish or strengthen old memories as did – or, so, the hypothesis went -- normal, control subjects.

While studies can be run that indicate there are memory differentials between a person like HM who has no hippocampi and control subjects who do possess hippocampi, this set of facts does not necessarily prove that hippocampi create memories, or transition experience into long-term memories, or, over time, help to preserve or strengthen those memories. One can also show that there are performance differentials between a damaged radio and a functional radio, but, nonetheless, such differentials do not prove that radios generate the signal they are receiving.

Obviously, hippocampi play some sort of role with respect to memory. However, pinning down the nature of that role in a precise fashion is not necessarily a straightforward and easily understood process.

How do synaptic spaces become sufficiently aware of themselves to be able to reconfigure connections in one way rather than another? In other words, what is the nature of the process through which the hippocampus comes to 'know' or 'understand' how to recognize, arrange, and integrate meaning, value, and structural properties involving an idea, emotion, and/or experience into a pattern of neuronal firing and synaptic configurations that constitutes one kind of memory rather than another kind of memory?

How does the hippocampus 'know' what kind of synaptic configuration will constitute the memory of, for example, an emotion rather than the memory of an idea or belief or episodic experience? How do neuronal activities and synaptic configurations come to give phenomenological expression or phenomenological representation to a memory of one kind rather than another?

What are the specific dynamics that permit the hippocampus to translate short-term memories into long-term memories? How are memories transferred from the hippocampus to the neocortex?

How do synaptic configurations remember themselves? Assuming that a person does not have an eidetic memory (and very, very, very few of us do), what decides – as well as why and how -- which of the second-to-second synaptic configurations that are being generated in the hippocampus are to be transitioned into long-term memory storage?

Once stored in a relatively permanent fashion, how do synaptic configurations find their way back into awareness? What determines that stored synaptic configurations (i.e., memories) will be activated in any given instance? How does the hippocampus 'know' where to find the synaptic configurations it has helped transition into long-term memories that are stored in the neocortex in order, from time to time, to help strengthen those synaptic configurations?

How does the hippocampus 'decide' that memories are important and that are not? Why are some memories that involve apparently unimportant data transitioned into long-term storage whereas other instances of seemingly equally unimportant information are not so transitioned?

How did the hippocampus acquire the capacity to create memories? How did the hippocampus acquire the capacity to facilitate the transition of short-term memory into long-term memory? How did the hippocampus acquire the capacity to strengthen synaptic configurations in the neocortex from time to time?

A number of years ago, Rodrigo Quiroga, Itzhak Fried, Christof Koch, Gabriel Kreiman, and Lela Reddy discovered something. While working in conjunction with a patient who had given consent for certain kinds of experimental research to be conducted during treatment for a neurological disorder, the foregoing researchers came across a neuron in the patient's hippocampus that responded vigorously when various photographs of Jennifer Aniston, an actress, were made visible to the patient, but the same neuron appeared to be indifferent to photographs of a number of other famous individuals.

The aforementioned researchers found a neuron in another patient that responded strongly when pictures of Halle Berry were shown to the patient and, in addition, that neuron also responded when the name of the actress was being typed on a computer screen visible to the patient.

Another neuron was discovered in one of the patients being studied that actively responded when images of Luke Skywalker were shown to the patient. Moreover, the same neuron responded to either the typed name of the science fiction character or if that name was spoken.

On the day following the discovery of the Jennifer Aniston neuron, the same experiment was repeated. In addition to once again being shown various pictures of the aforementioned actress, the patient also was shown photographs of Lisa Kudrow, a costar with Aniston in the television show *Friends*. The Aniston neuron responded to pictures of Lisa Kudrow as well.

Other individual neurons were discovered that similarly responded to related themes. For example, the neuron that previously had responded to pictures, sounds, and typed names involving Luke Skywalker also responded to images of Yoda, a fellow character in some of the *Star War* movies.

The researchers came to refer to neurons that fire in response to multiple, but related, stimuli as 'concept cells'. Each concept cell was considered to be part of a larger network of neuronal cells that give expression to a more detailed and complete representation of whatever theme or topic was being constructed through the interactive and collective efforts of the individual concept cells.

An ensemble of concept cells integrates information from the visual and auditory cortices. Other kinds of information also are integrated into the formation of a composite representation of this or that aspect of experience.

The foregoing concept neurons were found in the hippocampus. In the previous section on the patient HM, the discussion indicated that many psychologists believe – as a result of the experimental and observational data that was discovered by working with HM -- that short-term memories are created in the hippocampus and, then, converted into long-term memories that are stored in the neocortex. Consequently, if the latter theory is true, why are concept cells being found in the hippocampus, or, if we consider this issue from an alternative perspective, does the fact that concept cells are being found in the hippocampus constitute, to some degree, countervailing information concerning the theory of memory developed in relation to studies of HM?

According to some of the aforementioned researchers, the presence of concept cells in the hippocampus plays a central role in the translating of short-term memories into long-term memories that, subsequently, become warehoused in other parts of the brain. According to them, concept cells work with whatever has been triggered into awareness by the impact of sensory stimuli and, then, go about forging a long-term memory.

How do concept cells get triggered into awareness by sensory stimulation? How do concept cells 'know' what to do with the incoming sensory information that has triggered them into awareness?

Understanding how concept cells come to give expression to a concept remains something of a mystery. For example, how does a given neuron come to be associated with, or form, a particular meaning (say, Jennifer Aniston or Luke Skywalker or Halle Berry)? Does that meaning reside in the neuron, and, if so, how does this happen and what sustains that meaning in a given neuron?

The idea that neurons give expression to concepts seems at odds with another popular view held by many psychologists who contend that concepts are a function of synaptic spaces. On the latter view, neurons provide information that can induce synaptic spaces to reconfigure themselves, but when neurons have completed their task of generating an action potential that leads to the release of neurotransmitters into synaptic spaces, then according to the underlying theory, neurons return to their default position, and, as a result, their slate is wiped clean, so to speak, and, therefore, one has difficulty understanding how neurons give expression to concepts.

If neurons are firing in relation to certain stimuli, what, if anything, is taking place in the synaptic spaces bordering such neurons? Do the dynamics of neurons entail dimensional complexities beyond what traditional neurophysiology has been claiming for quite some time?

Is the neuron firing when shown pictures of, say, Jennifer Aniston because it is induced to fire by contiguous synaptic circuits? If so, what is the nature of that induction process?

How do synaptic circuits recognize an image being presented to a patient? Why do those circuits induce neurons to fire (if this is what happens)?

How do synaptic circuits give expression to a concept? How do synaptic circuits reconfigure themselves to give expression to one kind of concept (say, Jennifer Aniston related issues) rather than another kind of concept (say, Luke Skywalker related issues)? What organizes the reconfiguration process?

What is responsible for integrating different concept cells into a larger, more complete, and detailed ensemble or composite? What is sufficiently aware of the contents of different concept cells (and how is this awareness acquired and possible) to be able to integrate those cells into a coherent, meaningful, logical whole?

Does the brain (as a function of neuronal and synaptic activity) create the phenomenology of the mind? Or, is there some other dimension of the mind inducing certain neurons and/or synaptic circuits to fire when a patient is presented with a visual or auditory cue?

Does the causal flow of concepts run from mind to brain? Or, does that causal flow run from brain to mind? Or, does it run in both directions?

If one explores the circuitry of a radio or television set with an electrical probe, one can induce certain kinds of responses in the receiving device. However, the existence of such responses does not mean that a program being received by the radio or television set is generated by that circuitry.

The two (i.e., circuits and external signals) are correlated when considered from the perspective of the set. In order for a program to be made visible or audible, there must be collaboration between the signal and the set that is receiving that signal, but the signal and the receiver are different entities.

Similarly, the activities of the brain and the phenomenology of the mind are correlated. In order for the programming of understanding to be rendered visible, there must be some sort of collaboration between the mind (the station through which programming arises) and the set (i.e., the brain) that transduces that signal, but mind and brain are not necessarily coextensive with one another.

Some individuals (for example Stephen Waydo) have constructed neural networks by means of software programming. Some of these neural networks have been able to generate a means of recognizing and differentiating among a variety of unlabeled photographs and images of objects such as: planes, human faces, cars, and motorcycles.

The foregoing neural networks are described as having achieved their capacity to differentially recognize objects without being supervised by a teacher. Such descriptions seem somewhat misleading because the programming – however general it might be – that goes into stipulating the rules that govern the way in which the neural networks operate gives expression to the constant presence of a teacher (the programmer) that shapes whatever ensues once the neural network is permitted to reiteratively work out the possibilities that are entailed by the dynamics inherent in the rules governing a particular program.

In any event, the suggestion has been made that the foregoing sort of neural networks go about their activities in a manner that is somewhat akin to the way in which concept cells operate. Since no one really knows how concept cells go about their business (assuming that such cells exist), one really isn't in a position to determine whether, or not, neural networks and concept cells operate similarly to one another, and, indeed, concept cells (if they exist) might achieve the process of conceptualization in a manner that is very different from the way in which neural networks give expression to their own way of classifying the stimuli to which those networks are exposed.

Recently, I watched a 'TED' talk (TED is an acronym for 'Technology, Entertainment, and Design'). Two neuroscientists -- Steve Ramirez and Xu Liu – gave the talk, and it took place in Boston, June 2013.

The presentation was based on research that led to several publications that appeared in the science journals, *Nature* and *Science*.

The title of the *Nature* article is: '*Optogenetic stimulation of a hippocampal engram activates fear memory recall,*' and it was published in early 2012, while the *Science* report was entitled: '*Creating a False Memory in the Hippocampus,*' and the latter article was published in July 2013.

The ideas entailed by the foregoing articles and TED talk will be elaborated upon shortly. However, first, I would like to create a context for the critical reflection that will give expression to my comments concerning the research of the two aforementioned neuroscientists.

Toward the end of the June 2013 TED presentation, Steve Ramirez indicated that one of the purposes of their talk was to bring people up to date on the kinds of research that were taking place in neuroscience, as well as to acknowledge (even if only vaguely) the existence of various ethical issues raised by their research, and, finally, to invite people to join in the discussion with respect to their research. Steve's co-presenter, Xu Liu, also stipulated at one point near the end of the talk that their research was rooted in a philosophical principle of neuron science – namely, that, ultimately, mind is a function of physical stuff ... stuff that can be "tinkered with" and a tinkering process that is limited only by our imagination.

On the one hand, the following comments constitute my acceptance of the aforementioned invitation from Steve Ramirez during the June 2013 presentation for people to join in the conversation concerning their research. Consequently, part of my comments will address some of the ethical concerns that were alluded to by Steve Ramirez during the Boston presentation, while another aspect of my comments – perhaps the more central dimension of such comments -- will revolve around an exploration of the philosophical principle cited by Xu Liu that is at the heart of neuroscience and that, as indicated earlier, seeks to reduce mental phenomena to biological, material, or physical events.

Let's begin by providing an outline of the experimental model employed by Steve Ramirez and Xu Liu. Among other things, that model involves introducing mice to a few methodological bells and whistles.

Optogenetics (a word which appeared in the title of the aforementioned *Nature* article) is a term that – as the sub-components of the word might suggest – involves combining optical and genetic properties in certain ways. Essentially, microbial or viral genes are engineered to become receptive or sensitive, in some manner, to light or optical energies and, thereby, such genetic residues are enabled to, in effect, serve as a target for light sources (e.g., lasers) that will induce the target molecules to serve like switches that are capable of turning certain aspects of cellular functioning on and off when the genetically engineered concoction is injected into, say, mice and, subsequently, activated by laser stimulation.

In their presentation, Ramirez and Liu also point out that there is a biological marker or indicator present in cells that signifies certain kinds of activity have taken place in those cells. Therefore, part of the process of genetic engineering employed in the optogenetics technique is to take a molecular component that has a sensor-like capacity that is able to detect the presence of the aforementioned cellular indicator or marker signifying recent cellular activity and, then, splice that sensor component to the aforementioned molecular/genetic switch that, subsequently, can be activated and deactivated through the application of targeted laser energies.

In the case of the Ramirez-Liu experiments, the 'switch' portion of the genetically engineered component is channelrhodopsin. This is a membrane protein that controls the flow of certain ions (for example, sodium – Na+) into the interior of a cell. Modifying the flow of ions into a cell is possible because channelrhodopsin is a protein whose three-dimensional conformation can be altered when stimulated by, among other things, laser light and, in the process, open or close a membrane channel-way with respect to ion flow, thereby affecting the functioning of such a cell.

To sum up, the general idea employed by Ramirez and Liu in their experiments is to identify cells that are involved in, for example, memory formation through the manner in which those cells will leave an activity signature or marker. This marker can be detected by the genetically engineered sensor-switch component and, this, in turn, will transform the cell into a target that is believed to have something to do with memory formation and that -- when deemed appropriate by the researchers – can be activated by stimulating the switch side (i.e., the membrane protein channelrhodopsin) of the genetically engineered virus with laser light.

For quite some time, the hippocampus (a ridge section found along the bottom of the lateral ventricle portion of the brain – there are two such ridge sections … one in each hemisphere) has been implicated (via an array of experimental and clinical evidence) as playing an important role of some kind with respect to memory formation. Thus, when one scans the title of the aforementioned *Nature* journal article – i.e., '*Optogenetic stimulation of a hippocampal engram activates fear memory recall*' – and understands that the term "engram" is a way of referring to a memory trace that has arisen through a hypothesized change (temporary or permanent) in brain chemistry within the hippocampus, then one is being told by the *Nature* article title that the Ramirez/Liu experiment is one that uses optogenetic methods (outlined previously) to bring about the activation (or recall) of memories involving fear.

In 2000, Eric Kandel received the Nobel Prize for research that helped establish the nature of some of the physiological dynamics that are associated or correlated with memory formation/storage in Aplysia -- a sea slug whose relatively large nerve cells made it a good candidate for trying to scientifically analyze what happens biochemically when learning or memory formation occurs in those life forms. To make a much longer story somewhat shorter, Kandel and other researchers discovered -- while studying the gill-withdrawal reflex in Aplysia -- that sensitization and habituation (which are both forms of learning and, therefore, constitute instances of memory formation) were associated with the release of certain kinds of molecules … [e.g., c-Amp – the so-called second messenger of the cell -- serotonin (a neurotransmitter), PKA (c-AMP dependent kinase), and CREB (c- AMP response element binding protein) -- that appeared to play important roles in short-term and long-term memory formation, and, as well, the foregoing molecules seemed to be implicated in the processes that converted short-term memory into long-term memory.

The generation of the foregoing sort of cascade of biochemical molecules also was correlated with increases in synaptic complexity or connectivity. As a result, Kandel came to believe that changes in synaptic connectivity were indications that learning/memory was somehow being established through those synaptic enhancements, and, in turn, those changes in synaptic connectivity were some kind of a function of the cascade of biochemical changes that were taking place within neurons … although many of the details were lacking with respect to the precise dynamics of that function.

Mice are more complex than Aplysia, and humans are more complex than either mice or Aplysia. Nonetheless, ever since the work of Kandel began back in the 1960s, a great deal more biochemical, physiological, cellular, and neuronal evidence has been generated that is consistent with the idea that when certain (a) biochemical changes in cellular physiology are correlated with (b) changes in synaptic connectivity that are correlated with (c) differences in behavioral activity over time, and when the foregoing three elements occurred in relatively close temporal (if not spatial) juxtaposition to one another, then the collective presence of those three elements was interpreted to indicate that learning or memory had been generated ... and, this remains the basic idea concerning the issue of memory formation irrespective of whether one is talking about Aplysia, mice, humans, or any other life form that is capable of exhibiting a capacity to learn or retain memories (short-term or long-term) with respect to on-going experience.

Naturally, the physical/material details of learning and memory might change as one moves from species to species. Nevertheless, a growing body of evidence lends support to the idea that learning/memory is entirely a function of physical/material events.

The Ramirez/Liu research that was outlined in the June 2013 TED talk is a continuation of the foregoing perspective. The two investigators took mice and surgically implanted a means of delivering laser stimulation to the hippocampus portion of a mouse's brain that also had been equipped with a genetically engineered 'sensor-switch' that could detect recent activity in cells that seemed to be involved in the formation of memories concerning fear in the experimental animals.

More specifically, the researchers placed a number of surgically altered, and genetically engineered mice into a chamber where an electrical shock was applied to the feet of the animals. As a result of this experience, certain cells in the hippocampus portions of the mice brains became active, and this activity left a biochemical footprint that was detected by the genetically engineered sensor-switch that had been injected into the mice through a viral host and, as a result, served as target candidates for subsequent laser stimulation.

The fact specific cells became active during the shocking process was interpreted by the researchers to signify that a memory had been formed. However, a number of questions can be raised concerning that kind of interpretation.

To begin with, what does it mean to say that a cell has left a marker indicating that the cell has been active recently? Active doing what?

The presumption of Ramirez and Liu is that the cellular activity gives expression to processes that are involved in learning or memory formation. However, one could ask in relation to such activity: Involved how?

How does a neuronal cell's activity generate learning or memory formation? Where, exactly, is the memory amidst such cell activity?

Is learning/memory in the cells that have been activated? If so, what is the form of the dynamic structure or process that is said to 'hold' the memory in the cells – whether considered either individually or collectively? Or, is the memory of fear to be found in the synaptic changes that follow from the changes in cell chemistry? Or, is it some combination of the foregoing two possibilities?

According to Ramirez and Liu, the process works as follows. First, the three-dimensional conformation of channelrhodopsin is induced to change. As a result, certain ions begin flowing into the interior of the cell.

In turn, the ion influx leads to a cascade of metabolic processes involving, among other things, c-AMP, serotonin, CREB, PKA, and other bio-molecules. Where is the memory or learning in all of this, and how did this cascade of cellular denizens come to signify, or be interpreted to mean, "fear"?

Kandel and others believed that the foregoing cascade of events was functionally related to changes in synaptic connectivity and that it was this transformation in synaptic connectivity and complexity that signified that learning had occurred or that a memory had been formed. So, does the memory reside in the synaptic connections, and, if so, how is the memory instantiated in those connections, and if the memory is held through those synaptic connections, what determines the holding pattern and what 'reads' that pattern to understand that it is a memory that holds one kind of learning rather another kind of learning?

What is the relationship between, on the one hand, cells that are active during memory formation (the sort of cells in which Ramirez and Liu are interested and for which they have genetically engineered their sensor-switch mechanism) and, on the other hand, changing synaptic connectivity (which people such as Kandel believed was central to learning and memory formation)? If memory is in the cells – as Ramirez and Liu seem to believe – then what is the significance of the changes in synaptic connectivity and how does what transpires in the cell shape, color, and orient those synaptic changes?

Alternatively, one might ask what determines that cells will be initially activated to become part of the fear learning or fear memory process? Or, what determines that biochemical, electrical, and physiological changes will take place within cells that will permit an organism to differentiate learning/memory experiences over time.

After all, if the same cellular components (e.g., c-AMP, serotonin, PKA, CREB, etc.) are thought to be at the heart of memory formation, then how are those components put together in distinct packages that would enable an organism to differentiate among memories? Or, what determines the pattern of synaptic connectivity that will take place and that can be said to hold – allegedly – this or that form of memory/learning, and what is it about the structural or dynamical character of enhanced synaptic connectivity that gives expression to memory?

One might also critically reflect on the nature of the differences between the original existential circumstances that led to the – alleged – formation of a fear memory, and the quality of that memory relative to the actual event. People who suffer from PTSD have vivid, intense, flashbacks, and, consequently, there seems to be a dimension of intensity associated with such flashback memories that is comparable to the original circumstances out of which the memories arose.

However, memories are not always as vivid and intense as the original circumstances from which they were derived or on which they are based. So, the fact that a given memory in a mouse is activated doesn't necessarily explain – in and of itself – why such a memory should necessarily lead to the response of freezing, and, therefore, one is left with the possibility that something might be going on in the experiment other than what Ramirez and Liu are hypothesizing is the case.

Mice appear to have some degree of awareness or consciousness. How do cellular and synaptic changes generate phenomenology or how does phenomenal experience arise out of those changes?

When a mouse receives a shock to its feet, does the mouse experience fear or does it experience pain? Or, is the mouse experiencing stress?

There is a behavioral response in mice known as "freezing". This consists in a set of behavioral dispositions in which the mouse remains very still and, possibly, vigilant when immersed in a given existential situation that is considered threatening in some way.

Once a mouse has been shocked and, then, subsequently, exhibits, freezing, this doesn't necessarily mean that the mouse is experiencing fear or remembering fear while in the condition of freezing (although this might be the case). Instead, the mouse might be exhibiting a form of coping strategy (which could be instinctual rather than learned) that is intended to either help avoid subsequent shocks or deal with the pain of having been shocked, and if so, perhaps the primary phenomenological component under such circumstances is merely heightened vigilance with an inclination in the mouse toward escaping or avoidance when possible.

Alternatively, freezing in mice might represent a state of shock. Possibly, a mouse that is exhibiting freezing behavior might not either be in pain or in a state of fear, but, rather, is just stunned and directionless with respect to how to proceed or what to do next ... somewhat like a prize fighter who has been rocked by a punch and is merely trying to stay on his or her feet but with very little focused awareness concerning just what is going on around him or her.

A variation on the foregoing possibility is that ‘freezing’ in mice might be a response to stress rather than an expression of fear. Pulled in different direction by various internal and external forces, a mouse might freeze up, and, consequently, the associated phenomenological state is one of stress generated through conflict rather than fear.

The fact of the matter is that we don’t know what is going on in the phenomenology of a mouse during the state of freezing. Is the mouse afraid, in pain, in shock, stressed, uncertain, vigilant, wanting to get away, remembering a previous, similar problematic experience, or is the mouse experiencing some combination of all of the foregoing possibilities? We don’t know.

Freezing is a behavioral disposition that is exhibited by mice during certain circumstances. Freezing in mice is a coping strategy and/or an instinctual behavioral response.

Learning -- or memory formation -- might play some sort of modulating role with respect to how that behavioral response manifests itself within different circumstances. Nevertheless, we don’t necessarily understand what is triggering the behavioral response of freezing or what the precise properties and dynamics of the triggering event are.

Is the freezing response being triggered by a memory? If so, how does the memory lead to the initiation of the behavior?

Moreover, mice have a more expansive repertoire of behavior than just freezing. Sometimes they fight and sometimes they take flight?

What if the freezing is an indication that the mouse is uncertain about whether to pursue fighting or fleeing? What if the freezing indicates indecision rather than fear, stress, pain, or shock?

Perhaps, freezing means different things to a mouse in different circumstances. On some occasions, it might be an expression of fear, but on other occasions it might indicate stress, indecision, or a vigilant wait for the sort of information that might push the mouse toward fighting or fleeing.

We don’t know what, if any, phenomenology is associated with that behavioral response. We don’t know what, if anything, the cellular and synaptic changes that have been described by neuroscientists since the time of Kandel have to do with the generation of that phenomenology.

There is no neuroscientist on the face of the Earth who has yet been able to demonstrate how one goes from cellular changes in neurons to enhanced synaptic connectivity, and, then, is capable of proceeding on to demonstrate how the phenomenology of memories of a particular character and quality arise from those cellular and synaptic changes. All scientists have established so far is that there is a correlation between, on the one hand, certain kinds of biological events and, on the other hand, the appearance of behavior that seem to suggest that learning has taken place or that a memory has been formed, but, unfortunately, some scientists have jumped to unwarranted conclusions concerning the connection between biological activity and the phenomenology of experience.

Consider the following idea. One can probe the electronic intricacies of a television set all one likes – even down to the quantum level. However, such analysis will do nothing to tell one where the content and structure of the picture comes from that is made manifest through the television set.

As is the case with television sets, so too, biology, cell physiology, and synaptic connectivity might play a necessary supporting role with respect to the phenomenology of experience. Nonetheless, biology alone might not be sufficient to account for the character of the content that is given expression through the phenomenology of experience.

A television set plays a necessary supporting role with respect to being able to generate a picture on its screen but that same electronic device cannot account for why the picture has the content, structure, and informational quality it does. To account for the latter phenomenon, one needs to talk about television stations, writers, authors, directors, actors, producers, and viewers ... all of which exist beyond the horizons of the television set, just as a proper explanation for memory or learning might exist beyond the horizons of purely biological considerations – at least as those considerations are currently understood.

Let us return to the Ramirez/Liu experiment. Under normal circumstances, when a mouse is placed in an experimental box, the animal exhibits exploratory behavior ... sniffing and scurrying its way around the interior of the apparatus.

If the feet of the mouse are shocked during the exploratory process, the mouse, subsequently, might begin to display freezing behavior. According to Ramirez and Liu, the mouse has formed a memory of fear, and this state of fear leads to the behavioral response of freezing.

However, as indicated earlier, we really can't be certain of what is taking place within the phenomenology of the mouse. The mouse might be experiencing fear, but, as well, the mouse also might be experiencing a phenomenology of vigilance, avoidance, stress, shock, indecision, and/or pain along side of the fear or instead of such fear.

If shocked for a sufficiently long period of time with no possibility of escape, the mice also might come to exhibit the same sort of 'learned helplessness' that Martin Seligman discovered occurred with respect to dogs when the latter animals were exposed to inescapable shocks. Under such circumstances, the freezing might be a sign of learned helplessness rather than a state of fear per se.

Learned helplessness is a more complex phenomenological state than fear since it consists of the integration of a set of experiences rather than being a function of just one experience. Yet, the differences in phenomenological state between fear and learned helplessness both might end up being manifested through the same freezing behavior.

Ramirez and Liu arrange for the genetically engineered channelrhodopsin switch to be activated through the application of a pulse of laser light. This sets in motion a series of cellular biochemical and physiological changes, and, then, freezing behavior is exhibited.

What actually has happened? Has a memory been activated and, then, that memory causes freezing behavior to appear?

Even if it is the case that a certain memory has, somehow, been activated through the laser 'flipping' of the channelrhodopsin switch, can one be sure that the biological situation isn't somewhat similar to a television set that has been switched on, and, yet, the picture that appears is not – strictly speaking – caused by the turning on of the television set? Rather, the turning on of the television set is little more than a necessary precursor for gaining access to a picture (memory) that is generated through an entirely different process occurring outside of the electronic circuits of the television set.

Does the laser-activation of those cells that were active during the process of memory formation (when the unfortunate mice were shocked) represent the recall of a specific kind of memory? Or, does the laser-activation of such cells merely set in motion a sort of 'learned reflex arc' or 'behavioral circuit' that results in freezing behavior without the middleman of memory mediating between laser pulse and the condition of freezing?

We see the pulse of laser light being applied. We see the freezing behavior.

Ramirez and Liu hypothesize that the two events are bridged by the experience of a memory of a specific kind that has been activated by a pulse of laser light. However, they are unable to provide a plausible explanation that can take a person step-by-step from the point of initiation (laser stimulation) to the terminal point of behavior and show that what was transpiring involves a memory of a certain kind and the existence of that specific memory caused the observed behavior.

The fact of the matter is that Ramirez and Liu can't even be certain what kind of memory was laid down during the process of shocking. They claim the memory is one of fear, but they can't prove this because they can't eliminate the possibilities that the memory that formed might have contained elements of stress, pain, shock, or indecision … and not just fear.

Or, perhaps, fear was not part of the original memory phenomenology at all. For example, one might argue that the original memory was one of pain, not necessarily fear, and, therefore, fear is a secondary emotional response to the perception or anticipation of pain.

Did the laser-activation of cellular activity give expression to a memory of pain rather than fear? If so, then the title of their *Nature* article is, at best, misleading, and at worse, it is incorrect.

Moreover, if the original memory was of pain, then, how does the secondary event of fear come into the picture? How does laser-activation of a pain memory bring about an emotional response of fear that, in turn, brings about freezing behavior? Is the experience of fear a second memory different from the memory of pain, and isn't it possible that pain might be associated with other secondary phenomenological states (e.g., stress, flight, fight, vigilance, indecision, and shock) that could just as easily lead to a freezing response?

Ramirez and Liu can peer into the structure of their experimental situation only a little farther than their laser-activation of the channelrhodopsin. They know that such activation will set in motion a cascade of biochemical and physiological changes (the sort of changes explored by Eric Kandel and others), and they know that those changes will be followed by changes in synaptic connectivity.

However, they really don't understand what any of this cascade of molecular actually means other than the fact that, collectively speaking, such cascades are correlated with memory formation. The rest is all conjecture and speculation.

During the Boston presentation, Ramirez spoke of giving the mouse "a very mild foot shock". One wonders why a mouse would develop a fear memory if the shock were so "very mild"? Clearly, euphemistical language is being used to mask a process that is more painful than the phrase "very mild" might suggest.

Nothing was said during the Ramirez/Liu presentation (by either the researchers or the audience) with respect to the ethical issues entailed by treating animals in the way they were treated during the experiments that were the focus of the TED presentation. This was true both with respect to surgically altering the heads of the mice to accommodate a laser delivery system as well as in relation to shocking the mice, and, so, the ethical issues to which the researchers were vaguely alluding during their presentation apparently involved something other than the treatment of life forms within the lab.

When I was an undergraduate, I participated in an experiment involving the delivery of shocks, and the nature of the experiment was such that I was the one who delivered the shocks to myself. For me, there was a clear phenomenological difference between those shocks that were very mild and those shocks that were painful and might lead to a sense of fear, stress, shock, and/or anxiety if they were to continue.

In a rather startling expression of egocentricity, Ramirez/Liu appeared to be talking in terms of what they considered to be a very mild foot shock … with nary a spoken worry about what the mouse might have thought or felt about the whole affair. Nonetheless, the word that appears in the title of their Nature article is "fear" – the article title didn't say anything about 'a very mild shock memory recall, ' but, rather, used the phrase "fear memory recall".

Presumably, there is a difference in learning and memory formation with respect to different kinds of stimuli. The phenomenology of the experience involving "a very mild foot shock" is likely to be different than the phenomenology of an experience involving a shock deemed to be capable of generating a memory formation of fear.

So, even if one were to accept at face value everything that the two researchers said with respect to the nature of their experiment and the way in which it supposedly tapped into memory formation, there is a question that remains. Was the memory that was established in the mice one of fear, or of a very mild shock, or of something much more complex?

What exactly was in that memory? The researchers claim that the memory was one of fear, but even if this were true, that fear occurred in a context.

In other words, the shocks took place in an experimental apparatus within a laboratory. The air had a smell. The box had a smell. There were sounds. The box had a feel to it. There were visual qualities present within the box. The surgically implanted mechanism had a 'feel' to it.

The foregoing context served as horizon to the experience of the shock. The memory was not just a matter of the alleged fear but, as well, the memory involved certain aspects of the context surrounding the shock.

How are the foregoing sorts of contextual factors coded for with respect to either the cascade of cellular activities that occur in connection to memory formation or with respect to the subsequent alterations in synaptic connectivity? This is not an insignificant issue because, as we shall soon discover, it plays an important role within the Ramirez/Liu experiment.

More specifically, according to the two researchers, if one removes a mouse that has been shocked in one laboratory box and, in turn, places that mouse in another, different box, then the mouse will start out by behaving as any mouse tends to do when introduced into a new environment. In other words, the male or female mouse will begin to explore the box and will not exhibit freezing behavior. All of this changes when a laser is used to activate the channelrhodopsin membrane molecule in those cells that have been identified by the injected genetically engineered sensor-switch as having been active during the process of memory formation in the shock phase of the experiment.

When the laser is used to re-invoke the 'fear memory' by changing the three-dimensional conformation of the channelrhodopsin that leads to the flow of ions into the cell and sets in motion a cascade of biochemical and physiological events associated with memory, then mice that previously have been shocked will exhibit the freezing response. According to Ramirez and Liu, the mouse is being induced to remember the original experience of fear and responds accordingly – that is, the mouse freezes.

In their Boston presentation, Ramirez and Liu discuss how they have added a few wrinkles to their experimental design. For example, they talk about, first, taking surgically altered and genetically engineered mice and placing them in a blue box, and, then, identifying the cells that are active in the presence of such 'blueness'.

Before proceeding on with an account of the experiment, it seems to be appropriate to pause briefly and ask a question. How does one know that the cellular activity being identified by the researchers through their genetically engineered sensor-switch has to do specifically with blueness rather than some other feature of the experimental set-up, and, moreover, even if one were to accept the idea that the cellular activity has something to do with retaining a memory of blueness, once again, one can raise the question of what, precisely, such activity has to do with memory formation?

How – specifically -- is 'blueness' being encoded via the cascade of cellular events that are occurring during the learning of, or memory formation concerning, blueness, and how does this particular package or set of cellular events translate into unique changes in synaptic connectivity concerning the issue of blueness? Moreover, how is this aspect of learned or remembered blueness separated from, or integrated into, the context of other sensory experiences that form the context surrounding the experience of blueness?

In addition, one might ask why certain cells are selected for the memory of blueness, while other cells busy themselves with the memory of different sorts of sensory modalities. Or, one also might wonder how the work of an array of active cells concerning different facets of a experiential context become integrated to generate a unified phenomenological experience that can be understood in one way rather than another by a given life form. [By way of a personal aside, for reasons obvious and not so obvious, all of this talk about red and blue boxes led to my thinking about the contents of the so-called *Blue and Brown Books* of Ludwig Wittgenstein that I read as an undergraduate ... my memory seems to be somewhat colorblind].

Now, let's return to the Ramirez/Liu experiments. In the first stage of one of their experiments involving a blue box, nothing happens to the mice. They just get to explore the box.

In the next phase of the experiment, the mice are placed in a red box. While in the red box, a laser pulse activates the cells that were identified as being active during the blue-box experience, and, as well, the mice are given – I am quite certain – a very mild foot shock to generate a 'fear' memory that is now associated with a re-invoked or recalled memory of the blue box.

In the final state of this experiment, the mice are placed back in the blue box where they have never been shocked. Yet, as soon as the mice are placed in the blue box, they exhibit freezing behavior.

Ramirez and Liu maintain they have created a false memory in such mice. I have a little difficulty understanding how the two researchers arrived at their conclusion.

But, let's deal with first things first. Ramirez and Liu speak about an association being established between two things. On the one hand, there is the re-invoked memory of blueness, and, on the other hand, there is the shock that is given in the red box while the memory of blueness is re-invoked.

There is no false memory that is being created in the foregoing scenario. The association being established is not a false memory, but, rather, it constitutes the blending together of two facets of the red box context – namely, a shock and the experience of blueness.

This is an example of classical conditioning. One takes a stimulus – blueness – and pairs it with another stimulus – shock – to generate a behavioral response – freezing -- that can be initiated by the presence of blueness alone even without a shock being administered, and even though blueness had never before been experienced as being 'fear-stress-shock-pain-avoidance' related.

The mice are not misremembering the original experience of blueness. They have been taught something new during the time spent in the red box ... that is, they have been taught how the presence of blue can be threatening, and when the mice are placed back into the environment of the blue box, they are induced to enter into the condition of freezing because of what they learned in the red box.

Beyond the foregoing considerations, there is the problem of understanding the dynamics of association. How does the memory of association work?

Many individuals talk in terms of the capacity of various life forms to associate different aspects of experience whether through temporal and spatial juxtaposition. We all know that such a phenomenon is real, and we all note evidence of its presence through a wide variety of circumstances involving human beings and other life forms.

Nevertheless, no one really knows how it works. No one understands the dynamics of association, but, instead, we only acknowledge the result of those dynamics.

How does the memory of blueness and the memory of being shocked – very mildly -- enter into a new, modified understanding within the context of a the red experimental box that is capable of generating, say, the freezing response in mice? How does what happens in those cells that are active during the formation of a memory of blueness become intertwined with what happens in those cells that are active during the experience of being shocked?

One might suppose that there are many neuronal cells that are active during any given experience. Why is blueness singled out as the feature that is to be mixed with the sensory experience of being shocked?

Phenomena such as generalization do occur (as is evidenced by my previously noted aside concerning Wittgenstein's *Blue and Brown Books* in which some sort of 'colorblind' generalization took place in relation to the blue and *red* boxes of the Ramirez and Liu experiments). Various life forms do transfer certain aspects of learning or memory developed in one context to a broader array of contexts that are in some, as of yet, mysterious way acknowledged to be -- or arbitrarily designated as being -- similar to the original context of learning.

Unfortunately, we don't really know or understand much about how any of this actually works. We see all kinds of correlations, but we have little idea of how everything fits together and generates or causes this or that memory or this or that understanding or this or that belief or this or that instance of learning, and this remains true even with respect to the simplest of cases involving learning and memory formation such as in instances of: habituation, sensitization, association, conditioning, or generalization.

The experiments conducted by Ramirez and Liu really haven't gotten us any closer to understanding the specific dynamics of either memory, learning, or how the phenomenology surrounding such experience arises. More specifically, their work hasn't helped demonstrate how to bridge the gap between, on the one hand, changes in the internal biochemistry or physiology of neurons and synaptic connectivity, and, on the other hand, the actual, causal dynamics of learning and memory as a function of the former material changes.

Furthermore, Ramirez and Liu have not been able to explain in a plausible, consistent, rigorous, coherent fashion how changes in neurons and synaptic connectivity become manifested in phenomenological, conscious states that are characterized by differential qualities that are integrated into a unitary sense of experience concerning reality. In addition the foregoing considerations are quite independent of whether such unified phenomenology accurately reflects the nature of some aspect of that reality.

Ramirez and Liu only have provided us with some more correlations. These might be interesting correlations, but, in the end, that is all they are.

The methodological techniques that have been devised by and are used by Ramirez and Liu to demonstrate the existence of certain correlations are quite innovative. Nonetheless, the bottom line on all this ingenious innovativeness is that nothing which they have said in their TED talk or in the corresponding articles gets us any closer to understanding how the dynamics of memory and learning work, and, certainly nothing that they have said demonstrates the truth of the underlying philosophical premise that mind can be shown to be a function of purely material events … events that can be tinkered with.

This leads to a further issue. Toward the end of the Boston TED talk, Xu Liu talked about how we are living in very exciting times in which science is not tied down by any arbitrary limits with respect to the prospect of progressing in our understanding and knowledge concerning such phenomena as memory and learning. In effect, science is bound only by our imaginations.

Unfortunately, the imaginations of some people are more problematic and disturbing than are the imaginations of other people. The Defense Department subsidizes a great deal of the scientific work that is taking place in academia and in the corporate sector (both are integral parts in the military-industrial complex), and, as luck would have it, the people who are in control of that Department imagine all kinds of things with respect to the arbitrary uses to which scientific research can be put -- uses that end up killing, maiming, hurting, and enslaving people ... both foreign and domestic.

Although, in my opinion, the research of Ramirez and Liu has not demonstrated the generation of false memory, that research has revealed some possible techniques for interfering with the minds of life forms. How long will it be before the research of people like Ramirez and Liu is weaponized and applied against whomever the people in power deem to be appropriate subjects.

We don't live just in the exciting times about which Liu enthuses. We also live in very perilous and authoritarian times ... times in which all too many governments are quite prepared to do whatever is necessary to stay in power, control resources, and induce citizens to serve that power. Ramirez and Liu are very naïve if they believe their research is only about scientific progress, and they also are in denial if they suppose that they do not have a moral responsibility with respect to the possible applications of their work.

Speaking vaguely about the ethical implications and ramifications of their research work after the fact has got things backward. They should have been concerned about those implications before they did their research, and, in fact, those ethical deliberations should have impacted their decision about whether, or not, such research should have been pursued at all.

The Ramirez/Liu research dredged up memories within me of Michael Crichton's book: *The Terminal Man*. Like the scientists in the book, all too many neuroscientists today are full of swagger and arrogance with respect to their technical proficiency and ingeniousness, and, unfortunately, like the scientists in Crichton's book, all too many of them appear to be ignorant of their own ignorance concerning the many lacunae between what they believe they know and the actual nature of reality.

The scientists in Crichton's book believed they knew what they were doing. They didn't, and their ignorance cost the lives of quite a few fictional people.

The neuroscientists of today seem to believe they know what they are doing. This is not necessarily the case, and the problematic ramifications of that ignorance might manifest itself in potentially tragic ways only after problems of one kind or another have arisen.

The many physicists who worked on the Manhattan project believed they knew what they were doing. Few of them grappled with the horrors of Hiroshima or Nagasaki before the fact except, perhaps, Oppenheimer who quoted from the Bhagavad-Gita after witnessing the Trinity test: "Now I am become Death, the destroyer of worlds".

There were many physicists and other scientists who worked to bring nuclear technology into the real world. Those scientists seem unconcerned – before the fact -- about the possibilities of Three Mile Island, Chernobyl, and Fukushima becoming future realities, or about the problems surrounding the disposal of nuclear wastes, or the use of depleted uranium as weapons of mass destruction.

T.S. Eliot said: “Where is the wisdom we have lost in knowledge? Where is the knowledge we have lost in information?” Ramirez and Liu, along with a great many other researchers have a lot of information but do not seem to possess much in the way of either knowledge or, more importantly, wisdom concerning the ethical implications of what they are doing.

More specifically, I worry about people – such as Ramirez and Liu – who believe they understand what is going on with their experiments when this just might not be the case. The ramifications of ignorance are possibilities to which the foregoing discussion have lent some degree of credibility.

In the first chapter of this book, evidence was put forth concerning the terrible consequences that have ensued, and are continuing to ensue, from the self-serving arrogance of the pharmaceutical industry with respect to its psychoactive concoctions that are based on a form of technical wizardry that is entirely devoid of any real understanding concerning the human mind, but, is, instead, rooted in a bevy of correlations that are not understood. Yet, quite recklessly, the pharmaceutical industry and the FDA are permitting -- if not rushing -- all manner of drugs into the market that are generated through spurious science in their attempt to create life-time dependencies (rather than cures) with respect to this or that psychoactive drug … many of which entail potentially horrendous properties.

As people such as Joanna Moncrieff (*The Myth of the Chemical Cure*) a psychiatrist from England, and Peter Breggin (*Medication Madness*), a psychiatrist from the United States, have pointed out, neuroscientists have very little understanding of how psychoactive drugs metabolize within human beings or how the actual dynamics of the ‘effects’ of those drugs take place. The existence of side effects lends support to the foregoing claim.

I know of no pharmacological study that begins with a set of predictions concerning the precise array of side effects that will arise in conjunction with the use of a given psychoactive agent. Scientists do not make such predictions because they don’t actually know what happens in people when those drugs are taken.

For instance, there are many scientists and clinicians who speak in terms of the idea of “chemical imbalances’ being the cause of various emotional and mental problems, and this mythology is present in the marketing campaigns for an array of pharmaceutical products being advertised on television. Let's consider the case of SSRI – that is, selective serotonin re-uptake inhibitors.

I don't know of any neuroscientist who has provided a convincing argument about how the absence of serotonin causes depression or how the absence of serotonin leads to the sorts of symptoms that are associated with clinical depression. Moreover, there is also the rather embarrassing fact that when independent, double blind studies are done concerning the efficacy of SSRIs, those drugs have been shown to be no more effective than placebos.

In his book *Embracing the Wide Sky*, Daniel Tammet (introduced earlier) claims that scientists now know (is this the same kind of 'knowing' that scientists previously had with respect to serotonin?) that antidepressants work not because those drugs help maintain high levels of serotonin in certain synaptic spaces of the brain but, instead, antidepressants work because they enhance the production of trophic factors (a class of proteins that includes molecules such as NGF or Nerve Growth Factor) that assists neurons to grow. Even if antidepressants do lead to the production of greater numbers of trophic factors, how does that production alleviate the symptoms of depression?

Currently, there is no theory of which I am aware that credibly and viably accounts for why the problematic growth of neurons leads to depression (if this is what happens) or accounts for how such problematic nerve growth begins in the first place. Moreover, if depression is due to the problematic growth of certain groups of neurons, someone will have to come up with an explanation for why Electric Convulsive Therapy (ECT) -- which tends to destroy the growth of neurons -- appears to sometimes help relieve some of the symptoms of depression despite such destruction.

Moreover, just what is it that the enhanced growth of certain groups of neurons accomplishes? How does that growth alleviate the symptoms of depression, and, if enhancing the growth of neurons is all that antidepressants do, then, how does one explain the onset of 'medication madness' (see the work of Peter Breggin) in people who take antidepressants.

Finally, if scientists and doctors didn't initially know what was going on when people took antidepressants (after all, according to Tammet, it was only later that scientists discovered that antidepressants allegedly worked not because of the presence of serotonin but because of the stimulation of trophic factors like NGF), then why were doctors prescribing or administering so-called antidepressants at all? There seems to be a very unethical dimension to the practice of prescribing and administering drugs when the metabolic ramifications that ensue from the consumption of those drugs are not understood.

As Peter Breggin, Joanna Moncrieff, and others have documented in considerable detail, antidepressants seem to work by masking problems, not curing them. In the process, such psychoactive agents tend to dull, if not destroy, many facets of emotional life, consciousness, and human sensitivity.

Unfortunately, all too many so-called professionals seem to have mistaken the loss of one's humanity for the alleged effectiveness of a given drug with respect to a change in a user's symptom profile. Certain symptoms might disappear, but other problems surface, and people become so caught up in the former phenomenon that they fail to see the emergence of the latter kinds of problems.

Scientific methodologies are one thing. Conjecturing about the significance and meaning of the experimental results that are run through those methodologies is quite another issue altogether.

In line with the foregoing comments, I have a lot of concerns about the work of Ramirez and Liu because I am not convinced that they understand what they are doing … anymore than I believe that all too many scientists know what they doing when it comes to psychoactive drugs like SSRIs. For example, I do not believe that Ramirez and Liu have developed a theory of memory or learning per se although Ramirez and Liu certainly believe that they are working at the cutting edge of such a theory.

Seemingly, what they have is a series of conjectures based on a problematic understanding about, and interpretation of, the correlational dimensions of their own experiments along with the experiments of other individuals working in the area of mind/brain research. The issue before us is the following one.

Are neuroscientists on the right track with respect to their attempt to reduce mental phenomena to some set of physical dynamics and, therefore, the work of researchers like Ramirez and Liu represent important steps along an inevitable path that will take us to the promised land of full understanding and a complete explanatory account of how mental phenomena are all functions of underlying biological events? Or, alternatively, are neuroscientists on an asymptote path that generates ever more tantalizing correlations that will never permit them to reach the promised land of complete explanations and, instead, will only enable them to provide flawed accounts of mental phenomena?

I believe the foregoing critical analysis of the Ramirez and Liu experiments leads to more than a few questions about just what it is that neuroscientists know with respect to the nature of mental phenomena such as memory formation. Maybe, eventually, they will reach the promised land of 'Full Explanations', but right now they are stuck in the entangled underbrush that populates the land of descriptions that are based on proliferating correlations, and they don't seem to have much, if any, real understanding, knowledge, or wisdom concerning the actual nature of the mind.

Chapter 22: <u>The Computational Mind</u>

There are many individuals today who believe that the brain and the mind are synonymous entities. For such people, the term "mind" is just a more philosophical and archaic way of referring to the material and physical activities of the brain.

In other words, before the science of neurophysiology arose, the word "mind" was used as a catchall sort of notion that encompassed whatever theories (philosophical, theological, mythological, and/or psychological) that, supposedly, were associated with, or attempted to account for, mental phenomenology. However when the disciplines of information science, molecular biology, evolution, and neuroscience began to dominate the cognitive landscape, the brain was considered as the source and cause of all mental phenomenology, and, consequently, the word "mind" was relegated to being merely a linguistic reminder of how people in the past used to approach such phenomenology.

Since the advent of computers, many neurophysiologists (but not necessarily all of them) also often likened the activities of the brain/mind to an information-processing medium. Within such a context, reasoning, thinking, interpreting, and understanding are construed as computational processes without necessarily implying that the brain is just some kind of computer.

From the computational perspective, the brain constitutes a set of specialized modules that solve certain kinds of problems that are important for survival. Such modules are described as being the end product of natural selection, and, therefore, some proponents of the computational perspective claim that natural selection helps to design the computational modules inherent in the brain.

"Evolutionary psychology" is a phrase that certain individuals use (the term was coined by the psychologist Leda Cosmides and the anthropologist John Tooby) as a way of referring to the foregoing perspective. When engaged through those sorts of filters, psychology becomes a process of trying to reverse engineer the modules of the brain to understand how those processes serve evolutionary interests.

In general terms, evolutionary psychologists believe that the modules of the brain arose over long periods of time as a result of:

Copying errors during the process of replication, and/or mutational events, and/or the combinatorial powers of sexual reproduction that individually, or collectively, resulted in a capacity that was selected because of its ability to fit in with existing, material conditions and, thereby, assist not just the organism possessing such capabilities to survive but, more importantly, if that capacity was transmitted to other members of the general species population to which that individual belonged, then such a capacity would render the gene pool of that population to be more evolutionarily viable.

To say that natural selection is responsible for the designing of the brain (or any of its modules) is misleading. The foregoing claim would still hold even if evolutionary theory were someday discovered to give expression to an accurate depiction concerning the origin of life together with the processes of speciation that has been alleged to ensue from that origin … which, as pointed out in Chapter Two, is a very contentious proposition.

A biological capacity can only be selected if, in a given environmental and ecological context, that capacity is functional (or, at least, not dysfunctional). Although the functionality of a given biological capacity is due to the interactional dynamics of both the nature of such a capacity as well as the nature of the environment in which that capacity emerges, nevertheless, the environment has had nothing to do with that capacity having the properties it does since those properties are, supposedly, largely due to the vagaries of: copying errors due to chance happenings, random mutations, and the luck of the draw with respect to reproductive combinatorics.

The "design" of the biological capacity that allegedly arises out of the foregoing array of random events exists prior to its being selected by the state of environmental conditions. Indeed, the prevailing environmental circumstances select that design precisely because it is compatible with existing environmental conditions.

On occasion, some evolutionary biologists misuse the term "evolutionary pressure" in an attempt to explain why a given biological capacity arises in a given set of environmental circumstances. However, not only is this sort of terminology rather somewhat Lamarckian in character, and, therefore, at odds with a Darwinian approach to evolutionary theory, but, even more importantly, the foregoing terminology (i.e., evolutionary pressure) is not supported by any plausible, evidentially based account concerning the specific nature of the dynamics that permits the environment to "pressure" an organism to come up with new capacities that are compatible with a given environment.

Of course, after a string of events involving natural selection takes place, there is a sense in which one might talk about the properties of the organism (or population) that constitute the focal point of that kind of series of selection events as having been shaped, to a degree, by the environmental circumstances that continue to support the existence of an organism or population with those kinds of properties. Nonetheless, the foregoing sense of shaping only involves the determination of which features are being selected and has nothing to do with designing those features … the "designing" process has taken place before natural selection begins to act, and such existing designs are what natural selection acts on.

Notwithstanding the foregoing considerations, treating the mind as being a function of computational processes is intended to give emphasis to the idea that the brain processes information. The patterns, relationships, meanings, and logical currents inherent in that information can be studied – or so it is argued – independently of the media through which those properties arise.

According to advocates of the computational theory of mind, such an approach permits a long-standing puzzle in philosophy and psychology to be solved. More specifically, the computational theory of mind supposedly permits one to bring together two very different kinds of things into one, consistent, and coherent explanatory account – that is, non-material ideas such as intention, beliefs, and meaning can be translated into material processes within the brain (and vice versa).

In other words, beliefs, ideas, intentions, and meanings give expression to information. Moreover, from the perspective of the computational theory of mind, Information can be instantiated in the form of symbols that represent physical realities … such as the firing of neurons and the process of configuration and re-configuration of synaptic circuits.

Thus, the activities and processes of the brain give expression to ideas, beliefs, values, intentions, and meanings. Seemingly ethereal entities like intention and meaning cause concrete, material, physical events in the form of brain processes … and vice versa.

The structural character of ideas, meanings and intentions give expression to patterns of information. The structural character of neuronal action potentials, synaptic spaces, and glial cells give expression to patterns of information.

Information – which consists of a patterned sequence of symbols – becomes the common medium linking mental phenomenology and brain activity. Information flows through both the ethereal realms of mental phenomena and the physical/material realms of brain events.

According to the computational theory of mind, patterns of information can be encapsulated in programs that reflect the way in which those patterns of information might have been generated through an appropriately organized series of steps. That is, patterns of information can be translated into programs or algorithms that constitute a set of steps that are able to generate or recreate such patterns.

However, as Dick Martin, one of the main characters in the old television show '*Laugh In*', used to say: "Au contraire!" There are some problems roaming the interstitial spaces of the foregoing outline – brief though it might be -- concerning the computational theory of mind.

On the surface, the theory seems compelling and intriguing. Yet, when one probes beneath its surface a little, some of the initial impression of the theory's compelling and intriguing sense of shininess begins to fade and tarnish.

For instance, one can agree with the computational theory of mind that Ideas, thoughts, intentions, meanings, and beliefs can be described as a flow of information. Furthermore, the activities of neurons, synaptic spaces, and glial cells also can be described as a flow of information.

What is unclear is what one flow of information has to do with the other flow of information. For example, while the activity of a radio can be described as a flow of information, and, as well, while the signals being sent out by a radio tower or radio station can be described as a flow of information, the activities that are generating the signal are not the same as the activities that are receiving that signal and rendering it audible.

The two kinds of information do overlap with one another like Euler diagrams. Nonetheless, outside the spaces where the two kinds of information intermingle with one another to give expression to an audible radio program, the nature of the information that makes a radio receiver functional and the nature of the information that makes a radio program signal possible involve very different kinds of information.

The computational theory of mind is assuming that the activities of the brain contain the same kind of information as various ideas, meanings, and intentions do. However, this is not necessarily the case since the flow of information through the brain might be more like the activities underlying the functioning of a radio, whereas the flow of information running through ideas, beliefs, and intentions might be more like the activities that are underlying the generating and transmission of the original radio signal.

Now, admittedly, we don't know whether, or not, the foregoing similes are accurate. That is, we don't know if the brain is like a radio receiver, and we don't know if thoughts, beliefs, and intentions are like signals that are generated elsewhere but are being received by the brain.

However, that is precisely the point. Since we don't know how, on the one hand, thoughts and beliefs are possible, and, on the other hand, we don't actually know what is entailed by the activities of the brain (other than the generation of action potentials, the release of neurotransmitters, the dynamics of glial cells, and the configuration of synaptic spaces), we just can't assume our way to what the character of that relationship between mental phenomenology and brain activities will be, and, for the most part, the computational theory of mind appears to be doing just that … namely, assuming that the same kind of information is flowing through both mental phenomenology and the activities of the brain.

Yes, there might be a flow of information running through thoughts/intentions and, as well, through brain activities. We just don't know whether the kinds of information running through the two sides of the issue being considered are equivalent to one another (as is assumed – not proven – to be the case by the computational theory of mind), or whether -- like the relationship between a radio receiver and the signals such a device is receiving from a radio station or tower (and despite the fact that the latter two kinds of activity are capable of interacting with one another) -- those two kinds of activity are complementary to one another and are not equivalent to each other.

The activities of a radio can be represented as a flow chart of information-containing steps to which a functioning radio gives expression. The information processing capacity of a radio can be represented as a program or patterned sequence of steps.

The activities of a radio station that lead to the generation of a signal can be represented as a flow chart of information containing steps to which a functioning radio station gives expression. The information processing capacity of a radio station can be represented as a program or patterned sequence of steps.

Nonetheless, the two foregoing programs are not the same. The flow of information that is contained in each of the two representational programs involves different steps and different dynamics and different patterns of organization.

Do thoughts cause brain events? Perhaps.

Do brain events cause thoughts? Possibly.

However, the causal character of the relationship between thoughts and brain events is not necessarily because -- as the computational theory of mind assumes – those two dimensions give expression to the same kinds of information. The computational theory of mind has not proven that, on the one hand, brain states and, on the other hand, thoughts, intentions, beliefs, meanings and the like are one and the same … rather, that theory assumes this is the case.

Until the computational theory of mind can demonstrate that brain states give expression to, say, thoughts (and vice versa), then, the foregoing theory has not really solved the aforementioned puzzle concerning the causal relationship between mind and brain. Until the foregoing equivalency has been demonstrated, then the computational theory of mind has not shown that thoughts cause brain states or that brain states cause thoughts, but instead the computational theory of mind is using linguistic sleights of hand (i.e., the same term –

"information" -- is being used to refer to potentially different kinds of phenomena) in order to give the impression that the patterned information contained in thoughts, beliefs, intentions, and meanings is the same sort of informational currency that is flowing through the brain.

One should also keep in mind that the idea of 'information' is a medium of description and not necessarily a mode of ontology. Thoughts can be described in terms of informational content (as can brain events), but, ontologically speaking, thoughts are not necessarily a function of information, anymore than the activities of the brain can be reduced to being a function of information.

For example, words are linguistic symbols that give expression to information. In addition, words can be used to describe both mental phenomenology and brain activities, but neither mental phenomenology nor the activities of the brain are necessarily reducible to language, anymore than mental phenomenology and brain activities are necessarily reducible to flows of information despite the fact that both mind and brain can be described through the concept of information. Seemingly, the computational theory of mind has difficulty differentiating between such nuances of possible meaning.

From the perspective of the computational theory of mind, the modules of the brain -- that is, the specialized biological networks consisting of: Neuronal action potentials, glial cell activity, neurotransmitter dynamics, and synaptic configuration processes -- are constructed by means of an underlying algorithmic recipe inherent in the information of the genome. Such genetic information gives expression to a developmental system that is responsible for the unfolding of those specialized modules at the right time, and in the right place, and with the right set of components and capabilities.

During the brain's developmental process, an array of neuronal modalities must be fashioned and different kinds of glial cells must be constructed. For example, neurons and glial cells must be equipped with the right kind of membrane proteins as well as with a capacity to release neurotransmitters and gliotransmitters under the right circumstances and with the right kind of functional shapes to enable those transmitters to attach to the right kind of membrane proteins.

In addition, neurons and glial cells must be induced (via the construction of paths made from the right kinds of chemical molecules) to migrate to their appropriate 'homes' within the architecture of the brain. Once settled, neurons must be induced to send out axon processes and dendritic branches to be able to communicate with appropriate neural networks in other parts of the brain as well as be able to lend assistance to the construction of various kinds of synaptic circuits, while glial cells must be induced to form networks of gap junctions that permit glial cells to communicate with one another as well as to be able to be sensitive – to some degree – to the dynamics of neurons.

How did the blueprint for the foregoing developmental process arise? No one knows.

Even if one assumes that such a blueprint came together through a process of evolutionary steps (and there is no compelling theory that explains what those steps were or when and how they occurred), nevertheless, no one knows why that blueprint has the properties it does or precisely what those properties accomplish, if anything, as far as the contents of mental phenomenology are concerned. Does the genomic blueprint for the brain enable ideas to be generated and intentions to be formed and judgments to be made, or does the genomic blueprint give expression to a very elaborate receiving device that, within limits, filters, frames, and modulates the signals it receives, but is not necessarily capable of producing the contents of mental phenomenology?

If the genomic blueprint for the brain is not capable of enabling the brain to generate either a screen of awareness and/or the phenomenological contents that play on such a screen, then, certainly, a huge problem is left behind – namely, how does one account for consciousness and the mental contents of consciousness. However, at the present time, that problem cannot be addressed adequately by merely assuming that the genomic blueprint underwrites something like a computational theory of mind.

If we don't know how the genomic blueprint for the brain arose, and if we don't know what, if anything, the blueprint for the brain has to do with the generation of consciousness and the contents of consciousness, and if we don't know how the modules of the brain acquire their specialized computational capabilities, then it becomes quite difficult to judge the value of any given edition of a computational theory of mind. Given the many things that we don't understand about how the genomic blueprint for the brain came to be or what, exactly such a blueprint is capable of accomplishing, can one really reverse engineer the contents of consciousness and in the process come to understand how the specialized modules of the brain made such contents possible or what functions they serve?

One can come up with an indefinitely large number of theories about how evolutionary forces might have generated the blueprint for the human brain. One can come up with an indefinitely large number of theories about why various modules of the brain have the capacities they do? One can come up with an indefinitely large number of theories about how the properties of the brain might be able to generate consciousness and/or the contents of consciousness. One can come up with an indefinitely large number of theories about how consciousness and the contents of consciousness arise through means other than the activities of the brain.

The problem is that we do not possess a sufficient understanding of the process of evolution (if that is what is directing things), or the nature of the brain, or the nature of mental phenomenology, or the nature of the universe to be able to identify that of the foregoing indefinitely large numbers of theories best reflects the available data. All manner of computational theories of mind are possible, but we have no reliable means of navigating our way through those possibilities to locate the 'right' one because too many fundamental issues concerning the nature of evolution, the brain, consciousness, mental phenomenology, and the universe are unknown.

Are beliefs, meanings, assumptions, ideas, values, judgments, inferences, insights, intentions, and interpretations various kinds of computations of the brain, and, if so, what kind of computations are they? Or, do the computations of the brain involve other kinds of activities that are related to, but different from, the dynamics that underlie the generation of beliefs and the other contents of mental phenomenology (much as a radio and the signals it receives are related to, but different from, one another)?

The difference between information and noise is the presence or absence, respectively, of order. Any given computational theory of mind will have difficulty justifying its existence if that theory cannot account for the origins and nature of the order that renders its computations possible or cannot determine whether such computations are even possible as a function of what developmental genomics enable the brain to do.

Consider the following possibility. Intelligence, in general, could be considered to be a computational module, or one might divide that general capacity into an array of sub-specializations that collectively give expression to that general capacity.

Whether considered as one dynamic capacity or as a collection of specializations, from the perspective of the computational theory of mind, intelligence is a function of the way that neurons, glial cells, neurotransmitters, gliotransmitters, and synaptic circuits interact. Moreover, such interaction gives expression to the possibilities that the underlying genomic blueprint for the brain sets in motion through the processes of development as well as through the manner in which the millisecond-to-millisecond transactions of the brain unfold in accordance with the guidance of the genomic blueprint in terms of both general and specific forms of modulating influences.

One small, but important, dimension of intelligence involves the process of making assumptions in order to be able to engage various aspects of experience. Assumptions can play important catalytic, heuristic roles in the development of understanding by providing one with a conceptual place to stand as one works out the implications of such possibilities … possibilities that might be difficult to conceptualize without the starting point provided by assumptions.

Mathematical systems, sciences, philosophies, and theologies all employ certain kinds of assumptions to which, for better or worse, individuals commit themselves. However, everyday life also is woven together by a variety of assumptions that help bridge the gap between what is known and what is not known.

Assumptions also help shape what we believe we know. If those assumptions are proven to be false or turn out to lead to problematic consequences, then, one will be required to rework the conceptual landscape that has been built, in part, through the presence of assumptions.

Assumptions provide vectored starting points from which to launch exploratory expeditions that seek to reach the promised land of understanding. Assumptions help to frame experiential data and invest that data with a sense of meaning. Assumptions purport to explain why a given phenomenon is the way that it is. Assumptions offer opportunities through which to test the nature of reality against the perspective to which an assumption gives expression. Assumptions can lead to fruitful, heuristically valuable results even if such assumptions turn out to be false or problematic.

The foregoing paragraph outlines what assumptions can do. However, what makes assumptions possible? How do assumptions arise?

The computational theory of mind maintains that assumptions emerge as a result of the interactional dynamics of neurons, glial cells, neurotransmitters, gliotransmitters, and synaptic circuitry that have been made possible by the potentials entailed by the genomic blueprint that helps govern the processes of life. The previous sentence outlines -- in a fairly clear manner -- a general outline concerning the emergence of assumptions from the perspective of the computational theory of mind.

The devil is in the details. This is because, so far, no one has been able to show how some set of specific brain dynamics, together with the potentials of the underlying genetic blueprint, are capable of giving expression to something as seemingly simple as the process of making an assumption.

Are assumptions insights of some kind? Are they intuitions?

Are assumptions inferences? Are they imaginative guesses concerning the possible nature of reality?

Are assumptions computations? If so, what kind of computations are they, and what makes such computations possible?

Do assumptions arise, somehow, as a function of the genomic blueprint for the brain? If so, how does this work, and how did the capacity to make assumptions become encoded in the DNA that gives expression to the blueprint for the brain?

Or, do assumptions emerge through the dynamic potential of the neural networks that are put in play by the underlying genomic blueprint that governs the activities of the brain? If so, what are the specific details governing that process of emergence?

The computational theory of mind is rooted in many assumptions. That perspective employs assumptions concerning the nature of origins, evolution, mind, brain, computations, and theories.

If that theory cannot account for how assumptions are possible in terms of its own perspective, then, what, really, does such a theory have to offer? Is the computational theory of mind anything more than a set of empirical data framed, filtered, shaped, oriented, and ordered by a set of assumptions that is rooted in ignorance concerning the origins of such assumptions?

Are the assumptions we choose as heuristic tools through which to engage experience a matter of genetics and/or environment and/or something else? From the perspective of the computational theory of mind, how do human beings acquire the capacity to generate assumptions and, then, choose to use them in an attempt to explain, or frame, or theorize, or filter, or prove the nature of reality?

What combination of action potentials, glial cell dynamics, synaptic reconfigurations, and flow of neurotransmitters and gliotransmitters generates an assumption and the choice to implement that assumption? What determines that such an assumption will have one kind of structure and content rather than some other kind of structure and content?

Over the last 15-20 years, an array of interesting things have been discovered about what used to be referred to as junk DNA … "junk" because no one could figure out what, if anything, it encoded for, and, consequently, most scientists dismissed the molecular material as genetic flotsam that merely constituted accumulated residue left over from generations of coding errors, jumping genes, and the like. In the light of recent research, however, an increasing proportion of so-called "junk DNA" is being shown to have functional value through the manner in which it provides instructions about how, when, and where the genetic blueprint expresses itself.

Perhaps, allegedly junk DNA is camouflaging the manner in which the computational character of the mind operates. Maybe such components of mental phenomenology as: consciousness, choice, imagination, creativity, language, reasoning, thinking, and understanding are functions of the instructional guidance contained in what previously had been considered to be nothing but junk.

When one is ignorant, anything seems to be possible. We are ignorant because proof has not, yet, surfaced with respect to how any of the foregoing computational possibilities correctly account for the phenomenology of mental spaces.

Furthermore, even if such a proof (or set of proofs) were forthcoming, there still would be a canyon-sized hole in the computational theory of mind's account of cognition. More specifically, ultimately, the computational theory of mind is rooted in evolution, and, consequently, advocates of that theory must be able to provide a plausible account of how such instructional and computational wherewithal became encoded in the human genome.

Currently – and as previously indicated -- the computational theory of mind does not have a plausible and viable account of how the genetic blueprint is able to generate the computational processes that constitute such phenomena as consciousness, reasoning, intelligence, imagination, creativity, understanding, and language. Furthermore, that theory does not possess a plausible and viable account of how such computational capabilities came to be encoded in the genetic blueprint for the brain.

Moreover, if the genetic blueprint does not provide strict instructions (via, say, what was formerly known as "junk DNA) for the running of cognitive, computational dynamics (such as choosing and making assumptions), then the computational theory of mind will have some computational work of its own to do. In other words, the computational theory of mind will have to provide an account of how the genetic blueprint for the brain creates the <u>potential</u> for generating mental phenomenology through the manner in which the genetic blueprint enables neurons, glial cells, gap junction networks, neurotransmitters, gliotransmitters, and synaptic circuitry to give expression to the dynamics through which the computations emerge that underwrite mental phenomenology.

The lexicon of mental phenomenology includes terms such as: awareness, ideas, beliefs, values, judgments, intentions, emotions, reasoning, interpreting, and understanding. Presently, the computational theory of mind cannot account for the nature of the computations that generate the phenomena to which the foregoing terms allude, anymore than that theory can account for the nature of the computational process that makes assumptions possible.

The Minnesota Study of Twins Reared Apart explores what happens when individuals who are from the same set of identical twins are raised in different environmental contexts and, then, that research is compared against what happens when individuals who are from the same set of fraternal twins grow up in different environments. Some interesting findings have been discovered.

For example Jim Lewis and Jim Springer are one of the sets of identical twins that were studied in the aforementioned research project. Their lives apart began at the age of four weeks, and they were not reunited until approximately 39 years later.

Both of the Jims shared some remarkable similarities despite having been raised in different circumstances. For instance, both of them married and divorced a woman named Betty … presumably the Betty in question was different in each case.

Both Jims had a dog named "Toy". They both were fathers of boys named James with middle names that differed by only one letter, 'l' … Alan versus Allan.

They both owned Chevrolets. Each of the two individuals was employed as a part-time sheriff, and they each spent their vacations in Florida.

The two Jims also exhibited pretty much the same pattern of behavior with respect to smoking and drinking. In addition, the two individuals both began to suffer headaches around the same time in their lives – age 18.

Not everything was the same between them. For instance, one of the Jims preferred to express himself orally while the other Jim was inclined toward writing things out in order to express himself.

Their hairstyle preferences were also different. One Jim likes to have sideburns and slick his hair back, while the other Jim lets his hair fall across his forehead and does not maintain sideburns.

There were other identical twins involved in the aforementioned study that exhibited their own sets of similarities. For example, there were two females who had been separated from one another at the age of six weeks and were not reunited for another fifty-plus years.

They both had been haunted by the same nightmarish dream for years. The dream consisted of having fishhooks and doorknobs stuffed in their mouths and, then eventually, dying of suffocation.

Although one might anticipate that identical twins would share some similar physical characteristics – for instance, being prone to headaches or being inclined toward similar behaviors with respect to, say, smoking -- nonetheless, issues involving overlapping behavioral tendencies with respect to nightmares, cars, vacation spots, and occupations, or the virtually identical character of the names for a spouse, child, and dog are a little more puzzling. Equally intriguing is the fact that there are some differences in how such twins comport themselves in certain areas of their lives since if everything is a matter of genetics, as one might assume, then how do such differences arise?

Are the choices that the two Jims made in conjunction with the name of the women they married and divorced a function of genetics? Are the choices the two individuals made with respect to the kind of job, car, or place where they vacationed a matter of genetics?

Is choice a function of genetics? If so, how does the phenomenology of choice arise out of genomic dynamics?

Moreover, if choice is a matter of genetics, then, how does one account for the differences in choices that are made by identical twins? How do environment and genetics interact to give expression to such computational differences?

Are the only two options we have to decide the foregoing issues a matter of genetics or environment … nature versus nurture? Does an individual bring anything of his or her own to the human condition that permits her or him to choose independently of nature and nurture?

Prior to the work of such experimental physicists as John Clauser, Stuart Freedman, Alain Aspect, Michael Horne, Anton Zeilinger, and a few others, the notion that two entities might be able to 'communicate' with one another in an apparently instantaneous-like manner seemed rather far-fetched. While I will have more to say on this topic later in the book, for present purposes, I will just draw your attention to the empirically proven fact that photons have been experimentally demonstrated to be 'in touch' with one another in ways that seem to be independent of the capacity of the speed of light to be able to transmit some sort of signal across the distance separating those quantum objects.

Since the time (1905) when Einstein's special theory of relativity first entered the consciousness of physicists, scientists have accepted the idea that nothing travels faster than the speed of light. Thus, if that understanding is correct, then what is one to make of an array of well-designed and well-executed experiments that have demonstrated that two quantum entities that previously had interacted with one another apparently can -- to some degree -- continue to communicate with each other despite the fact they have become separated by a distance that cannot be traversed by a signal traveling at the speed of light within the time frame being considered?

In English, the phenomenon is known as "entanglement". In general terms, the underlying principle appears to be that once, say, two photons interact with one another, then even when those quantum entities become separated from one another by distances that cannot be traversed by signals traveling at the speed of light within a given framework of measurement, nonetheless, those photons appear to still be causally connected such that if a change occurs to one of the entangled quantum entities, that change will be reflected, as well, in the behavior of the other entangled quantum object.

To be sure, the differences between human beings and a couple of quantum objects are indefinitely great. However, if quantum objects that once interacted with one another are capable of staying in touch with each other after being separated, then, perhaps it could also be the case that identical twins who interacted with each other for even a period as little as 4-6 weeks might continue to be entangled in certain ways with one another following separation, and, as a result, some of the choices of one twin might influence the choices of the other twin.

The foregoing idea is not being introduced as an explanation for why identical twins sometimes exhibit such extraordinary similarities in their choices. Instead, it is being mentioned to provide a concrete context through which to entertain the possibility that there might be more forces acting upon us than can be accounted for by genetics and the immediate environment.

In 1980 John Searle introduced a thought experiment that attempted to point out what he considered to be a problem with the computational/information processing approach to the idea of what it means to have an understanding of something. More specifically, among other things, the computational or information processing theory maintains that understanding is just a matter of running an appropriate program (the algorithmic processing of information) under the right circumstances in order to, say, solve a problem, whereas opponents of the computational theory contend that understanding involves more than just being able to run the right program at the right time in order to obtain a certain kind of result.

Searle's thought experiment is often referred to as the Chinese Room Argument. The thought experiment begins when a human being who does not know, understand, or speak Chinese is placed in a room that has a variety of boxes containing Chinese characters (this serves as a data base).

The individual also is provided with a book of instructions that tells him what to do with the characters stored the boxes when pieces of paper -- with characters on them -- are slipped under the door to the Chinese room. Unknown to the person in the room, the squiggle-like markings on the paper are Chinese characters, and, in addition, the individual in the room does not know that the instruction book that she or he has been given is a program that gives expression to some form of artificial intelligence … a form that is designed to assist the individual in the room to arrange the characters in the boxes so that they constitute appropriately crafted answers that are written in Chinese to questions that are being asked in Chinese in relation to a story (which, presumably, has been written or spoken in Chinese).

There is a general procedure that is followed by the person in the Chinese Room. First, a slip of paper with squiggles on it is slid into the room through the small space between the bottom of the door and the floor of the room.

The individual in the room picks up the piece of paper (the input), looks at the squiggles, and, then, consults the instruction book and the characters in the box to find out what to do when such squiggles appear on a slip of paper (this gives expression to a kind of information processing). Next, depending on what that individual finds in the instruction book, the person follows the instructions that are provided and writes down the indicated squiggles on a piece of paper, and, when necessary, slips those pieces of paper with squiggles on them beneath the door leading to another room (the output).

Over time, the individual in the Chinese Room gets quite proficient at finding out what to do when different pieces of paper with various squiggles on them are slipped into the room. Based on the answers that are received in relation to the questions that are slipped beneath the door, the person (or persons) on the other side of the door from the Chinese Room has (have) come to believe that the individual in the Chinese Room speaks Chinese.

The individual in the Chinese Room is doing nothing but: (1) taking pieces of paper with squiggles on them that have been written by someone else; (2) using the squiggle characteristics to locate the relevant sections of the instruction book and the characters in the boxes that deal with those kinds of squiggles; (3) following the instructions given in the book involving those squiggles to be able to provide an output that is relevant (according to the instruction book) to those squiggles, and (4) returning – to the other room -- a piece of paper with squiggles that have been manipulated in accordance with instructions provided by the book. Consequently, although the individual is providing apparently satisfactory answers as far as the question-askers are concerned, nonetheless, the person in the Chinese Room does not really understand what is going on as far as the meaning of the slips are concerned that are being received and sent.

He didn't understand Chinese at the beginning of the experiment. He doesn't understand Chinese at the end of the experiment.

On the surface, what is taking place in the Chinese Room appears to constitute evidence that the Turing Test has been passed. In other words, the person who is sliding pieces of paper containing questions written in Chinese under the door to the individual in the Chinese Room comes to believe that whoever is answering those questions is a conscious being who understands Chinese sufficiently well to be able to answer questions about a given story in a intelligible and satisfactory manner.

Searle argues that the Chinese Room Argument demonstrates that one can arrange a set of circumstances involving a computational system – that is: (1) A data base; (2) a program; (3) an input; and (4) an output -- which is capable of fooling people and inducing those individuals to believe they are dealing with a conscious, intentional, intelligent agent and, thereby, pass the Turing Test. Yet, despite the capacity of the previously outlined computational system to be able to pass the Turing Test, that computational system does not understand the nature of the Chinese characters that are being processed.

The foregoing argument involves some issues that are being conflated with one another when they should be kept separate. As a result, the computational/information processing aspect of things becomes somewhat muddled.

One can acknowledge that Information processing is taking place within the Chinese Room. However, only part of that processing involves some discernible computational properties – namely, the program in the instruction book.

Nevertheless, one cannot necessarily prove that the <u>creation</u> of such a program is the result of a computational process. Presumably, the program didn't write itself.

One or more human beings did the coding. Therefore, whether, or not, the cognitive processes that led to the writing of the program are computational in nature is a separate issue.

Moreover, the program contained in the instruction book and the collection of Chinese characters stored in the boxes that are in the Chinese Room are only capable of generating an answer because of the cognitive activity of the human being in the room. This cognitive activity includes: Rummaging around for the correct characters in the boxes (assuming no mistakes are made during this facet of information processing), and, then, the individual has to find the appropriate parts of the program in the instruction book (assuming no mistakes are made during this part of information processing), and, then, the individual has to interpret the instructions in the book to arrange the characters in a certain pattern (and, again, assuming that no mistakes are made during this facet of information processing).

Consequently, there are two modalities of information processing in the Chinese Room. The first modality – the instruction book -- is static, at least partially computational (i.e., the form of the program in and of itself), and it needs to be activated by a human being (or in some other way), while the second modality of information processing is active and is self-regulating – namely, the human being. Nevertheless, neither of the foregoing modalities is necessarily fully computational in character since we don't understand the nature of the dynamics through which those modalities of information processing have been created and/or operate.

Among the conclusions that John Searle draws with respect to the Chinese Room Argument is that the processing of information does not necessarily give expression to active understanding of the information that is being processed. In other words, the presence of activities of information processing that contain, at least to a degree, some computational elements (in the form of the instruction book) does not necessarily guarantee the presence of understanding concerning the information that is being processed.

To be sure, an artificial intelligence program that is sufficiently sophisticated might be able to fool human beings into believing that a given program has the capacity to understand and be aware of what is taking place during any series of blind exchanges between the individual and the program. Nonetheless, according to Searle, the capacity to process information through the manipulation of symbols (syntax) cannot necessarily be equated with the presence of understanding, consciousness, intention, or other expressions of intelligence concerning the meaning (semantics) of those manipulations.

The book of instructions in the Chinese Room does not understand the instructions that are written in it anymore than the pieces of paper on which squiggles are written understand the nature of the squiggles written upon them even though those squiggles constitute an algorithm of sorts (a question) written in Chinese. It also is quite clear that the person or person who wrote the instruction book does, in fact, understand Chinese or else the instructions in that book -- when properly followed -- would not have provided intelligible answers to the questions being asked via the slips of paper being slid beneath the door into the Chinese Room.

On the other hand, the individual in the Chinese Room who is reading the book of instructions is able to understand the nature of the instructions being written (assuming that the instructions are written in a language that the person can understand) … otherwise that individual could not produce results that satisfied people in the next room who are asking various questions. What makes things work in the Chinese Room is the ability of the person in the Chinese Room: (1) To be aware of the contents of the instruction book; (2) to be able to read/understand those instructions; to be able to manipulate the indicated squiggles in the required way, and (4) to be able to slip such results under the door at the indicated times.

What the individual in the Chinese Room is doing is processing information using the pieces of paper in conjunction with the contents of an instruction book. The issue is not whether, or not, that individual is processing information but, rather, the issue is how is that person able to do what that he or she is doing in the Chinese Room.

Is that individual using computational techniques to process such information? If the person in the Chinese Room is using computational processes to be aware of, focus on, read, understand, interpret, and write in accordance with the directives of the instruction book, then, irrespective of whether that individual can understand Chinese, the person is operating in a manner that is consistent with the computational theory of mind.

At the present time the problem is that we don't know if the cognitive processes being used by the individual in the Chinese Room are, or are not, computational in character. That is: We do not know whether, or not, consciousness is a computational process? We do not know whether, or not, intelligence is a computational process? We do not know whether, or not, reasoning is a computational process? We do not know whether, or not, language is a computational process? We do not know whether, or not, the process of understanding is a computational process?

To contend that, currently, we do not know whether, or not, any of the foregoing capacities are computational in nature means that if such computational programs exist in human beings, then, at the present time, we don't know what they are. In other words, we don't know what sequential -- or in parallel -- combinations of neurons, glial cells, synaptic circuitry, neurotransmitters, and gliotransmitters will generate consciousness, or intelligence, or reasoning, or reading, or understanding, or writing. Moreover, we don't know what the nature of the DNA computational processes are (assuming they do exist) that would enable appropriate algorithms to arise through such genomic coding that were, in turn, capable of giving expression to mental phenomenology of one kind or another.

Searle's Chinese Room Argument demonstrates that not all instances of information processing necessarily entail an understanding of everything that is being processed – for example, knowledge of Chinese. Theoretically, one could process information involving Chinese symbols without knowing any Chinese, but whether, or not, the capacity to process information -- that underlies and makes possible what is taking place in the Chinese Room – is computational in nature is a separate issue.

Searle has not shown that what the person in the Chinese Room is doing demonstrates that the computational theory of mind is wrong. In fact, what the person in that Room is doing might actually be the computational theory of mind in action, but, currently, we lack the evidence needed to prove or disprove that possibility.

Awareness, intentionality, and understanding do not necessarily have to be <u>directly</u> present in the modalities of information processing that run in accordance with a set of computations. Nonetheless, awareness, intentionality and understanding tend to be <u>implicitly</u> present in contexts involving information processing by virtue of the fact that the program exists at all … in other words, presumably such a program did not come into existence through its own efforts). Thus, computers can carry out a program and still not necessarily be aware of 'themselves' or the programs being run through it.

However, as indicated earlier, the jury is still out on whether, or not, the manner in which human beings process information is computational in nature. Furthermore, the jury is still out on whether, or not, the genome consists of a set of computations that generate mental phenomenology and its contents.

There is a further issue related to the foregoing considerations. Let us imagine that somewhere down the temporal line an individual discovers that understanding is, indeed, a function of computational processes involving the way, for example, that the generic blueprint for the brain gives expression to itself through the dynamics of physical-chemical processes but, nonetheless, the individual within whom those computations are occurring is not aware that they are being carried out but, instead, is only aware of the results of those computations.

Is the <u>awareness</u> of those results necessarily computational in character? In other words, even if one were to acknowledge that the generation of a given kind of understanding were computational in character, does such an acknowledgement necessarily force one to conclude that awareness of those results must also be computational in character?

Conceivably, a distinction might be able to be drawn between consciousness and the contents of consciousness. In other words, even if the contents of consciousness were computational in nature, this would not necessarily automatically mean that the phenomenology in which those computational results appeared was also computational in character.

The foregoing scenario is like the Chinese Room. The brain (a possible modality of computational information processing) represents the instruction book or program, and consciousness represents the individual in the Chinese Room who works with that program to provide answers for the person in the next room who is asking questions.

Given the foregoing possibility, consciousness is said to be aware of a state of understanding that it did not produce (just as the individual in the Chinese Room is aware of an instruction book and a set of boxes with Chinese characters that the individual did not produce). One of the questions arising in conjunction with the scenario being outlined above is the following one: Is the computational processes of the brain aware of what it is doing at the time it is doing it? Or, considered from a slightly different perspective, could the brain pass the Turing Test even though there is an absence of awareness or understanding present in the brain with respect to the nature of the computational processes that are taking place?

Searle wanted the Chinese Room Argument to distinguish between, on the one hand, the kinds of information processing that went on in a computer and, on the other hand, the sorts of information processing that take place in a human being. He wanted to show that computer programs are not, in and of themselves, necessarily capable of consciousness and intentionality, whereas human beings, in and of themselves, do exhibit consciousness and intentionality.

The Chinese Room Argument addresses the former issue but not the latter one … or, at least, not completely. In other words, while Searle has shown that the kind of information processing that involves at least some computational features (such as in a program or a computer) does not necessarily entail understanding of the information that is being processed, nonetheless he has not shown that the information processing that takes place in human beings is necessarily aware of itself … only that awareness of some kind is present.

Searle does not know what makes such consciousness possible. Furthermore, he does not know what makes the understandings that appear in consciousness possible.

Human beings can pass the Turing Test. Nevertheless, they do not necessarily have any more understanding of how such understanding and concomitant awareness are possible than the person in the Chinese Room understands the information involving Chinese that she or he is processing.

Searle assumes that biology -- unlike computers and algorithms/programs -- produces consciousness and understanding. However, he has not shown that this is the case.

He only demonstrates that there are circumstances in which information processing takes place in a way that could pass the Turing Test despite the fact there is no understanding present with respect to the nature of the information that is being processed. Consequently, unwittingly (and indirectly as far as the purpose of his Chinese Room Argument is concerned), Searle's argument has led to a problem.

The thrust of his argument is not capable of resolving the problem that ensues from his thought-experiment. Indeed, Searle has created for himself the very problem with which he wished to saddle the computational theory of mind – namely, just because human beings can pass the Turing Test, this does not necessarily mean that human beings understand, or are aware of, the nature of the information processing (which might or might not be computational in character) that is taking place within the brain and that might, or might not, be responsible for consciousness, intentionality, intelligence and so on.

Chapter 23: The Nature of the Unconscious

In February 1997, *Science* published an article by a group of researchers at the University of Iowa. The title of the article was: "Deciding Advantageously Before Knowing the Advantageous Strategy."

The contents of the foregoing article discussed an experiment involving the development of strategies for maximizing winnings in a given set of circumstances. Those circumstances involved four decks of cards, two of which were blue in color while the other two decks were red in color, and, in addition, each card – from each of the four decks – carried a value that represented a gain or a loss of money.

Furthermore, the researchers knew ahead of time that while an experimental subject occasionally might be able to earn a lot of money by choosing cards from the red decks, more often than not, the red cards would lead, over time, to the loss of money. The blue cards, on the other hand, entailed only relatively small gains, but those gains were fairly consistent.

The individuals conducting the experiment wanted to know how long it would take before a given subject would realize that choosing the blue cards was more likely to lead to monetary gains whereas choosing cards from the red decks was likely to undermine a subject's attempt to maximize winnings. There were several stages to the experiment.

During the first phase of the experiment, a general group of people was tested. Such individuals began to suspect there is something problematic about the cards in the red deck when approximately 50 cards have been selected, and by the time 80 cards have been selected, most of the individuals participating in the first stage of the experiment, are able to accurately describe the nature of the problem.

Although people in the general group suspect – around the 50 card juncture – that there might be a problem with the cards in the red deck as far as maximizing winnings is concerned, they usually are not able to articulate what the nature of that problem is at that time. They just know they are becoming more inclined toward choosing cards from the blue deck, and another 30 cards, or so, will have to be selected before the penny drops, so to speak, and the subjects are able to identify the precise nature of the problem involving cards from the red decks and, as well, are able to specify the nature of that problem.

The second stage of the foregoing experiment focused on the responses of individuals who liked to gamble. Aside from the distinguishing feature of liking to gamble, the other primary difference between the two groups is that the hands of the individuals in the gambler group were hooked up to an apparatus that measured the dynamics of the sweat glands in the palms of their hands, both with respect to heat and stress.

The glands in the palms of the hands of the gamblers began to sweat after about 10 cards. Moreover, the behavior of the gamblers began to change around the same time … that is they began to favor cards from the blue deck over cards from the red deck.

Therefore, some 40 cards prior to the time when individuals from the gambler group of subjects or from the general group of subjects would consciously begin to suspect there might be some kind of problem entailed by selecting cards from the red deck, and 70 cards prior to the point when those individuals would be able to articulate what the nature of the problem was, 'something' in those individuals knew there was a problem with cards from the red deck and, as a result, such awareness led to changes in behavior that were not being instigated by the conscious minds of those individuals … in other words, individuals from the gambler group were favoring cards from the blue decks, but those people were not aware this was taking place.

The 'something' that seemed to be aware of what was going on prior to the time when "normal consciousness" was aware of the problem involving cards from the red deck is sometimes referred to as the "adaptive unconscious." This terminology seems rather curious.

While normal consciousness appears to be unaware of what is going on, the so-called adaptive unconscious seems to have a keen insight into what is transpiring. The foregoing awareness is sufficiently keen to bring about an alteration in a person's behavior in order to reflect, and be able to profit from, such an understanding.

What seems to be acting in an unconscious manner is the normal, surface, waking consciousness. What seems to be conscious are the dynamics that are taking place out of sight from allegedly normal, surface, waking consciousness.

The Iowa experiment gives expression to the presence of an inverted perspective. What is normally considered to be conscious is, instead, unconscious, while what is usually considered to be unconscious is, actually, quite aware of what is transpiring.

In the second stage of the foregoing Iowa experiment, 'normal' consciousness seems to be in something of a stupor and lacking the requisite intelligence to be able to figure out what is going on. Yet, 10 cards into the experiment, another part of human understanding – something that is, allegedly, unconscious -- grasps the situation.

Why is the adaptive unconscious being referred to as the unconscious when the capabilities it is manifesting in the experiment seem to indicate otherwise? Why is surface awareness being referred to as conscious behavior when that awareness is so obviously oblivious to what is taking place before its very eyes?

Antonio Damasio, a neurologist, led the Iowa research group that devised the foregoing experiment. Among other things, Dr. Damasio has a scientific interest in a segment of the brain known as the ventromedial prefrontal cortex.

A variety of data implicates the ventromedial prefrontal cortex of the brain as having some degree of responsibility for helping to render judgments that shape behavior. For example, that area of the brain seems to be involved in processes of differential diagnosis with respect to prioritizing incoming information concerning how to proceed amidst various possibilities in a given set of circumstances.

Patients with damage to their ventromedial prefrontal cortex were run through the aforementioned experiment involving four decks and two kinds of colored cards. Those patients performed differently than did either the general ('normal') group or the gambler group.

Like the people in the gambler group, the individuals in the group with damaged ventromedial prefrontal cortices had the palms of their hands hooked up to a monitor so that the activity of their sweat glands could be measured. However, unlike the individuals in the gambler group, the people in the ventromedial prefrontal cortex patient group displayed no hint of glandular activity during the experiment.

Can one assume that the absence of any sign of glandular activity in the patients with damage to their ventromedial prefrontal cortex was because those patients were not aware of some sort of problem involving the red colored cards? Not necessarily, since one, or another, dimension of cognition in those patients still might have been aware of the problem with the red cards but, for whatever reason, the signal that induced sweating in the palms of the gamblers was blocked in the case of the patients with damage to their ventromedial prefrontal cortex.

In addition, unlike the other two experimental groups, individuals with damage to their ventromedial prefrontal cortex also did not seem to exhibit any intuitional sense -- at around the 50-card mark -- that something might be amiss with the red cards. Nonetheless, how or when the foregoing fact was determined is somewhat unclear.

Conceivably, the individuals in the patient group might not have considered the presence of that information to be very high priority and, as a result, it was not reported because it was loss amidst lots of other information and not because there had been no experience of such an intuition. Or, perhaps, at some point the patients did have such a 'hunch', but because that experiential information was not flagged as being important to them, it was not converted into a long-term memory and, therefore, if the individuals in the patient group were asked about whether, or not, they had any intuition concerning the situation, they might not have remembered what they actually had experienced.

Finally, even after the members of the patient group arrived at a 'conscious' understanding of the problem entailed by the red cards, their behavior did not change. In other words, they did not take advantage of that understanding to maximize their winnings.

To be sure, something is being disrupted in patients with damage to their ventromedial prefrontal cortex, but what – precisely -- that 'something' is isn't necessarily clear. Whatever it is, unlike Damasio, I'm not convinced that the problem is one involving decision making per se … although decision-making might be affected by whatever the foregoing problem entails.

Participating in an experiment involves making a decision, and, yet apparently, decisions were made to begin to participate and decisions were made to continue to participate. Choosing cards from decks of cards involves making decisions, and, yet, cards were selected. Responding to the questions of the researchers involves making decisions, and, yet, answers appear to have been given.

If an individual didn't care about maximizing winnings, then it might make sense that despite coming to grasp the significance of the red and blue cards, such an individual would not necessarily use that understanding to help him or her to maximize winnings about which the person didn't care. If a person were indifferent to a hunch that something was amiss with the red cards, then, why bother to remember a fleeting instance of phenomenology that appeared to be unimportant? If a person were indifferent to maximizing winnings, then why bother to induce the glands in the palm to sweat … sweating is a sign of tension, or concern, or stress, so, why would an individual who doesn't care about winning bother to sweat?

Considered from a different perspective, one also might suppose that decisions are, in fact, being made with respect to the filtering of information concerning the experiment. However, if an individual is uninterested, or unmotivated, or indifferent to the idea of maximizing winnings, then, such an individual might appear to be having difficulty with decision making when she or he fails to use new understanding to benefit himself or herself.

Nonetheless, deciding to rate certain kinds of information as being unimportant with respect to the issue of devising strategies to maximize winnings is not necessarily the same as being unable to make decisions at all. The Iowa researchers might have pre-conceived ideas about what constitutes evidence of a decision having been made and, as a result, they might not recognize the presence of certain kinds of decisions that run contrary to their expectations about what a decision looks like.

Notwithstanding the foregoing considerations, even if one were to agree with Dr. Damasio that the ventromedial prefrontal cortex was connected, somehow, to the process of making judgments and decisions with respect to the relative importance of incoming information in relation to an ongoing set of circumstances as well as with respect to the sort of behavior that would best address those circumstances, there are some questions that need to be asked. Those questions all concern the role of the ventromedial prefrontal cortex in the process of decision-making.

How does a network of neurons, glial cells, synaptic circuits, neurotransmitters, gliotransmitters, and gap junctions in the ventromedial prefrontal cortex make decisions concerning the relative importance of incoming information? How does such a network prioritize that sort of information? Where do the values come from that establish what the priorities are? How is incoming experiential information interpreted to determine its relative importance? What is sufficiently aware of incoming experiential information to be able to make the foregoing sorts of determinations?

What if the ventromedial prefrontal cortex is not responsible for making such decisions but, rather, is merely a medium for transmitting certain kinds of signals involving those decisions? If the ventromedial prefrontal cortex is responsible for decision-making, we, currently, have no idea how that cortex does what it does.

Conceivably, the reason why no one has, yet, come up with a plausible account about how networks of neurons, glial cells, and the like are capable of making those sorts of decisions is because those networks don't actually possess the capacities that are being attributed to them. Decision-making might be done in some way that occurs outside the dynamics of the brain, and the reason why the ventromedial prefrontal complex is associated with such processes is because that segment of the brain has some kind of a role to play with respect to translating into biological terms information from the non-brain-based dynamics being alluded to … a biological dynamic that supports/receives such information processing signals without being responsible for generating the kinds of information processing signals that give expression to decision-making.

Assuming that the brain is responsible for intelligence, decision-making, evaluation, interpretation, judging, prioritizing, and so on might appear to be a far simpler proposition than supposing that there could be some undiscovered realm (possibly of a physical nature) that lies beyond the brain that is responsible for phenomenology and its contents even as the brain plays some sort of complementary and/or supportive role with respect to that phenomenological dynamic. Nevertheless, the foregoing assumption is simpler only if it is actually the case that the brain is responsible for: Phenomenology, its contents, and the capabilities that make those phenomenological contents possible … something that, at the present time, seems to be a long way away from being demonstrated.

Many of the fundamental features of the quantum world were discovered gradually over a period of 75 years, or so, because, among other things, the assumptions that were made along the way about the nature of atomic phenomena didn't make sense in the light of empirical data. While it might still be the case that researchers will discover a conceptual Rosetta-like Stone to decode how neurotransmitters, gliotransmitters, synaptic circuits, neurons, glial cells, and gap junctions interact to produce the phenomenology of consciousness and its contents, nonetheless, it might also be the case that the assumption that the brain underwrites all mental phenomena could be wrong in part, or entirely, even as the brain does have its role to play with respect to those phenomena … and, today, that role is only partially understood.

Modern imaging technology – which is rapidly evolving with the passage of time – is giving better and better resolution concerning the precise nature of the dynamics of the brain that are implicated in one, or another, cognitive process (and the aforementioned ventromedial prefrontal cortex is just one of many networks that could be mentioned in this respect). However, as such resolution continues to improve and as the focus of imaging technology narrows the scope of the field being examined, the brain networks being considered are shrinking in size and, yet, those shrinking networks are being burdened with the responsibility of having to explain considerable complexity and specialization as a function of smaller and smaller networks of brain circuitry.

Up until relatively recently, researchers have been pointing to the existence of billions of neurons and glial cells in the brain, along with the on-going dynamics of trillions of synaptic connections, to account for consciousness and other mental phenomena. However, as imaging technology zeros in on smaller and smaller networks of the brain (such as the ventromedial prefrontal cortex) in order to account for specialized mental phenomena, a possible problem begins to rear its head.

More specifically, if various kinds of mental phenomena are not caused by the complexity of billions of cells and trillions of synaptic circuits interacting with one another but, rather, are the result of the properties of particular, dynamic circuits of limited size (relatively speaking), then, researchers might have to re-think how such, relatively small circuits are responsible for behavior of considerable complexity.

For example, on the basis of various statistical methods, some people (e.g., Stephen Waydo) have estimated that a given concept might involve the firing of just $1/1000^{th}$ (a million neurons) of the available neurons (approximately a billion neurons) in the medial temporal lobe. Other individuals (e.g., the recently deceased Jerome Lettvin) have suggested that specific concepts might involve the firing of no more than 18,000 neurons.

While there is certainly a difference in size between a network involving a million neurons and a network involving 18,000 neurons, in either case, one is no longer talking about billions of cells and trillions of synaptic connections. How did a million neurons (and associated synaptic connections) or 18,000 neurons (and associated synaptic connections) come to represent or give expression to a particular concept?

Within such relatively restricted fields of consideration, what differentially regulates the flow of neurotransmitters and gliotransmitters amidst an array of neurons, synaptic circuits, and gap junctions to generate one concept rather than another? What induces synaptic circuits to reconfigure themselves to help give expression to one kind of concept rather than another kind of concept?

Within such relatively restricted fields of consideration, what is responsible for integrating those concepts into a decision circuit (for example, in the ventromedial prefrontal cortex) that leads in one direction rather than another? How do neurons, glial cells, synaptic circuits, gap junctions, neurotransmitters, and gliotransmitters interact to produce an evaluation, interpretation, or prioritizing of incoming information so that decisions emerge from such restricted fields of consideration.

The aforementioned Iowa research concerning the experiment involving four decks and two colors of cards bearing different values supposedly indicates that subjects are making complex evaluations in an unconscious manner. Furthermore, the foregoing research also indicates that individuals who have some sort of damage in their ventromedial prefrontal cortex are unable to make the same sort of evaluations, and, therefore, the ventromedial prefrontal cortex is identified as the location where such unconscious evaluations/prioritizations are made for the purpose of making decisions concerning the problem with the red cards relative to the blue cards.

Aside from the previously outlined reservations about what, exactly, the nature of the deficit might be in people with damage to their ventromedial prefrontal cortex, one might also question the description of whatever it is that is capable of discerning a difference between the values of the blue cards and the red cards in the Iowa experiments as being an <u>unconscious</u> process.

'Something' is aware of the differences between the red cards and the blue cards. 'Something' is keeping track of what happens over time with respect to both kinds of cards. 'Something' is evaluating such differences in an intelligent, reasoned manner. 'Something' is actively influencing behavior so that individual subjects (other than ventromedial prefrontal cortex patients) will be able to take advantage of such understanding so that winnings will be maximized.

None of the foregoing activity qualifies as being unconscious. To be sure, such activity does take place outside the awareness of so-called normal, waking consciousness, but this only means there are several kinds of consciousness that are capable of operating simultaneously in human beings.

If we identify with so-called normal, waking consciousness, then every other form of consciousness that is occurring within us will seem alien and other … as unconscious in nature. However, such an interpretation of what is transpiring is merely a biased take on what the evidence is telling us.

The unconscious realm is not what is figuring out what is going on with the red cards in the experiment. The unconscious in not what generates a correct 'hunch' concerning what has been discovered that bubbles into view within so-called normal, waking consciousness.

The unconscious realm in gamblers is not what permits them to figure out what is going on after selecting just ten cards. Instead, a conscious, intelligent, reasoned understanding of the experimental situation is taking place, and one of the ways in which that assessment is disclosed to so-called normal, waking consciousness is through the activity of sweat glands in the palms of the hands of the gamblers.

The sweating palms are trying to tell normal, waking consciousness something. However, normal, waking consciousness is too busy engaging incoming information from its own, limited perspective, and, therefore, the form of consciousness that actually knows something has to assume responsibility for modifying behavior in a way that will maximize winnings even though normal, waking consciousness doesn't understand what is taking place.

There is no unconscious dynamic taking place because the activity that is being described as giving expression to the unconscious could not do what it does if it actually were unconscious. Indeed, how can that which is supposedly unaware of the incoming information (e.g., the four decks of cards experiment) evaluate the significance and value of that information in such an intelligent manner?

The principles underlying the value of the blue and red cards were understood before waking consciousness understood what those principles entailed. Consciousness is present in a manner that is being manifested through different modalities.

Normal waking consciousness might believe that it is the chief operating officer as a function of the sense of 'self' that has been constructed through an array of biases, assumptions, expectations, beliefs, interests, needs, hopes, and past choices that regulate and govern what takes place in (and what is granted access to) normal, waking consciousness. However, evidence – such as that produced through the Iowa experiments – indicates that so-called normal, waking consciousness is not the only form of consciousness that is operating. (These issues will be discussed further in the final chapter of *Final Jeopardy: The Reality Problem, Volume II*.)

Because normal, waking consciousness has developed the false belief that it should be in control of things, other conscious modalities have to struggle to find ways of influencing what transpires in the form of awareness that is known as 'normal, waking consciousness'. This struggle comes in the form of such things as: Sweating palms, hunches, intuitions, insights, or, finally, by inducing surface awareness to acknowledge the correctness of a conscious understanding (e.g., concerning the difference between red cards and blue cards) that has been present for quite some time but -- due to the inclination of normal, waking consciousness to try to control the flow of both focal awareness as well as the contents of consciousness -- so-called normal, waking consciousness has resisted the attempts of the other modalities of consciousness to inform and modulate the understanding of normal, waking consciousness.

Once the waking form of consciousness becomes inclined toward certain biases, beliefs, and assumptions, then, other modalities of consciousness encompassing data (ideas, values, and feelings) that run contrary to the framework of so-called waking consciousness tend to be relegated to compartmentalized mental spaces that form along the horizons of normal, waking consciousness. Such relegated forms of consciousness are referred to as being unconscious.

However, there is nothing of an unconscious nature that is taking place in such modalities of awareness. The evidence from experiments such as those performed by the aforementioned Iowa researchers indicates as much … and due to its own agenda in such matters, the only source of resistance to the foregoing reality is normal, waking consciousness.

There are many, many experiments that could be cited in place of the aforementioned Iowa research (and the Bibliography for this book references some of that material) which all point in the same direction as the Iowa research. In other words, there are numerous experiments that – like the Iowa four decks of cards experiment -- supposedly demonstrate the existence of the unconscious when the data from those experiments actually provide evidence concerning the existence of modalities of intelligent awareness or consciousness that run parallel to so-called normal, waking consciousness but, under certain circumstances are also able to engage, inform, and modulate normal, waking consciousness.

Normal, waking consciousness gives expression to working memory. Such consciousness constitutes the bench of awareness on which recent and on-going experiences are processed and through which beliefs, values, expectation, ideas, emotions, motivations, and interests, are constructed (i.e., turned into learning or long-term memory) and that, in turn, serve as filters that frame the way working memory is inclined to engage future experiences.

Various modalities of awareness – besides working memory – simultaneously seek to modulate the perspective of working memory by processing incoming data and forwarding that information to working memory. A dialectical dynamic takes place between working memory and those other modalities of awareness to determine that kinds of information will get to shape – at least for the moment – the hermeneutical perspective that will filter and frame the current understanding or interpretive orientation of working memory through which experience is engaged.

For example, emotions give expression to modalities of awareness that seek to modulate working memory or normal, waking consciousness according to the perspective of a given emotion. Moreover, there are, generally speaking, three broad categories of emotions that seek to induce working memory to filter and frame experience in certain ways.

On the one hand, there are problematic emotions such as: jealousy, envy, anger, greed, anxiety, apathy, despair, depression, lust, rage, and hatred. On the other hand, there are constructive emotions such as: love, compassion, empathy, patience, charitableness, gratitude, and remorse.

Finally, there are emotions that might be constructive or problematic depending on circumstances. Among this third category of emotions are the following possibilities: hope, grief, joy, shame, trust, desire, contentment, fear, confidence, curiosity, passion, and courage.

According to modern neuroscience, the amygdala is the heart of emotional life. If the amygdala (there are two of them) are: Removed, disconnected from the rest of the brain, or if there is some sort of damage to those structures of the brain, then, the individuals so affected tend to suffer from various forms of affective blindness or dysfunctional emotionality.

While clinical and experimental evidence might indicate that when the amygdala in human beings or animals are, in some way, defective, and, as a result, those organisms are observed to exhibit emotional deficits of one kind or another, nonetheless, such facts do not necessarily mean that the amygdala are responsible for generating emotions. The amygdala could act as receivers for emotional signals from elsewhere, and, if this were the case, then, when the amygdala are defective, such dysfunctional organs would disrupt the reception of such signals and, in the process, yield a condition of affective blindness even though those organs are not responsible for the generation of emotions.

One reason for thinking in the foregoing manner revolves around the fact that no one has, yet, come up with a plausible explanation for how the dynamics of neurons, action potentials, glial cells, gap junctions, neurotransmitters, gliotransmitters, hormones, and synaptic circuits generate the phenomenological feeling and flavor of different emotions. We might all agree there is a neurochemistry that is associated with the presence of emotions, but there is almost no agreement about how: Neurochemistry generates emotion; or, how various networks of neurochemistry arose in order to give expression to different kinds of emotional experience; or, how neurochemistry 'knows' what emotions to generate in a given set of circumstances; or, how – or if – neurotransmitters such as serotonin, dopamine, cortisol, GABA, oxytocin, and so on are capable of producing feeling in human beings (or animals); or, how the nuances of emotion are differentially constructed through various circuits in the amygdala.

From the perspective of normal, waking consciousness (i.e., working memory), emotions seem to impinge from the outside. Working memory is unaware of how or why such emotions arise or where they come from, and, therefore, working memory considers such interlopers as products of the great unknown … that is, the unconscious.

Nonetheless, there is an active awareness flowing through any particular emotion that gives expression to an understanding concerning the potential significance that on-going experience might have in relation to the interests of something (e.g., a parallel system of intelligent awareness) that is not necessarily a function of working memory. Of course, certain emotions can, and do, serve the interests of working memory, but even then, emotions often seem to be aware of the significance of what is transpiring in on-going experience (from the perspective of the hermeneutical orientation of such emotions) and, as a result, enter into the awareness of working memory without necessarily being called for by working memory.

When emotions disturb normal, waking consciousness, they frequently (but not always) come as uninvited and unwelcome outsiders. Such emotions seem to operate independently of the dynamics of working memory/waking consciousness, and, yet, there is a dimension of intelligence (not always of a constructive nature) to such emotions that gives expression to different kinds of evaluations or judgments (according to the nature of the emotion) concerning what is taking place in working memory.

The phenomenon of "thin slicing" is rooted, to some extent, in our emotions. 'Thin slicing' refers to the process of rendering judgments about situations based on a limited amount of information, and such judgments are a function of being able to perceive the presence of certain kinds of patterns of behavior or properties in a given situation that capture – when done correctly – something important about a person or a set of circumstances.

For instance, Wendy Levinson conducted research that was geared toward trying to discover what the differences are, if any, between doctors that got sued on multiple occasions and doctors that have never been sued. She listened to hundreds of conversations between doctors and their patients, and she noticed a pattern that might account for why some doctors got sued, while other doctors did not get sued.

More specifically, she noticed that doctors who did not get sued tended to display certain characteristics … characteristics that were not in evidence – or to the same degree -- among the physicians who got sued on multiple occasions. For example, doctors who did not get sued spent an average of three minutes, or longer, with their patients than did doctors who were likely to be sued.

Moreover, the doctors who had not been sued spent their minutes with their clients emphasizing active listening in which individuals were encouraged to talk about their condition. In addition, those doctors tended to joke and laugh a lot more with their patients than did doctors who had been sued on multiple occasions.

The 'thin slicing' that patients/clients did in relation to their doctors had to do with how the doctor made them feel. Doctors that were willing to spend a little more time with their clients and who were willing to use that time to show interest in the lives and conditions of their clients and who were willing to laugh and joke with their patients were not likely to be sued, whereas doctors who tended to de-emphasize or lacked the foregoing qualities were the ones who got sued.

For the most part, individuals spend only a limited amount of time with their doctors over the course of many years. So, visits lasting 15 to 20 minutes constitute only a very small sampling of the millions of minutes that are entailed by the life of a doctor.

Doctors who do not get sued do not necessarily give better medical information or treatment to their clients than doctors who do get sued, and individuals from the former group are not necessarily better doctors than individuals from the latter group are. There are doctors who make medical mistakes who never get sued, while there are very competent doctors who get sued irrespective of whether they have made a mistake.

Nalini Ambady, a psychologist followed-up on the research of Wendy Levinson. Dr. Ambady listened to the Levinson recordings and selected two conversations from each doctor/client relationship.

Dr. Ambady reduced those conversations to ten second segments. She, then, filtered the smaller, audio segments in such a way that the content of the words were removed from the audio recordings while the rhythm, intonation, and pitch of those ten second conversations were retained.

The next step of her research involved having judges evaluate those clips and rate them for the presence of qualities such as: Hostility, warmth, and dominance. Once those ratings were made, Dr. Ambady discovered that she was able to use those judgments to differentially distinguish between doctors who were, and were not, likely to have been sued.

Doctors -- based on just the pitch, rhythm, and intonation of what they said – who were judged to exhibit qualities such as warmth were in the group of doctors who had not been sued. Doctors who were judged to display qualities such as dominance – again based on just the intonation, rhythm, and pitch of what was said – were in the group of doctors that had been sued multiple times.

The 'thin slicing' of the judges in the experiment conducted by Dr. Ambady was fairly extreme. Nonetheless, it served as an accurate predictor of who had, and who had not, been sued.

Similar 'thin slicing' experiments have been done in conjunction with being able to predict whether marriages will, or will not, be successful and whether someone is, or is not, a good teacher. Gavin De Becker wrote a book entitled: *The Gift of Fear* that explored how learning to attend to certain kinds of 'thin slicing' emotional assessments that take place outside of the activities of waking consciousness could protect a person against being killed, raped, or physically assaulted in some way.

Human beings engage in such 'thin slicing' all the time. On the basis of very little information, we make judgments or evaluations – especially emotional ones -- concerning people and situations.

The judgments and evaluations that are being made through the process of 'thin slicing' are not unconscious. There is an intelligent awareness present in those 'thin slicing' judgments/evaluations – to which normal, waking consciousness/working memory is not necessarily privy (except indirectly through physical responses such as sweating palms, or through hunches, intuitions, and feelings) – that often are capable of accurately assessing the nature or character of what is transpiring in the on-going experiential activity being processed (to a degree) by working memory.

Now, not all instances of thin slicing are necessarily accurate reflections of what is taking place. There are all kinds of ways that thin slicing can be influenced, corrupted, and thwarted by the biases, fears, anxieties, beliefs, values, interests, and so on that frame waking consciousness or working memory.

However, irrespective of whether the process of thin slicing manages to accurately capture some facet of on-going experience or whether that process fails to grasp what is going on in on-going experience, the phenomenon itself gives expression to a form of awareness (outside the awareness of working memory) in which various kinds of assessments, evaluations, and/or judgments are being made according to certain kinds of logic and reasoning and that is taking place in conjunction with what is transpiring in normal waking consciousness/working memory. In other words, there are parallel modalities of intelligent awareness that are operating side-by-side in the same individual, and while the dynamics underlying thin slicing are aware of what is taking place in normal, waking consciousness, the latter is unaware of what is transpiring in conjunction with such thin slicing dynamics (or only vaguely so through the presence of physical indicators – such as sweating palms – or through the presence of intuitions, hunches and other kinds of feelings).

The so-called unconscious is not unconscious. Instead, waking consciousness/working memory has engaged in an inaccurate form of thin slicing and, as a result, has come to the conclusion that what is taking place outside of its sphere of awareness must be of an unconscious nature, but, in reality, the only thing that is unconscious is normal waking consciousness (or working memory) relative to all the other modalities of conscious activity that are taking place within the individual but beyond the narrow, compartmentalized horizons of working memory.

Emotions give expression to a hermeneutical assessment of some aspect of on-going experience. Some of those assessments are largely problematic (e.g., hatred, jealousy, despair, rage), while other emotional assessments are largely constructive (e.g., love, compassion, patience, and empathy), and still other emotional assessments, depending on circumstances, are either problematic or constructive (e.g., hope, courage, trust, and contentment).

Emotions are centers of active awareness that communicate hermeneutical perspectives capable of informing us about ourselves and about the world in a way that cannot necessarily be grasped through rational analysis. Moreover, emotions – whether of a problematic or constructive nature -- engage experience in a manner that often tends to be far more intense than most forms of reasoned-based engagement.

Indeed, feeling the truth of something is often a quite different kind of experience than is the experience of understanding that same thing intellectually. However, there are experiences involving intellectual insights or epiphanies (Eureka moments) that give expression to experiences that encompass intensity on both the emotional and rational level, but the emotional component of that experience is a function of a separate emotional evaluation or assessment of the significance of the intellectual breakthrough.

Even when certain emotions generate a problematic assessment of an on-going experiential context, there is still a form of logic – problematic though it might be – that flows through such emotional evaluations. Emotions are not blind, but, instead, they always operate out of a certain hermeneutical orientation.

Unfortunately and all too frequently, some emotions are very narrow and rigid in the perspective to which they give expression. As a result, emotions are often blind or indifferent to other points of view -- emotional or intellectual – and such emotions might be referred to as being egocentric.

The kind of understanding to which emotions give expression is done through feeling rather than through thinking. Nonetheless, there is an awareness and modality of intelligence that is present in such feelings, and, therefore, emotions constitute centers of awareness that are capable of evaluating experiential situations according to the rules and principles governing such centers … rules and principles that vary from emotion to emotion.

Emotions are centers of rule or principle governed awareness that run in parallel with the activities of normal waking consciousness (i.e., working memory). Emotions are aware (although filtered and framed by their own hermeneutical perspective) of what is transpiring in on-going experience, but normal, waking consciousness tends to be unaware of what is transpiring in different emotional centers until waking consciousness begins to be besieged by emotions expressing their point of view and insisting that normal, waking consciousness become cognizant of that perspective.

When Eleanor Longden began university in 1999, there were at least two dimensions to her personality. On the one hand, she was intelligent, competent, and full of energy, but, at the same time, she also was frightened of almost everything, perpetually anxious, haunted by a sense of emptiness, and very unhappy.

At a certain point she began to hear a Voice. The Voice would make comments and observations about what was going on in Eleanor's life and the Voice seemed to be coming from a source that was separate from what Eleanor, at that time, considered to be her 'self' … her person.

The Voice would come and go. Sometimes it stayed for a few days commenting on pretty much everything Eleanor did, and, then it would go away, only to come back at a later time.

The visits of the Voice became more frequent. The stays became longer.

For the most part, the Voice was just a relatively neutral town crier concerning the events in Eleanor's life. At times, however, the Voice would express things with an emotion that had been present in Eleanor but that had gone unexpressed in some given set of circumstances.

In time, Eleanor had an emotional and mental breakdown. She was diagnosed as being schizophrenic.

Largely because of the negative way (fear, distrust, suspicion) through which other people began responding to the label of schizophrenic that had been attached to her, Eleanor began to respond to the Voice in the same negative fashion and became hostile toward the presence of the Voice and its running commentary. Even the so-called 'professional' assistance she began to receive -- after hospitalization and being diagnosed as a schizophrenic -- encouraged Eleanor to view the Voice as a symptom of madness rather than as being a part of herself that might have something to teach her concerning the problematic ways in which she was engaging life and thinking about herself.

As Eleanor became more antagonistic and resistant toward the Voice, the Voice reflected those feelings back to her. Eventually, the Voice was replaced by many voices, all of which were demanding in an incessant and manipulative manner … including attempting to induce Eleanor to hurt herself.

She began to have terrifying, macabre visions. Delusions arose in her that became more extreme over time.

Fortunately, at a certain point during her mental distress, Eleanor came in contact with some individuals (e.g., members of the Hearing Voices Movement that is shaped and inspired by the work of Sandra Escher and Marius Romme) who were able to induce her to take a more constructive approach to her condition. Among other things, they helped her to entertain the possibility that the voices she was hearing were merely a means through which the awareness of past traumas to her being had been trying to communicate meaningful – if not important -- content to her waking consciousness or working memory.

However, the form of communication through which various centers of traumatized awareness within her engaged her working memory was largely metaphorical and emotional in nature. She had to learn how to interpret or decode what was being communicated to her, and she had to learn how to become receptive, within certain limits, to what was being communicated.

Eleanor gradually discovered how to work co-operatively and constructively with her voices. Boundaries and conditions had to be set, but within such a framework, constant progress was made.

Over time, she learned that each of the voices she heard gave expression to different traumas from her past. Furthermore, she came to understand that the more menacing, hostile, and aggressive a given voice was, the more traumatic and painful were the experiences to which such a voice gave expression.

Although the voices never went away, Eleanor's manner of engaging the voices changed in a radical fashion. The more she became able to be a compassionate witness to the traumatic experiences that were being communicated through her voices and the more she became an active listener to their grievances, then the more the voices began to calm down and express themselves in benign ways.

Eleanor's ideas about schizophrenia also changed. She did not consider schizophrenia to be the result of genetics or some sort of chemical imbalance but, instead, she felt that schizophrenia encompassed the mind's deeply felt reaction to a set of past – and, perhaps, even on-going -- traumas, abuses, and existential losses of one kind or another.

Eleanor Longden went on to successfully complete her undergraduate work and, as well, to earn a master's degree in psychology. She is active in doing research and participates in the process of helping other people who hear voices to discover how to heal themselves by learning how to listen to and engage their voices.

Her story is unique, but it does not constitute an isolated incident of recovery. Marius Romme, a Dutch psychiatrist, has edited a book entitled: *Living with Voices: Fifty Stories of Recovery* (PCCS Books, 2013). In addition, Eleanor Longden and Dirk Corstens have written an article with the title: '*The Origins of Voices: Links Between Voice Hearing and Life History in a Survey of 100 Cases*' that will appear in a forthcoming book: *Psychosis: Psychological, Social, and Integrative Approaches*.

The voices that were communicating with Eleanor Longden were not forces of the unconscious. They were centers of awareness concerning issues of trust, betrayal, fear, abuse, neglect, trauma, and loss.

Those centers were aware of what was, and had been, transpiring in her life. However, Eleanor's waking consciousness was not aware of what was taking place in those centers of consciousness until first, the Voice, and, then, other voices began to give waking consciousness or working memory an earful.

When Eleanor's working memory learned how to engage those centers of awareness, the seeds of recovery began to be sown. Recovery involved a process of getting centers of awareness that simultaneously were running parallel to one another to become engaged in co-operative and constructive forms of communication.

Irrespective of what other mental and physical components might be present, a person's manner of responding to abuse, trauma, loss, fear, and so on is often deeply emotional. Those emotions give expression to existential, hermeneutical understandings or perspectives that are keenly aware of what is transpiring and/or what has transpired in a person's life.

Although identity diffusion disorder is considered to involve different kinds of mental issues than schizophrenia does, nonetheless, as far as the perspective that is being outlined in this section is concerned, there are, potentially, some important overlapping themes. More specifically, in those individuals who suffer from identity diffusion disorder, there are different personalities – somewhat akin to the role that voices play in schizophrenia – that tend to operate in parallel with one another and, with the exception of so-called normal, waking consciousness or working memory, those personalities (or voices in the case of schizophrenia) do seem to have varying degrees of awareness involving one another and, especially, they seem to have an awareness of what is taking place in waking consciousness or working memory despite the fact that the latter kind of awareness does not reciprocate with respect to being aware of what is transpiring in relation to the other personalities (or voices in the case of schizophrenia).

In schizophrenia, the voices are the ones who are trying to initiate a conversation of some kind with working memory. They do so by intruding into the mental space of normal, waking consciousness.

During identity diffusion disorder, various personalities that have arisen attract the attention of working memory in other ways. Rather than merely intrude into the mental space of waking consciousness through the use of voices, the other personalities hijack working memory and compartmentalize normal, waking consciousness to such a degree that the latter is not able to form memories concerning on-going experiences and, therefore, is unaware of what has taken place during the temporal framework within which the hijacking occurred.

Sooner, or later, however, what takes place during those instances of hijacking -- together with the lack of memory of normal, waking consciousness concerning such episodes -- tends to lead to life complications of one kind or another. Those complications become the doorway through which the contributions of different personalities -- like the contribution of different voices in schizophrenia -- serve as metaphorical clues that are to be decoded (with the assistance of another human being … such as a therapist) in order to uncover existential problems of abuse, betrayal, trauma, loss, and emotional damage.

There is a certain amount of controversy surrounding the diagnosis of identity dissociative disorder. The disorder – to whatever extent it exists – appears to occur much less frequently outside of the United States than it does in America.

For example, in Japan and India, the disorder is considered to be non-existent. Moreover, in England, the incidence of identity dissociative disorder seems to be fairly rare.

To be sure, the processes through which symptoms and mental conditions are interpreted or diagnosed in different parts of the world tend to vary. Consequently, at least some cases of identity diffusion disorder might occur in Japan or India but those conditions are engaged and understood in a different manner than is the case in the United States, and as a result, the same condition in two different, geographically and culturally separated localities might be labeled in alternative ways in countries and cultures that are separate and distinct from one another.

Notwithstanding the foregoing considerations, in the United States, diagnosed cases of identity diffusion disorder have mushroomed over time. For instance, between 1930 and 1960, there were, on average, only two cases per decade that came to the attention of mental health workers, but in the 1980s, tens of thousands of cases were being reported.

Furthermore, whereas the cases of identity diffusion disorder (previously referred to as multiple personality disorder) between 1930 and 1960 tended to involve only 2-3 personalities, the number of personalities being reported in the 1980s exploded right along with the rapidly increased numbers of the disorder that, supposedly, were being diagnosed. In the 1980s clients were reportedly exhibiting between 3 and 12 distinct personalities rather than the 2-3 personalities that had been reported in cases between 1930 and 1960.

Were there thousands of cases involving identity dissociative disorder that were occurring between 1930 and 1960 and, for whatever set of reasons, simply, went undiagnosed? Possibly!

However, some psychologists believe that identity dissociative disorder is a cultural phenomenon that has been induced into existence by the way in which many therapists and psychologists have talked clients into believing that the latter individuals suffer from identity diffusion disorder. As was discovered in conjunction with false memory syndrome, research has demonstrated that the way in which questions are asked by a therapist or psychologist can shape the beliefs and understanding of the individual who is being asked the questions, and this might also be the case with respect to the issue of identity diffusion disorder.

While the explosion of diagnosed cases involving identity diffusion disorder that began in the 1980s could be, to a considerable extent, an iatrogenic-like phenomenon (that is, a problem generated through the process of psychological/medical diagnosis and/or treatment), this does not necessarily mean that all diagnosed cases of identity diffusion disorder are spurious. The cases that were reported between 1930 and 1960 might be few in number (6-7), but this all took place long before the diagnostic frenzy of the 1980s, and, therefore, those earlier cases were not necessarily induced by the physicians and therapists who were treating such individuals. Moreover, although many of the alleged cases of identity diffusion disorder that were diagnosed in the 1980s might have been therapist-induced, this does not necessarily mean all diagnosed cases were therapist induced.

Actual cases of identity diffusion disorder might be rare. However, there is no evidence to show that such a condition does not exist. Rather, the available evidence only indicates that the disorder might be far less prevalent than is often believed to be the case.

Finally, while according to the perspective of DSM-V (Diagnostic and Statistical Manual of Mental Disorders, 5th edition) identity diffusion disorder is considered to give expression to a different kind of malady than schizophrenia, nonetheless, the underlying parallels in the roles that appear to be played by voices and personalities (outlined earlier) is suggestive. Possibly, voices and personalities are variations on an underlying mental mechanism and, as a result, there might not be as much of a difference as DSM-V's diagnostic categories tend to indicate between certain aspects of schizophrenia (e.g., conditions involving hallucinations and delusions to give metaphorical expression to underlying trauma) and identity diffusion disorder (which uses personalities to give metaphorical expression to underlying trauma).

Let's engage the issue of the unconscious from one last perspective. More specifically, let's consider some of the results from split-brain research.

The term "split-brain" alludes to a surgical procedure in which the corpus callosum (the extensive band of intermingled nerve fibers and glial cells that connect the two cerebral hemispheres of the brain) is severed, isolating the two hemispheres from one another. Such a procedure is sometimes carried out in relation to patients who suffer from seizures that cannot be treated in any other way.

A number of decades ago, clinicians discovered that disrupting the flow of information across the corpus callosum from one hemisphere to the other often resulted in the significant reduction in seizure activity. No one seemed to understand why the procedure worked, but because it led to the lessening of seizure activity, it was considered to be a pragmatic solution for a difficult and serious problem that previously had resisted other kinds of medical treatment.

However, given the radical nature of the procedure and despite the fact that the procedure had beneficial medical results, researchers were interested in trying to map out what, if any, collateral damage might have occurred as a result of the surgical procedure. This is where split-brain research enters the picture.

For many (but not all) individuals, the left hemisphere of the brain tends to play a dominant role in, among other functions, the understanding and production of language. On the other hand, the right hemisphere, among other functions, tends to control and sense what takes place in relation to the left side of the body.

The corpus callosum connects the two hemispheres. Scientists believe that information concerning what is happening in a given hemisphere is transmitted to the other hemisphere via the corpus callosum.

So, what happens to cognitive functioning when the information bridge between the two hemispheres is removed through the severing of the circuitry that previously linked the two hemispheres with one another? Dr. Michael Gazzaniga, among others, wanted to find out what, if anything, happened to cognitive functioning in such surgically treated patients.

The foregoing research revolved around the way human eyes are hooked up to our brains. Our visual system sends information to both hemispheres, but the nature of that information depends on which side of a person's visual system processes that information.

Information – such as an image or word – that is presented to the left of a given fixed point in the visual field will be sent to the right hemisphere. Information that is presented to the right of that fixed point in the visual field will be transmitted to the left hemisphere.

Generally speaking, individuals who have not been subjected to the split-brain surgical procedure will be able to use information from both sides of the visual field, relay that information to the appropriate hemisphere (based on the way the visual system is wired) and, then, via the corpus callosum, such information is exchanged between hemispheres and a holistic, visual picture is assembled. The foregoing situation is different for those people who have undergone split-brain surgery.

In the latter individuals, when an image is presented to the right of the aforementioned fixed point of the visual field, that information travels to the left hemisphere (where, in most people, language operations tend to reside), and, consequently, the individual will be able to give the word that corresponds to the object or word that is seen. However, if an object or word is presented to the left of the aforementioned fixed point of the visual field, the information will travel to the right hemisphere and the person will be unable to name the object.

In individuals who have not undergone split-brain surgery, whatever part of the visual system is projected to one hemisphere will be shared with the other hemisphere via the corpus callosum. In individuals who have gone through split-brain surgery, such information cannot be shared via the corpus callosum, and, therefore, the right brain doesn't have access to the linguistic facilities of the left-brain, and, as a result, the visual object goes unnamed even though it is visible.

In split-brain patients, the right hemisphere does have access to visual information concerning what has been presented to the left of the visual field. However, in order to be able to give expression to the presence of such information, some non-verbal means will have to be used in order to be able to elicit such information.

For example, suppose a banana or the picture of a banana had been presented to the left portion of the visual field. If the individual were subsequently shown pictures of fruit, including one involving a banana, the banana could be picked out to reflect what had been seen.

Even more interesting things happen in relation to split-brain patients if two different images are presented simultaneously to each half of the visual field. In one of the experiments, the image of a chicken claw was presented to the left part of the visual field, while a snowy scene was shown to the right half of the visual field.

The pictures that subsequently were presented to the subject included the picture of a chicken and the picture of a snow shovel. If a subject was asked to use his or her right hand (controlled by the left hemisphere) to select the picture that best reflected the nature of the image that had been flashed earlier to the right side of the visual field (a chicken claw that was relayed to the left hemisphere), then, the person would point to or select the picture of the chicken, but if the individual were asked to use her or his left hand (controlled by the right hemisphere) to select the picture that best represented what had been shown, previously, to the left side of the visual field (a snowy scene that was transmitted to the right hemisphere), then, the subject would choose the shovel.

In the latter case, if the subject was asked to explain why the shovel was selected, the individual would engage in confabulation – that is, the individual would invent a story to give a 'rational' account of why the given choice of picture had been made. For instance, the person might say something to the effect of needing to be able to shovel out the waste material that had been left by the chickens.

The subject's explanation for why the picture of the shovel was selected was intended to permit that individual to give an answer that seemed to make sense to the language-dominant hemisphere. Nevertheless, there was knowledge or understanding associated with right hemisphere activity that influenced what was selected with the left hand.

The latter kind of knowledge or understanding was not unconscious. It just couldn't be verbalized.

There was an intelligent awareness associated with the understanding present in the right hemisphere (concerning a snowy scene) that could induce a subject's left hand to pick the appropriate image (the shovel) from among the pictures being presented that best reflected or was most appropriate in relation to the information that earlier had been flashed to the left side of the visual field and that was, then, transmitted to the right hemisphere. Such understanding could not be put into words and, therefore, working memory had no linguistic way to give expression to that understanding, and, yet, the actions of the subject demonstrated that such understanding was present in working memory.

Language plays such a significant, dominant role in filtering and framing experience that when we have no words to express an understanding – such as in the foregoing split-brain experiment – it might seem as if such understanding is of an unconscious nature. However, this is not the case since that understanding is present, aware, and intelligent yet is operating through a different -- but parallel and simultaneous -- modality of consciousness than the left hemisphere does.

In another split-brain experiment, the researchers wanted to probe emotional responses to images that were presented to subjects. For example, in one of these experiments, the left sides of the visual fields of subjects were exposed to a film that showed one individual throwing another person into a fire, and, this means, that such information will show up in the right, largely non-linguistic hemisphere of the subject.

When asked what they saw, subjects might say something to the effect of: "I'm not sure", or "there was some kind of flash" or, "there were some trees with red leaves … like in the fall." In addition, the subjects would indicate that they found the experience disturbing, upsetting, scary, unsettling, and the like.

There are several interesting dimensions to the foregoing responses. Even though the linguistic descriptions were sketchy and somewhat off the mark, nonetheless, those descriptions reflected, in a limited and somewhat distorted way, what the subjects had seen even though the right visual field of those subjects had not been presented with any imagery concerning the situation in which one person had thrown another individual into a fire.

If the corpus callosum of the subjects had been severed, how did the left hemisphere have enough understanding of the situation to be able to give descriptions that – although limited and distorted – were appropriate to the imagery in the film that had been presented to the left side of the visual field and, therefore, supposedly only was transmitted to the right, non-language dominant hemisphere? How did the understanding associated with right hemisphere information get transmitted to the language dominant left hemisphere if the corpus callosum had been surgically severed?

Moreover, putting aside issues concerning the linguistic descriptions of what had been seen, the language-dominant left hemisphere is giving entirely relevant linguistic responses to the emotional content of the images in the film that were presented to the left portion of the visual field and that were transmitted to the right hemisphere. Again, how did the language-dominant left hemisphere gain access to the emotional understanding associated with the visual information that had been transmitted to the right hemisphere if the corpus callosum had been severed?

Conceivably, one possible explanation is that not all of the bands of fiber in the corpus callosum were necessarily severed. If so, then, although limited in number, those fibers might have been sufficient to transmit at least some information from one hemisphere to the other.

However, there is no evidence to indicate that the foregoing correctly accounts for how the left hemisphere appeared to have access to, and an understanding of, information that, supposedly, only was available to the right hemisphere. Thus, while it is possible that some sort of leakage was taking place between cerebral hemispheres via still intact fibers of the corpus callosum, this is only a conjecture.

Another possibility is that working memory has access to information from both the right and left hemispheres, but not all of that information is necessarily capable of being translated into a linguistic format. If this were the case, then, linguistic responses might be shaped, to varying degrees, by information and understanding that is present but that is difficult to translate properly into linguistic terms.

Seemingly, the left hemisphere is aware of some aspect of phenomenology that is being shaped by information coming from the right hemisphere. Moreover, there is sufficient awareness in the left hemisphere concerning that information to permit the language centers in the left hemisphere to be able to provide a limited, distorted, but not entirely irrelevant description of the visual information that was sent to the right hemisphere. Furthermore, there is sufficient awareness of that information to enable the left hemisphere to provide an entirely relevant description of the emotional content of the experience arising in conjunction with the imagery presented through the left side of the visual field that would end up in the right hemisphere.

Since the early experiments of Michael Gazzaniga, a lot of research has indicated that the brain is not necessarily as lateralized (which occurs when cerebral hemispheres have specialized functions distinct from one another) as once was believed to be the case. While there might be dominant aspects to certain dimensions of hemisphere activity, the non-dominant hemisphere might have a lot more going for it – including in relation to linguistic activity -- than previously had been thought.

Irrespective of what, ultimately, might be going on cognitively in split-brain patients, the main thrust of the foregoing discussion is to indicate that there can be parallel systems of awareness that simultaneously impact working memory. These parallel systems involve forms of understanding that cannot always be translated into linguistic terms and, yet, they are intelligent, aware assessments of on-going experience.

Chapter 24: Holographic Images

Objects have the effect of distorting or altering the waveforms that engage such objects. The manner in which a wave form is altered serves as an index or signal of the character of the object encountered. In a sense, the nature of the alteration of the waveform is sort of like a lingering trace of the character of the object engaged by the waveform.

For example, if a given object has the property of absorbing a certain range of wavelengths, then, when it meets a complex waveform, the object will 'extract' those energies that it is capable of absorbing from the waveform complex. Those wavelengths in the waveform complex falling outside the object's absorption range will be reflected. By extracting certain wavelengths, the object has altered the character of the waveform, and the nature of the alteration provides an index for one of the properties of the object involved. We usually refer to this property as color.

Objects with a penchant for absorbing all manner of wavelengths will appear dark or black because little of the original waveform is reflected back or permitted to be further transmitted due to the absorption property. On the other hand, objects possessing little capacity for absorbing any of a range of wavelengths in an encountered waveform complex will appear to be whatever color happens to predominate in the wavelengths of the waveform complex being engaged.

Thus, if the entire spectrum of wavelengths is present, the object will appear to be white. However, if the wavelengths in the waveform complex are dominated by those corresponding to the blue region of the spectrum, then, the object will appear bluish, and so on.

Beside the property of color, objects also will alter the character of encountered waveform complexes as a function of a variety of other features. These other features include general shape, texture, surface contours, and so on.

The energy associated with a given form of electromagnetic radiation is directly proportional to wavelength. The shorter the wavelength of the radiation, the greater will be the energy of that radiation. Furthermore, the shorter the wavelength of a given form of radiation, the greater will be the frequency or cycles per unit of time of such radiation.

Finally, as the wavelength of a given form of electromagnetic radiation becomes smaller, the amplitude of the waveform increases - that is, the peaks of this radiation's waveform become higher, and the valleys or troughs become deeper. The intensity of a waveform is directly proportional to the height of its amplitude. One should keep in mind, however, that although frequency and amplitude are functionally linked in the various forms of electromagnetic radiation, these two characteristics are independent in other kinds of waveforms such as in the case of sound waves and water waves.

No matter what kind of waveform one is dealing with, one can define that waveform completely by considering only its amplitude and phase. In mathematical terms, amplitude and phase constitute the essential variables in the function describing a given waveform, whether simple or complex.

Phase refers to the portion of a cycle that a wave has passed through at a given moment. The term 'cycle' is used because waveforms can be mapped onto points along the circumference of a circle. This provides one with the opportunity to describe the waveform in mathematical terms.

More specifically, the circumference of a circle covers an angle of 360 degrees. Since frequency is the rate at which a waveform repeats itself per unit of time, the 360 degrees circumscribed by the circumference of a circle can be used as a unit measure for the number of cycles completed per unit of time by a given waveform of a certain frequency.

A function's value depends on what happens to some other value. When such an independent value changes, then the value of the function will also change in an appropriately dependent fashion.

A sine has numerical values ranging from 0 to 1 and from 1 to 0 as the value of an acute angle varies, respectively, from 0 degrees to 90 degrees and from 90 degrees to 0 degrees. Cosines are also numerical values. However, as acute angles vary from 0 to 90 degrees and from

90 to 0 degrees, cosines range, respectively, from 1 to 0 and from 0 to 1.

When the sine value is at its maximum, the cosine is 0, and when the cosine is at its maximum value, the sine value is 0. Sine and cosine are opposite in value, both with respect to magnitude as well as sign, so if one of the two is positive, the other will be negative in value.

If one draws a unit circle, in which the radius of the circle remains constant at 1, then, any right triangle one inscribes in the circle with angle A's vertex at the center, will have a constant hypotenuse of 1. On the other hand, one moves the right triangle around the unit circle, the values of 'A', 'x' and 'y' all will change.

As 'A' changes from quadrant to quadrant (one should envision the unit circle with diameters running from top to bottom and from side to side, forming a perpendicular axis), one gets two non-zero values for 'x' and 'y' of the right-triangle. That is, one gets two nonzero values for the sine and cosine of the right triangle.

If one constructs a graph, plotting values of sine and cosine (fluctuating between +1 and -1 and forming the y-axis) against the corresponding degree readings of the unit circle (ranging from 0 degrees to 360 degrees and that will form the x-axis), one gets a wave form. In the case of the sine wave, one starts off at 0 (for the sine value) versus 0 degrees.

As the sine value approaches a maximum of +1, the degree value approaches a maximum of 90 degrees. At 180 degrees, the sine value becomes 0 again. As the sine value approaches a value of -1, the degree value works toward 270 degrees. Finally, when the degree value is 360 degrees, the sine value once again returns to 0, and the wave cycle has been brought to its original starting point of a 0 sine value and a 0 degree value.

In the case of the cosine wave, one starts off with a cosine value of +1 and a degree value of 0. As the cosine value approaches 0 for the first time, the degree value comes closer to 90 degrees. When the cosine value reaches a value of -1, the degree value is at 180 degrees. When the cosine value reaches 0 for the second time, this corresponds to 270 degrees. Finally, as the unit circle completes its cycle at 360 degrees, the cosine value once again approaches its initial value of +1.

The formula for the circumference of a circle is $2\pi r$. In the case of a unit circle, however, where $r = 1$, then, the formula for the circumference becomes merely 2π. If one translates degree values into 'π' values, 90 degrees, that corresponds to 1/4 of the circumference, converts into $1/4 \times 2\pi = 1/2\pi$. 180 degrees becomes $1/2 \times 2\pi = \pi$, and 270 degrees translates into $3/4 \times 2\pi = 1\ 1/2\pi$. With each new cycle, one merely adds 2 (which represents one complete circumference or cycle) to all the 'π' values for the corresponding degree values. Thus, 450 degrees (that is, 90 degrees into the second cycle) becomes $2\ 1/2\pi$, and so on.

The value of +1 represents the highest point of amplitude for either a sine or cosine wave. However, the value of +1, in and of itself, does not inform one whether one is dealing with a sine or cosine wave (or some form of wave in between a sine and cosine wave), nor does it tell one exactly where one is in the cycle.

The aspect of phase enters in at this point, for in giving the phase spectrum with the amplitude value, one is providing a means of locating where a given amplitude value occurs in a cycle, relative to some identifiable point of reference such as 0 degrees, or the starting point of a cycle.

A sine wave reaches a maximum of +1 at $1/2\pi$, $2\ 1/2\pi$, $4\ 1/2\pi$, etc.. A cosine wave, on the other hand, reaches a maximum amplitude of +1 at 0π, 2π, 4π, and so on.

If one has a wave, for example, of amplitude +1, with a phase spectrum of $1/2\pi$, $2\ 1/2\pi$, or $4\ 1/2\pi$, one knows that one is dealing with a sine wave. As long as one has both amplitude and a phase spectrum, one has the basic components for defining a regular wave.

In short:

(a) amplitude and phase define sine and cosine waves; (b) sine and cosine waves define regular waves; (c) a series of sine and cosine waves can define a compound wave; (d) amplitude and phase define compound waves.

In a sense, the cycle of a waveform marks the transitions in amplitude that the waveform undergoes over time, ranging from zero, to maximum, and back to zero again. If one wishes to inquire about the character of the amplitude at any given point in the cycle, then, one will have to engage the cycle at an appropriate point in time during which the aspect of the cycle in which one is interested is being expressed. The precise stage of transition of the wave's amplitude at that point in time constitutes the wave's phase.

Amplitude gives expression to a quantitative measure of the energy of a wave. For example, a wave has maximum energy at the crest point and minimum energy at the trough point. Phase, on the other hand, locates or places a particular manifestation of a given waveform relative to the structure of the entire cycle of transitions that such a waveform goes through over time.

The character of transition in amplitude referred to earlier does not refer to the absolute magnitude of the amplitude at a given point. It refers to whether the amplitude is increasing or decreasing as well as whether the amplitude is approaching or leaving: (a) a zero point in amplitude; (b) a maximum point in amplitude, or (c) a minimum point in amplitude. These themes of whether the amplitude is increasing or decreasing -- together with the nature of the relationship of this increasing/decreasing activity with the maximum/minimum points of the cycle -- describes how the current expression of amplitude (as a pure magnitude) stands in relation to the structural character of the waveform as a whole.

Thus, phase constitutes the facet of the waveform's structural character being engaged at a given point in time. Phase is the waveform's amplitude orientation to the world at a given instant of engagement or manifestation. As such, phase is not something that can be weighed with scales or measured, calibrated and scanned with instrumentation.

Phase is essentially relational in character. Therefore, it requires a reference point against which it plays off in order to establish its orientation within the structure of which phase is an expression. For the most part, the relational character of phase is expressed as a function of time and/or angles.

As long as one knows where to place 0π, that serves as a point of reference, one has a means of determining both amplitude and phase. However, if one has no means of identifying the point of reference through which one starts the ‘π’ scale, one really has no means of establishing whether a regular wave is a sine wave or a cosine wave or some other form of regular wave.

As a general principle, one might argue that any methodology involves, as part and parcel of its being a methodology, a means or technique for locating or establishing a point of origin or a reliable point of reference. This sort of point of reference is one that is rooted in, or is purported to be rooted in, the structural character of reality or that which reflects an aspect of such structural character. Through this point of reference, one can locate or orient oneself in relation to a wave's or latticework's (considered as a complex or compound waveform structure) current expression of its phase spectrum.

As long as one's methodology is unsuccessful in establishing this referential point of engagement, one will have no means of locating, identifying, determining or establishing what the phase spectrum of a latticework is or where one is in that phase spectrum when one experientially engages that latticework. Moreover, if one selects an incorrect, distortive or problematic point of reference as a basis through which to engage a given latticework, the difficulties surrounding that initial selection will be transmitted throughout the whole subsequent engagement and orientation process.

Even if one is not able to establish an absolute point of reference for locating where the n-scale begins, relative phase can still be given a determinate characterization under certain circumstances. For example, this can be done when one has two waves that are out of phase with one another by a specifiable amount of ‘π’.

In other words, when one looks at the phase difference between two waves, one has a means of engaging the waves in a relative manner that permits one to orient oneself with respect to them to a certain extent. The phase difference between two waves is usually calculated as an angle.

Interference involves two or more waves that are interacting through their phase differences. For instance, if one considers two waves of different amplitudes but that are in phase, when the two waves interact with one another, they will tend to produce a wave with higher crests and lower troughs than either of the original waves considered individually. This is a case of constructive interference in which there is a relative phase difference of 0.

However, if two waves of the same amplitude, but opposite phase, interact with one another, the result will be a wave in which troughs and crests coincide and, therefore, cancel out to have zero amplitude. This is a case of destructive interference in which the relative phase difference of the two waves is a non-zero value.

As the relative phase difference approaches a maximum value when the two waves are precisely opposite in phase character, the crests of the daughter waves will become increasingly less than either of the parent waves and the troughs of the daughter waves will become increasingly less than either of the parent waves. In short, both the crest and trough of the wave will approach the horizontal axis of the graph as a limit.

A definite phase relationship must be established between two or more sets of waves in order for an interference pattern to be created. A phase relationship that is well-defined is referred to as being "in step".

On the other hand, when the phase relationship is not well-defined, then, the waves are said to be "out of step". Out of step waves cannot produce interference patterns. Therefore, even in the case of destructive interference, there must be some degree of well-definedness to the phase relationship of the waves involved.

The situation becomes more complicated if one keeps the amplitudes of the interacting waves equal but allows the phase difference to have values less than n or 180 degrees. Under these circumstances, the waves sometimes will manifest constructive interference and, at other times, will give expression to destructive interference, depending on the value of the relative phase difference. Nonetheless, for each specific relative phase difference, there will be a unique daughter wave whose shape is a reflection of that specific relative phase difference.

If we permit one more complicating factor to be introduced (namely, variable amplitudes for the interacting waves), in addition to a relative phase difference of less than ‘π’, one will generate a daughter wave that has a unique size (as a function of the interacting amplitudes) and unique shape (as a function of the interacting phase differences). In other words, the magnitude of the daughter waves will be a function of the amplitudes of the parent waves, while phase differences will determine where and when constructive and destructive interference will occur.

In general, the magnitude and shape of the daughter wave produced by the interaction of n-waves will be completely determined by the amplitudes and relative phase differences of the interacting waves. Therefore, any compound wave can be represented as a summation series of amplitudes and phases of a set of interfering waves.

In an optical hologram, information is stored in the form of alternating zones and bands of light and dark. These alternating bands are the telltale signs of the presence of interference. The density of these interference regions depends on the intensity of the light being used to make the hologram.

As indicated earlier, the intensity of the light wave is an index of the wave's amplitude. Therefore, density of the interference patterns provides one with a means of deriving information about amplitude.

This is one of the two factors necessary to be able to give a complete description of a given waveform. The other factor enabling one to describe a waveform is the relative phase.

Such information is reflected in the rate at which transitions occur in relation to the shifts in constructive and destructive manifestations of interference as one moves from one point or zone of the hologram to another contiguous point or zone in the hologram. This rate of transition carries the phase code.

In simplified terms, objects alter the structural character of those light waves interacting with it. This alteration affects both the amplitude and phase character of the waveform. These altered characteristics will be transmitted to, and given expression in, the pattern of interference that develops when the light that has encountered an object meets up with light waves that have not encountered such an object.

Photographs of a conventional sort record data about amplitude but not about phase. Holograms also record and keep track of data on phase relations as well.

Initially, Dennis Gabor was not trying to invent a holographic process. He was trying to enhance the resolution of the pictures taken through electron microscopes.

Resolution concerns the problem of separating or sorting out the details, one from the other, in an image of some object, irrespective of whether the image is in the form of a photograph or a reflection. Although there are a variety of factors affecting the degree of resolution obtainable in a given instance, one of the more essential shaping factors is the wavelength of the form of radiation being used to 'illuminate' the details of the object one is trying to resolve. In general, the shorter the wavelength of the illuminating radiation, the better will be the resolution of the object being illumined and the better will be the resolving power of one's means of illumination.

Gabor believed that if one could get an electron picture containing all the available information in relation to a given object, and, then, if one corrected this picture through optical means, one might obtain a far greater degree of resolution than one could get otherwise. However, everything depended on being able to preserve the phase information that is often lost.

An essential tenet in Gabor's ideas concerning the enhancing of resolution through optical means was his belief that one tended to lose phase information because one had nothing with which to compare such information. He believed he had a way to preserve the phase information that was usually lost.

Gabor proposed to split the waves of a light source. One of the split beams would make contact with a target object. The other beam did not interact with the target object but would be permitted to recombine with the 'target-object wave' later on.

Gabor believed that if one split the light in the foregoing manner, the subsequent, 'post-object-engagement' interference pattern of the two beams of light would allow phase information to be preserved. In other words, the interference pattern would provide a means of keeping track of the differences in amplitude and phase between the object wave and the reference wave from the time that the two were split from the initial light beam, until they came together again in the form of an interference pattern.

The information concerning amplitude and phase differences was to be stored on a photographic plate. Gabor believed that if one reconstructed the wave-front of the interference pattern stored on the photographic plate, one should be able to give enhanced resolution to the object's image because the hologram would have preserved all of the relative phase variations as well as a record of the changes in amplitude.

Gabor's technique is referred to as the 'in-line' method due to the way the object to be photographed is placed in a direct line between the light source and the photographic plate. As originally developed by Gabor, the in-line method was limited to objects that were transparent. It could not handle non-transparent or dense objects.

The diffuse-illumination hologram was developed by Juris Upatnieks and Emmett Leith in the 1960s. Unlike Gabor's 'in-line' method, the diffuse-light hologram used reflected light rather than direct light and, consequently, was referred to as an 'off-axis' hologram.

In the Upatnieks-Leith method, the initial light beam was passed through a partially coated mirror that split the light beam. The split beams of light were then, transmitted along their respective paths by a series of mirrors.

One series of mirrors conveyed one of the light beams to an object and, then,, onto a juncture where it would meet up with the reference beam. The reference beam had been transmitted by another series of mirrors through an alternate route that by-passed the object being photographed. When reunited, the beams created an interference pattern that preserved variations in phase and differences of amplitude.

Leith and Upatnieks used laser light (lasers were invented in 1960) as their coherent light source. Laser light consists of twin emissions of light that are perfectly identical both with respect to phase as well as amplitude.

In addition, Leith and Upatnieks put a diffuser on the light source of the laser. This had the effect of scattering the light somewhat.

However, the light was scattered in a way that did not affect or alter the coherency of phase relationships of the twin emissions. The addition of the diffuser had the remarkable effect of permitting each and every point of an illuminated object to act as a light source.

Furthermore, each and every point of the photographic plate was able to store a complete record of the information received from the multiple light source of the object being illuminated by the diffuse but coherent laser light. In short, each point of the photographic plate preserved all amplitude changes and phase variations that resulted from the interference pattern created by the interaction of the object beam and the reference beam.

While the stored message is believed to be whole and complete at every point of a hologram, nonetheless, resolution of the message is lost as the size of the fragment of the hologram becomes smaller and smaller. The reason for the lost of resolution is due to the increasing weakness of the signal with decreasing size of the signal carrier.

As the signal grows weaker, it becomes more susceptible to the effects of noise or competing signals. This results in an eroding of the image being transmitted by the signal. How badly the image is eroded will depend on the ratio of noise to signal.

Theorists, however, consider the eroding of the image to be a problem of the signal carrier rather than the actual message itself. Therefore, they believe that although resolution is lost as the size of the hologram fragment decreases, the message always remains intact.

As indicated above, theorists believe there is no lower limit on the size of the point of the photographic plate that can retain all the amplitude changes and phase variations. The absence of a lower size limit is because of the supposedly 'sizeless' nature of relative phase. However, there are certain questions that might be raised about this contention.

To be sure, relative phase is a relational rather than a purely quantitative relationship. Yet, in the case of holograms, the relationship still involves physical entities in the form of energy interference patterns. Consequently, one might not be able to escape entirely from the realm of the material or physical and, therefore, quantitative and 'sized'. At some point on the far side of the Planck length, one might suppose the physical disappears and with it the 'things' that are being related through relative phase.

In any event, intuitively, one might presume that the smallest possible means of storing, as well as transmitting, an optical hologram is the photon that is the carrier of the electromagnetic force. This raises some interesting questions about how a single photon could transmit and store the entire interference code of a hologram.

For example, how does the structural character of a single photon (which is, supposedly, like a sizeless, geometric point-particle) allow the photon to preserve the amplitude changes and phase variations that occur when the photon engages some, given target object? If one supposes that the field generated by a photon, or that accompanies a photon, is where a signal is 'inscribed', the fact is, something has to keep the structural character of the encoded field intact. Something has to permit the phase relationships to be preserved so that the message does not dissipate prior to being recorded on the plate at the point of interference.

Presumably, this 'something' is the dialectic of forces and/or dimensions that establishes the set of constraints and degrees of freedom that are described in the field equations governing a given phenomenon. In this case, the phenomenon consists of coherent optical processes that are: (a) separated into reference beam and object beam, (b) sent along different paths (one of which encounters an object) and, then, (c) rejoined in the form of an interference pattern.

A field cannot account for the existence of the forces generating and shaping it. The field is merely the phenomenal expression of the dialectic of such forces. Consequently, the capacity of photons or the photon field to encode or store messages seems to depend on an underlying substratum of ordered or ordering activity. This ordering activity permits encoded signals to be preserved by organizing the way photons, photon-photon interactions, or photon fields manifest themselves.

Holograms need not be restricted to instances using light as the only means of creating the reference waves and object waves that subsequently interfere with one another. Any kind of wave phenomenon could be used, including: electrons, X-rays, microwaves, and so on.

In fact, since wave motion is equivalent to any kind of periodic or harmonic motion, theoretically, one should be able to generate a hologram using any sort of periodic motion as long as one can find a means of preserving the changes of amplitude and the phase variations involved in such motions. In other words, what is important is the set of relationships that capture the character of amplitude and phase, together with any transitions occurring with respect to amplitude and phase.

Frequency modulation of radio waves utilizes the phenomenon of phase modulation. In FM radio waves, the amplitude is kept constant while the frequency of the wave is modulated. The modulation of the wave's frequency that is conveying the signal is what constitutes the message being transmitted. Since phase is the primary index of the location of amplitude, and since the location of the crest and trough of amplitude shifts as the frequency of the wave is altered, frequency modulation is actually a matter of phase modulation, and phase modulation is central to the holographic process.

For quite some time, neurophysiologists knew that neural signals utilize principles of frequency modulation. Consequently, these signals revolve around phase variation.

The neural impulse is represented on an oscilloscope as a moving wave-front. This wave-front constitutes the fluctuation in voltage along the exterior of the neuron's cell membrane subsequent to the ebb and flow of ions brought on by, first, the collapse, and, then, the restoration of, the resting membrane potential. The moving wave-front on the oscilloscope is usually referred to as a spike.

The neural impulse is governed by the all-or-none law of transmission. Essentially, this law stipulates that: (a) unless the critical value of a neuron's threshold is reached, the cell will not generate an impulse wave; (b) once the threshold value has been achieved, the subsequent impulse will travel down the axon in a wave of uniform amplitude and constant velocity; and (c) neither the amplitude's uniformity nor constancy of transmission velocity will be affected by increasing the intensity of the signal triggering the neural impulse.

People such as Karl Pribram believe sensory receptors produce signals that trigger different sets of on/off or excitation/inhibition combinations of neurons. These different sets collectively form interference patterns. Where there are interference patterns, there, too, are phase modulations.

The magnitude of frequencies and energies required to generate holograms in the laboratory are not to be found in the nervous system. Consequently, one cannot draw direct comparisons between holographic theory and what goes on in the nervous system. However, the means by which events are encoded and stored in the nervous system might be an analog for the holographic process (or vice versa).

An analog is a structure or latticework or pattern capable of preserving a certain kind of logic, principle, relationship or set of relationships that is found in some other structure, latticework or pattern. Furthermore, the character of the two structures, latticeworks or patterns that are analogs of one another involve different mediums.

Oscillations, periodicies, vibrations, cycles, undulations, and so on which occur in a variety of different mediums are all analogs of wave phenomena. In each case, the logic, principles and relationships of amplitude and phase are preserved despite differences in the character of the medium in which, and through which, these phenomena occur or take place. Therefore, if a given medium has a means of preserving phase relationships, it has the potential for being an analog for a hologram.

Consequently, the brain or the mind, in some analog fashion, might be able to preserve data on amplitude and phase relations, as well as provide a means of reconstructing this data, without requiring the high energies necessary to produce the intensities associated with coherent light. In fact, what might be most important, if there were an analog process for the holograph in the mind or nervous system, is not even amplitude.

In the mind, neither amplitude nor energy, per se, might be as important as being able to have a means of recording gradations in the intensity of intentional orientation or focus. This aspect of the intensity of focal orientation (together with the feature of phase relationships that locates or orients that focal intensity within an aspect of the phenomenology of the experiential field) might be the means by which the latticework of an event's structural character is encoded to form a memory.

Alexander Metherell believes the heart of the hologram is actually phase. In fact, he was able to produce the phase-only hologram by keeping amplitude constant at one level and just focusing on the variations of phase. Metherell's discovery suggests that one might, yet, be able to show that memory is rooted in the idea of a hologram - but a phase-only hologram.

Similarly, one might want to treat the vectored interaction of ideas and concepts as interference patterns of a special sort. For example, instead of conceiving of the interference of ideas as a simple function of amplitude, frequency and phase spectrum, or instead of conceiving of such interference as merely giving rise to some simple daughter wave as a function of whether the interference is constructive (i.e., additive) or destructive (i.e., subtractive), the interference of ideas might best be construed in terms of being dialectic, multi-dimensional and non-linear in character. In short, the ideational or conceptual waveform might be a complex latticework that behaves differently than normal waves usually do - yet, still retains some qualitative properties of wave phenomena in an analogical form.

Normal waves give expression to the principle of superpositioning in which they 'flow' through one another without their structures being affected when they come out the other side of the interaction. During the course of interference, naturally, the 'daughter' wave resulting from the constructive/destructive interference of the parent waves will give expression to an altered structural character. However, once the interaction is over, the parent waves revert to their original character.

In the case of hermeneutical interference, the interaction might be less like a standard case of interference and more like a holographic context. In the latter case, the light wave is distorted or warped or altered by the structural character of the object with which it comes into contact. Furthermore, the light wave remains in a distorted or warped condition even after the wave departs from the scene of object-engagement.

In other words, as ideas move through one another, a dynamic, dialectical vectored field is generated that is capable of altering the structural character of one or more of the ideas involved in the interaction. Which, if any, ideas will be altered, or to what extent and in what way, will really depend on the character of the ideas involved. Moreover, the character of the alteration will depend on how the individual brings the ideas together in a given context and how susceptible each of the ideas is to certain kinds of motivational, emotional, physical and spiritual forces that might be impinging on the interaction.

Inferential/mapping functions might play an especially prominent role in this vectored, dialectical process of ideational interference. In this sense, the field generated by the interaction of the ideas is, or can be, greater than the sum of the parts since the phase relationships given expression through the inferential mapping functions have a tendency to generate further phase relationships and inferential mapping functions - somewhat as an electromagnetic field continues to propagate itself at right angles to the direction of primary propagation. As a result, the initial ideas involved in dialectical engagement begin to be altered by the very properties of the hermeneutical field that such ideas have helped to establish.

In the context of hermeneutical interference patterns, notions of phase, relative phase and phase difference are likely going to be a be more structurally complicated, subtle, dynamic and dialectical than is the case for ordinary waves of even an irregular and compound nature. Under such circumstances, phase might have a lot to do with the hermeneutical orientation of an individual at a given time as different ideas, concepts, values and so on are brought into juxtaposition with one another and begin to interfere with one another.

Moreover, in the case of hermeneutical interference processes, relative phase and phase difference might involve inferential/mapping relationships that become manifest, or are generated, during the period of ideational interference. Such inferential/mapping relationships might not establish what the ultimate truth is, but the phase differences of such relationships allow one to orient oneself with respect to the ideational interference at hand and to grasp the structural character of the 'daughter' latticework resulting from such interference. This provides one with a point of engagement through which to attempt to try to work out the character of the interaction between certain aspects of ontology and phenomenology that makes possible experiences of an observed structural character.

The relationship between focus and horizon often constitutes a relative phase difference and not necessarily an absolute one. An 'absolute' phase difference would be indicated if the relationship between focus and horizon was congruent with, or reflective of, some aspect of reality.

Even in the case of congruency, however, there would be a certain relativity of phase difference inherent in the situation since the truth being expressed or reflected would not necessarily constitute the deepest, most essential penetration of the truth concerning a given aspect of the structural character of reality. Nevertheless, a phase difference latticework having some degree of congruency with the structural character of the scene being reflected is certainly more objectively accurate than a phase difference latticework that has little or no congruency with the structural character of the scene to which identifying reference is being made.

In any event, when an 'object' is encountered in the phenomenology of the experiential field (irrespective of whether that object is a sensory experience, a concept, a dream, an emotion or some other kind of experiential latticework), the beam of consciousness is split, with horizon and focus traversing different paths until they reunite to create the dialectic of interference in which focus and horizon play off against one another to generate an n-dimensional hermeneutical holograph of the scene to which identifying reference is being made.

The term "n-dimensional hermeneutical process" has been used above in order to draw attention to the way, in the phenomenological context, one gets a multi-faceted point of view with the hermeneutical holograph, just as one does with a normal holograph. However, in the phenomenological case, one is not restricted to merely the exterior surface and contours of what is being holographed. One also has access to the qualitative, non-physical 'surfaces' and 'contours' of the structural character of the n-dimensional dialectical product of a hermeneutical holographic process.

In other words, the penetrating power and capacity for resolution of understanding goes far beyond the limits of purely physical/material process. Indeed, in a sense, one could say that the penetrating and resolving power of even material/physical techniques is a function of the underlying hermeneutical latticeworks in which such techniques are rooted and that shape and direct and orient the latter processes.

At the heart of Fourier's thesis for analyzing waveforms is the contention that any compound, irregular wave can be shown to be equivalent to the summation of a series of simple, regular waves. This series is known as a Fourier series. In turn, any physical phenomenon displaying an oscillatory nature or a periodic character can be expressed as a Fourier series of sine and cosine waves.

An irregular, compound wave can be treated as a series of increasingly smaller regular waves. In fact, as one proceeds along the series, the frequencies of the smaller and smaller waves becomes increasingly greater. In other words, they complete their cycles at progressively faster rates.

Fourier's technique involves selecting some initial regular wave to be used as a working representation of the period of the compound, irregular wave in which one is interested. He, then, used his method to establish a set of coefficients to be used in conjunction with the selected working representation of the initial, compound, irregular waveform. This process of finding the coefficients is called Fourier analysis.

When integrated, the series of coefficients and the corresponding increasingly higher frequencies for the increasingly smaller waves will add up to the value of the fundamental frequency used as a model for the irregular, compound wave. The coefficients were selected in order to make the frequencies of these increasingly smaller waves whole number multiples of the initial regular wave frequency.

Fourier's method actually uses a kind of dialectic to guide the process of generating the coefficients to be selected for the Fourier series. By gathering together the values for all the regular waves derived through Fourier analysis and using these values to make a compound wave, one has an opportunity to compare this synthesized wave against the original irregular, compound wave.

When the synthesized wave can be shown to closely match the original wave, then, one terminates the analysis. If, on the other hand, the match-up is not sufficiently close, then, one continues to proceed with further analysis.

The initial wave in a Fourier series is referred to as the fundamental harmonic. Each successive wave in the Fourier series is called, in turn: the second, third, fourth, etc., harmonic. In most cases, a series consisting of nine coefficients (that is, up to the ninth harmonic) is able to provide a sufficiently close approximation for even very complicated, irregular, compound waves.

Once the series of coefficients has been determined, one is in a position to plot a graph involving amplitude versus frequency. Graphs can be symbolized in the form of an equation. An equation consisting of a series of coefficients that represent the amplitude/frequency properties of a set of regular waves is known as a Fourier transform.

There were certain technical limitations inherent in the idea originally conceived by Fourier. However, a number of other theorems have been introduced to permit one to circumvent these limitations. The most important of these supplementary theorems is the Laplace transformation.

The term "transform" can be used in either a verb or noun form. Usually, however, the term is used in its noun form of transformation-as that which is generated from, or is the result of, a transforming process. In its noun form, transform refers to either the graph-figure or the equation that is produced by a specific functional ordering of the Fourier coefficients.

In essence, then, a transformation represents both the transition from one mathematical form to another, as well as the structure produced by that process of transition. Moreover, in accomplishing this transformation, one also has undergone, in the case of Fourier analysis, a transition from perceptual space (which is the medium through which the original irregular, compound wave that is being modeled is given expression) to Fourier transform space.

In perceptual space, frequency is a function of time, and, as a result, the 'perceptual frequency' is expressed in terms of cycles per second or Hertz units (Hz). However, in transform space, frequency becomes a spatial function. More specifically, frequency is measured by the density of stripes occurring in a given area of an interference pattern.

The term 'stripes' refers to the periodic patterns of light and dark that are manifestations of the junctures of constructive and destructive interference. In fact, the density value of stripes in a given area depends on the character of the phase difference between the interfering set of waves.

Therefore, frequency is fundamentally linked to phase. For example, signals in the nervous system are sent as waves in which amplitude and frequency are independent of one another, but the signal is transmitted in transform space as a spectrum of phase differences.

One of the benefits resulting from the transition to the 'spatial' form of transformation is to help simplify calculations. In Fourier transform space, one often can accomplish with multiplication and division what only could be accomplished with the use of calculus in perceptual space.

Furthermore, the periodic character of a phenomenon often manifests itself more clearly and markedly in Fourier transform space (as well as in the still more abstract counterpart of Fourier transforms known as Laplace transforms) than it does in perceptual space. For example, the message, signal or interference pattern of a holograph more clearly manifests its structural character in transform space than it does in perceptual space.

The key to gaining access to transform space is the Fourier transform. However, the enhanced clarity of the holographic message in transform space does not mean one visually can see a clearer signal. The clarity is a manifestation of the way the structural character of the logic of the relationships involved in, and among, different transforms becomes better resolved in our understanding. As a result, one can better grasp the structural character of the latticework of phase relationships that cannot be seen visually.

A Fourier series of coefficients has a corresponding Fourier transform. Therefore, if the structural properties of superimposing waves (i.e., the operation of convolution) becomes difficult, if not impossible, to grasp in perceptual space, one might perform the requisite transform operation to generate a mathematical form which is more accessible to the understanding, and, therefore, is more open to exploration, manipulation and so on.

The alterations and transitions occurring in the amplitude and phase of the light waves as a result of engagement with an object do not constitute an image of the object. These alterations of the light wave constitute a transform of the object. In order to restore the image of the object inherent in the information carried in the transform of the object, one needs to perform a transform of the transform.

The first Fourier transform translates the object's structural character into an 'object' (which could be a figure, graph, set, or magnitude of some sort) of transform space. Then, a second Fourier transform operation occurs when the first transform is run through a lens system that translates the object of transform space into an object of perceptual space.

The first Fourier transform operation is comparable to Fourier analysis. This similarity is due to the way in which the transform translates the irregular, compound wave, constituting the object, into a set of regular, uniform, simple waveforms in transform space. These latter waveforms are capable of modeling the original compound wave (i.e., the object).

On the other hand, the second Fourier transform operation corresponds to Fourier synthesis. This is the case because the second operation has the effect, like Fourier synthesis, of recombining the set of waveforms of transform space into an image or figure of perceptual space that gives synthesized expression to the irregular, compound waveform with which one started.

One of the essential defining differences between the object and reference wave revolves around asymmetric alterations in the property of phase variation arising as a result of differences in the character of the paths undergone by the object and reference waves. For each aspect of the compound object wave, phase will vary in relation to the corresponding aspect of the reference wave.

Furthermore, among all of these phase variations, there will be at least one phase variation that will remain the same both before and after the point of interference. This fixed-point phase variation serves as the invariant reference point relative to which all the other phase variations will take place.

The foregoing consideration concerning fixed-point phase variation is at the heart of one of the basic requirements underlying the hologram phenomenon. More specifically, there must be a spectrum of phase variations in transform space that has the property of being well-defined. Usually, the meaning of being 'well-defined' involves being able to tie a given variation to some invariant feature. Thus, one of the minimum conditions that must be satisfied in order for a hologram to be possible is for there to be a fixed-point relationship between the object and reference waves.

People, like Karl Pribram and Paul Pietsch, argue that memory is a particular spectrum of phase variations in transform space. These phase variations exist as a transform analog of relationships among different sets of neurons in the brain.

As such, mind is not stored in the form of molecules, action potentials, neuronal cells or any other aspect of brain functioning or anatomy. Mind is an expression of the variations in phase relationships that are stored in transform space.

The physical/material activity of the brain's neural networks might serve as part of the instrumentality that is necessary to help generate the compound reference and object waves. However, the storage of the interference patterns of these waveforms is a function of the spectrum of phase variations arising as a result of the differences between the reference and object waves. These differences are stored in transform space, not perceptual/material space, since they involve phase relationships, not actual 'things'.

Seen from the foregoing perspective, memory is a transform of a transform. This transform of a transform moves, as well as translates, a structure from transform space into perceptual space. It is an analog of the reconstruction of a wave-front that occurs when one passes coherent light through a holographic plate at the appropriate angle of incidence.

Although the foregoing has a nice theoretical ring to it, one should not lose sight of the fact that transform space is a mathematical construct that is, at best, an analog for what is occurring in the dialectic of dimensions (including the material processes of brain functioning). In other words, the model being put forth by Paul Pietsch, Karl Pribram, and others presupposes that transform space is primarily mathematical in character, consisting of the results of operations on sets of points or on magnitudes or on geometric figures in perceptual space. Nonetheless, actual transform space might not be at all mathematical in character, although mathematics might provide a means of generating analogs for the structural character of the ontological counterparts to such a mathematical model.

In the case of human understanding, transform space might be entirely a function of the hermeneutics of the phenomenology of the experiential field. This field is generated by the non-linear dialectic of various dimensions.

The dialectic of dimensions is, in turn, vectored, oriented, shaped, arranged and organized by an underlying order-field. Such an 'order-field' establishes the set of constraints and degrees of freedom governing the flow of the dimensional dialectic that generates the complex waveforms giving expression to the phenomenology of the experiential field having the structural character it does on a given occasion.

In the light of the foregoing possibilities, transform space can be approached in terms of its being a concrete reality rather than merely a mathematical abstraction. In other words, transform space is concrete in the sense that it is comprised of a determinate set of constraints and degrees of freedom as a result of an underlying dimensional dialectic.

However, the ontological character of this reality is not necessarily physical or material in nature. The ontological character might involve other dimensions such as consciousness, understanding (expressed as hermeneutical operations), will, and so on.

All of these other dimensions are capable of interacting with the physical/material realms, but the former cannot be reduced to being functional expressions of these latter dimensions. Indeed, the structures or waveforms generated through, for example, neural activity might have to be subjected to a set of non-material/non-physical operations in order for the neural waveform activity to be translated into hermeneutical transform space.

Once translated in this fashion, the neural activity might act as vectors that are capable of helping shape and orient the events of hermeneutical transform space. However, one need not suppose that transformed neural waveform structures are the sole vectored determinants of that space.

In one sense logical relationships are really a study in phase differences either within one latticework or between latticeworks or among latticeworks. However, rather than being linked with issues of frequency or temporal/spatial functions as is the case with frequency modulation or neural activity, respectively, logical relationships concern phase differences involving focal/horizonal orientation and engagement.

These phase differences can be relative since one can choose either horizon or focus or any one latticework as the point of reference against which one explores and measures differences in phase orientation and engagement in relation to whatever other structures, foci or horizons one is studying. Nevertheless, these phase differences can exhibit greater and lesser degrees of relativity depending on which dimensions and latticeworks, or that foci or horizons, one selects as a basis for reference and exploration.

Some reference points are more accurately and objectively reflective of the structural character of certain aspects of reality than are other such reference points. As a result, the former sorts of reference points are more capable than the latter sort of reference points of permitting one to properly orient oneself in relation to the study of logical relationships among different latticeworks or within a latticework or among various dimensions.

In any event, when one treats logical relationships as a species of phase differences, one is drawing attention to the way latticework orientation and engagement properties have vectoring and structural characteristics that manifest themselves in the form of various kinds of connections, linkages and relationships under different circumstances.

These orientation and engagement properties are capable of being mapped as a set of complex dialectical interactions.

These interactions, in turn, are characterized by shifting ratios of constraints and degrees of freedom. Such shifting ratios reflect transitions in logical relationships as a function of alterations in the structural character, orientation and mode of ontological engagement of latticeworks and dimensions, one with another, as well as within themselves.

When two or more wave systems interact to generate a memory, one cannot stipulate that memory is attached to any particular structural feature of the interacting systems. In holographic theory, any given memory is stored in transform space as a set of phase relationships. These phase relationships describe periodicity in terms of its essential characteristics.

Such relationships or characteristics do not, in and of themselves, give expression to any specific size, proportion or concrete form. They indicate relationships in the form of phase differences that do not have size, nor do they occupy space, nor do they have any particular concrete form of a physical or material nature.

As a result, in the holographic theory of mind, the mind cannot be reduced to the activity or anatomy or chemistry or electrical activity of the brain. This cannot be done since, in essence, the mind exists in transform space while the brain exists in perceptual space.

A question facing anyone who would propose a holographic theory of memory involves the problem of going from perceptual space to transform space. More specifically, what makes possible the translation or transduction process that converts perceptual space structures into transform space structures in view of the unlike nature of the two kinds of 'spaces'?

Seemingly, this is just another version of the mind-body problem of Descartes, for one would like to know how a physical/material process produces a non-physical and non-material structure. Perhaps even more importantly, how is transform space able to maintain or sustain or preserve relationships, given that it is non-physical and non-material in nature? Similarly, how does an element of transform space get re-converted into a perceptual space structure?

A holographic plate stores interference patterns in a form that can be re-accessed through wave-front reconstruction. The mathematical description of this process describes the movement between perceptual and transform space.

This sort of description is useful because it permits one to understand, within certain limits, some of the structural character of what is going on. One can, then, exploit that understanding to produce tangible results of a determinate, predictable sort. However, as previously suggested, the mathematical description or model might be, at best, only an analog for what actually occurs.

Even if one assumes that the physical plate only intercepts, somehow, the interference pattern existing in transform space and that the interference pattern is completely separate from the physical system used to intercept it, one still needs to know how such a process of interception works. How does a physical/material plate get affected and shaped by a non-physical and non-material set of relationships in transform space? Where and how do perceptual space and transform space interact? What serves as the mediator between these two realms?

The mathematical model can be shown to work because of the existence of a physical medium-namely the plate. In other words, theory maintains that the holographic plate stores the interference pattern in a form that is accessible by physical means.

Thus, if one wishes to retrieve the stored information, all one has to do is to engage the photographic plate with coherent light at the appropriate angle of orientation in order to reproduce the image of the object. What constitutes an 'appropriate angle' will be a function of the angle at which the interference pattern interacted with the plate when the transform of the object's image was originally stored. Without the plate, the mathematical model would be just an empty theory without any counterpart in the perceptual world.

Consequently, one wonders what will serve as the mind's counterpart for the physical plate of the holographic process. If the mind in holographic theory cannot be reduced to the brain, and if memories are not stored in the brain but in transform space, then, how does wave-front reconstruction take place so that one can have a memory-correlate in perceptual space? How does the brain manage to intercept the interference pattern of transform space to produce an image in perceptual space?

In addition, none of the foregoing mentions the problems surrounding the identity of the coherent light (or its source) that is to be used to help reconstruct the wave-front that exists in transform space. One also would like to know how such coherent light is to be sent through transform space at the appropriate angle. After all, transform space has no size or proportion or structure that would seem to permit one to have angles of any sort.

One possible approach to some of the foregoing issues and questions is outlined briefly in the following considerations. To begin with, the idea of transform space can be construed as an analog representation of the possibilities inherent in the dimensional dialectic that underwrites or makes possible the holographic process. In other words, transform space is a description of certain aspects of the structural character of the complex latticework generated by the dialectic of dimensions such as energy, temporality, space, materiality and intelligence (the latter introduced through the efforts of the scientists and mathematicians who devise and set up the holographic process).

More specifically, transform space is an analog representation or model of a subset of the phase relationships that are generated by the aforementioned dimensional dialectic. Transform space involves an inferential mapping that attempts to capture, or give expression to, the character of some of the linkages tying together the different dimensions under a given set of experimental or applied circumstances.

Therefore, in the case of a transform of a transform, such as occurs in wave-front reconstruction, a description is being given. This description is an analog representation of the sorts of phase transitions that are necessary to induce the dimensional dialectic to give expression to certain aspects of the phase relationships that were created when the original holographic interference waveform was generated.

Nothing is stored in transform space except a conceptual description. Indeed, transform space is just a label given to a certain kind of hermeneutical construction. This construction makes identifying reference to, as well as establishes inferential mapping relations and congruence functions with, those aspects of ontology involving holographic phenomena.

Information concerning the latter sort of phenomena is stored in the phase relationships that have been generated, and that are being maintained, by a specific arrangement of dimensional dialectics created through the holographic set-up. Viewed from this perspective, a holographic plate doesn't store information, so much as it is part of the dimensional dialectic that collectively underwrites the holographic phenomenon. As such, the plate is really a passageway through which one gains access, under appropriate circumstances of reconstruction, to those phase relationships that arose when the original pattern of interference was generated.

Thus, irrespective of whether one is talking about mental or material holographic plates, the principle might be the same. In each case, reconstructed images might be translations or reflections or transductions of certain aspects of the phase relationships that arose as a result of dimensional dialectics concerning the initial holographic process.

Although the plate and/or brain play a role in this dialectic, the role of the plate/brain might be that of a transducer rather than a storage medium. In other words, certain aspects of the plate or brain might serve as the physical/material pole of a complex latticework of phase relationships that links the plate/brain to other dimensional poles by means of the temporal dimension. As such, the plate/brain is capable of serving as a transducer that: translates, interprets, and generates, as well as, is shaped by, shifts in phase relationships concerning a wide variety of themes involving emotion, motivation, spirituality, intelligence, sensation, and so on.

A second point to keep in mind is this. In the hermeneutical/phenomenological context, phase gives expression to the individual's mode of engagement of, or orientation toward, the spectrum of ratios of constraints and degrees of freedom constituting the range of possibilities inherent in the structural character of the dialectic between individual and ontology.

While the attractor basins giving expression to the foregoing dialectic circumscribe all the possibilities inherent in the spectrum of ratios, under normal circumstances, not all of these possibilities can be engaged at any one time. When one of these possibilities is manifested-whether through inducement or spontaneous activity, the individual becomes oriented toward the on-going dialectic in a particular way. Consequently, the individual's mode of engagement or orientation becomes the hermeneutical angle of dialectical interaction at a given moment in time.

The term "hermeneutical angle" is used in the foregoing because the point of engagement or the point of orientation represents a phenomenological encounter of one ratio from among the spectrum of ratios of constraints and degrees of freedom that are possible to experience. Therefore, hermeneutical engagement establishes an experiential asymmetry that stands in focal relief to the horizon of remaining possibilities of the spectrum of ratios of constraints and degrees and freedom. This relationship between focus and horizon constitutes the hermeneutical analog counterpart to the notion of angle in geometry.

In June of 1854, Georg Friedrich Bernhard Riemann, gave a lecture entitled: "On the Hypotheses which lie at the Foundations of Geometry". In this lecture he said:

"...geometry presupposes not only the concept of space but also the first fundamental notions for constructions in space as given in advance. It gives only nominal definitions for them, while the essential means of determining them appear in the form of axioms. The relation (logic) of these presuppositions [postulates of geometry] is left in the dark; one sees neither whether nor how far their connection [cause-effect] is necessary, nor a priori whether it is possible."

In essence, what Riemann was getting at in his lecture is that philosophers and mathematicians had imposed an Euclidean order on the ontology of space without bothering to determine whether or not such an imposition was warranted. Furthermore, the imposition had occurred without anyone having a fundamental and clear grasp of the extent to which the logical relationships among the set of postulates that have been imposed on ontological space are necessary.

Riemann felt one of the fundamental problems with geometry was that its foundations had been left in shadows. Instead of having started from true first principles, Riemann claimed Euclidean geometry had emerged from certain kinds of presuppositions that were somewhat removed from, and beyond, the realms of defensible foundational considerations.

One of the shadows that had been cast across the foundations of geometry concerned the idea of a point. Riemann believed the same fundamental principles governed the properties of points in both curves as well as straight lines, but this set of common principles could not be elucidated as long as one approached geometry in the traditional manner of Euclid. Consequently, Riemann proposed to construct a multi-dimensional concept of space using the idea of quantity as the basic building block in his construction process.

Riemann's starting point was an intuition about the nature of quantity. This intuition revolved around the idea that one encountered quantity through measurement.

In other words, whatever quantity is, it is something that is measurable or to which the process of measurement is applied. For Riemann, measurement involved the superimposing of two magnitudes: one magnitude was the quantity whose magnitude was not currently known; the other magnitude was the mode of measurement that was to be used to determine the character of the first magnitude.

The key to this process of superimposing was locked within the idea of continuity. Superimposing could only occur, according to Riemann, when one magnitude is part of the other magnitude with which it is being compared. In other words, one magnitude only could be superimposed with another magnitude when the two were, in some way, continuous.

The aforementioned feature of being 'part of consists of a very precise and exacting sense of the notion of continuity. More specifically, in order to demonstrate that two magnitudes are continuous in the way that would be necessary to make superimposing possible, one had to show that, at a minimum, at least one of the elements of a magnitude had the capacity to affect at least one of the elements of the other magnitude.

Suppose one had two elements x and y. Suppose, further, that a one unit change in element x brought about a one unit change in element y.

If one constructs a graph of x versus y based on the foregoing relationship, one will get a straight line. A straight-line graph describes a linear relationship between the elements being graphed. In such a relationship, the ratio of x to y remains constant irrespective of the size of the values involved.

A curve can be described as the envelope of its tangents. When dealing with the very prototype of curvature - namely, a circle, tangents can be constructed for each and every point of the circle.

Of importance here, as far as Riemann's project is concerned, is the fact that the tangent is linked to a single point. A tangent is also a function of an angle, and this angle can be construed as being a sort of indicator of directionality.

In the case of a straight line, all the points on that line are considered to have the same direction. As a result, any attempt to construct a tangent for the points on a straight line would not be able to reveal any information about changes in directionality.

On the other hand, in the case of a circle, neighboring points along any aspect of the circle's curvature will display slightly different directional characteristics. These directional characteristics are revealed in the differences manifested in the unique nature of the tangent that can be constructed for each of these neighboring points. When these tangents are altered, as one traverses from one point to a neighboring point along the curvature of the circle, the transitions in the value of the tangent inform one about how the aspect of directionality is affected by shifting from one point to the next.

If one assigns a tangent to any given single point on the x-y curve, the curvature of the point at that juncture will establish the slope of the assigned tangent. Furthermore, if one could actually examine a single point on the curve, the direction of that point would coincide with the slope of the tangent that had been constructed for that point.

In actuality, however, one could never really examine such a single point. This is the case since the points on the line supposedly have position without occupying space, and are, therefore, infinite in a way that does not permit any individual point to actually be identified in a concrete manner. The points exist as neighboring relationships of relative position without size.

Nonetheless, one can increasingly reduce the values of x and y so that they approach the hypothetical point on the curve to which a tangent has been drawn. As the values of x and y get closer and closer to this hypothetical point, the discrepancy between the value of curvature and the slope of the tangent becomes increasingly smaller.

In short, one approaches the limit of changes in y in relation to x. The process of locating such limits is the task of differential calculus.

Through the operation of differentiation, that is one of the basic operations of differential calculus, one attempts to establish those limit-approaching ratios of x and y (known as derivatives). These ratios permit one to identify the juncture where the curvature of a single point on a curve is synonymous with the slope of the tangent that can be drawn to that point.

Supposedly, the derivative acts as a guarantee of the continuity between x and y at a given point. Theoretically, this limit ratio or derivative is capable of satisfying Riemann's requirements for the process of superimposing of magnitudes such that y becomes part of x.

Derivatives have an important link to 'e'-- the base of natural or Naperian logarithms. 'E' links y to x as a function: namely, y = ex. Thus, when x = 1, then, y = e(x) = e(1^{st} power) = 2.71821... ; if x = 2, then y = e(x) = e squared = (2.71821...) x (2.71821...) and so on. The plotting of the graph of this function yields a smooth, regular sigmoid curve. The uniqueness of 'e' lies in the fact that the value of the function y = ex in any given case yields the same value as the derivative in that case.

Although, as indicated previously, one never actually can see the relationship of points being referred to in the limit ratio that constitutes the derivative, in the instance of 'e, the graph of y = ex gives a macro depiction (i.e., a structure in perceptual space) of the structural character of curvature on the micro scale of infinitesimal points. The implication here is that if one actually could see what the structural character of a derivative is like on the infinitesimal scale of neighboring points along a curve, one would see what one sees when one plots the graph of the function y = ex - namely, a smooth, regular sigmoid curve.

There might be a confusion in the foregoing between the idea of a derivative that serves as an index of relationship in a given region of space and the actual point itself. In other words, the derivative associated with e designates a limit-area or region near to, or in the neighborhood of, a given point that is part of the graph of y = ex. When this derivative is translated into graph form, it yields a smooth, regular sigmoid curve. However, this sigmoid curve might not so much capture the structural character of a given point as it captures the structural character of the relationship of a set of neighboring points when the property of directionality undergoes transition as one moves through curvature.

The derivative is always relational and contextual. The derivative never concerns a single point in isolation. It focuses on how one point relates to another point in terms of alterations of directionality as one goes from one point to another along a curve.

Similarly, the function of y = ex is always relational. As such, although one can isolate points on the curve that are described by this function, these points are indices for relationships between x and y. In this sense, they are special kinds of points - relational points.

Relational points link together two or more values or magnitudes in the form of a juncture that can be static, dynamic or dialectical, depending on the character of the things that are being linked. Therefore, neither the graph of the derivative associated with 'e', nor the graph of the function y = ex, actually isolate or identify or make reference to a single point.

One might suppose, nonetheless, that the reason why Riemann's intuition works is due to the way it allows one to explore the structural character of relationships among points and values in regions of space that can be made arbitrarily small to suit one's current needs for precision and rigor. The fact one has not captured the actual fundamental unit of space (assuming, of course, there is such a fundamental unit) doesn't really matter since one has found a unit that is small enough to help one to explore and capture the structural character of what one is studying.

In this sense, what is important in Riemann's methodological process of superimposing is not that one element, y, becomes part of some other element, x. What is important is that one's units of measurement provide a means of capturing the relationship among a set of points that are fundamental to the structural character of the magnitude or quantity being measured.

The better one's mode of measurement, the more congruent will be the structural character of the fundamental relationships in one's mode of measurement with the structural character of the fundamental relationships in that to which identifying reference (through measurement) is being made. The key lies in congruence (broadly construed) and not in Riemann's notion of superimposing.

Continuous relationships are a matter of discrete continuity in which discrete features, aspects, properties, etc., are linked together by a set of inter-locking and overlapping relationships. The continuity is provided through these facets of inter-locking and over-lapping properties that provide a means for certain aspects of a structure to continue to manifest themselves despite the fact other aspects of that structure no longer are expressed. This is like the way in which the handing of the baton in a relay race permits the race to continue despite the fact that a new, discrete entity (i.e., a runner) has entered the picture, while previous discrete participants in the race no longer continue to play a role.

In an attempt to elucidate Riemann's thinking, Paul Pietsch, in his book ‘Shufflebrain’, asks us to suppose that 'e' is the only metering device available to one. In addition, Pietsch suggests one consider the visual image of a string of pearls made up of e-units. These units can be increased or decreased in number and that together can be used to form different kinds of curvature. However, the string of e-units can neither be stretched nor broken.

If one had a flat surface on which there were two points x and y and one wished to determine the shortest distance between them, one could use the string of e-units as a measuring device. Seemingly, the shortest path between the two points would be that one that contained the least number of e-units. If the shortest path were represented as being 'x' e-units in length, this length would not change if one were to curve the string by putting it around a person's neck.

Thus, flat surfaces and curved surfaces can be related through the notion of least curvature of the path that links any two points on either surface. As indicated previously, least curvature is defined in terms of determining the least number of e's that can link the two paths.

Next, Pietsch asks one to imagine a triangle that is to be measured by the string of e-units because the string is very loose relative to the rigidity of the lines of the triangle, there is considerable difficulty in getting an accurate measurement of the length of the triangle's sides. Yet, if one decreases the size of both the triangle and the string of e-units, then, the accuracy of the measuring device becomes increasingly more accurate when any given side of the triangle and the length of the string of e-units approach one another as a limit.

Supposedly, at infinity, at least one of the points of the string of e-units can be superimposed on at least one of the points of the sides of the triangle. When this occurs, then, at least at one point, one magnitude (i.e., the measuring device) becomes part of another magnitude (i.e., the structure to be measured).

In this way, the measuring magnitude, consisting of e-units, is said to have one feature in common with the quantity magnitude being gauged by the measuring device. The feature that they hold in common is said to be curvature.

One cannot actually argue that a given length of a string of e-units is the same as any given side of the triangle. This would give rise to an apparent contradiction in which the straight line of a triangle has the same smooth, regular sigmoid character that a graph of e-values has. Nonetheless, at least at one juncture, the relationship between the string of e-units and a side of the triangle manifests the property of superimposing in which both have the same degree of curvature and, thereby, one becomes a part of the other.

The foregoing account seems to create a problem. If one cannot say that any given side of a triangle, taken as a whole, has a superimposable relationship with a string of e-units, taken as a whole (i.e., a straight line is not the same as a sigmoid curve, then, just what becomes of the idea of measurement?

Presumably, in order for one magnitude to be able to measure or gauge another magnitude, then, one of the magnitudes taken as a whole must be superimposable on the other magnitude taken as a whole. Whenever and wherever there is deviation from a relationship of superimposing of the two magnitudes, one introduces a degree of error or inaccuracy into the measuring or gauging process.

If one is uncertain as to the number of points at which superimposing holds, then, one is really uncertain about the actual gauge of the magnitude being measured. Furthermore, one does not have any means of estimating just how frequently superimposing deviations occur.

To be sure, Riemann might be less interested at this point in the idea of measurement than he is interested in trying to determine the structural character of the fundamental unit of space- namely, curvature. However, as suggested previously, Riemann has not really established that the fundamental unit of space is that of curvature.

What he has established is that one can use the idea of curvature as a fundamental unit of relational measurement and, thereby, produce heuristic results. Such results allow one to model various facets of the magnitude of quantity to which one is making identifying reference through the measurement process. In other words, Riemann has found a means of making operational the concept of quantity as a function of curvature, but he has not necessarily fathomed the fundamental structural character of the magnitude of quantity per se.

Curvature in Riemann's sense is a relational concept that exists among a set of points or values and does not necessarily reflect the fundamental structural character of a unit of space. As a result, once again, a distinction has arisen between the structural character of methodology and the structural character of the ontology such methodology is attempting to engage as a means of helping the individual to orient himself/herself with respect to some aspect of experience.

According to Riemann: "About any point, the metric [measurable] relations are exactly the same as about any other point.". In other words, the same fundamental units are involved in the construction of lines, surfaces and spaces, irrespective of whether those lines, surfaces and spaces are linear or curved. Each of these geometric structures is determined by, and a function of, the property of curvature.

Riemann claimed to demonstrate that when one analyzes the magnitude of flatness in terms of its most fundamental aspects or units (namely, points), one discovers that these fundamental units are but a special case of the property making up the fundamental units of curved geometric structures. In effect, the fundamental linear units making up the structure of straight lines, flat surfaces and rectilinear spaces give expression to the property of zero curvature.

For Riemann, geometry, of whatever sort, was constructed from fundamental or elementary units of curvature, and curvature was a manifestation of the character of the relationship among a set of points or values. These relationships could assume a positive, negative or zero value, and, taken collectively, they represented a spectrum of infinite curvature with respect to which any possible geometric figure could be subsumed as a simple or complex function of such curvature.

Riemann's position is not anti-Euclidean. Riemann is attempting to show that geometry does not begin and end with the Euclidean methodology.

Moreover, he is attempting to show there are limits to what Euclidean methodology can be fruitfully and accurately applied. Euclidean geometry works quite well in the context of simple and uncomplicated spaces, planes and dimensions. However, Euclidean geometry is incapable of handling geometry involving infinitely small regions.

Moreover, the structural character of the Euclidean plane is such that one could never show that parallel lines are capable of crossing. The reason for this is because the Euclidean plane is constructed from units displaying zero curvature. However, in those geometric planes constructed from units of non-zero curvature, one is able to show there are cases in which the appropriate kind of curvature will permit parallel lines to cross at some point.

In general terms, Riemann holds that the shortest distance between two points is the path showing least curvature among all the paths that might be drawn between those two points. In the case of Euclidean geometry, the shortest path is the one displaying zero curvature. This is expressed as a straight line.

Riemann held a dynamic understanding of what Pietsch refers to as the idea of "active zero". This is the zero between +1 and -1, not the zero of nothingness.

It is a relational concept forming part of a continuum with other values. It is not an absolute emptiness. Active zero is a relational but neutral presence.

As such, zero space identifies that part of the infinite spectrum of continuous curvature that lies between positive and negative curvature and that serves as a connecting link between positive and negative curvature. Zero space geometry encompasses those aspects of the infinite continuum of curvature involving units of construction displaying zero curvature, and this is the realm with which Euclidean geometry deals.

In summary, there are at least three basic principles characterizing Riemann's position:

(a) Geometric coordinates are a function of the elements of curvature and not vice versa.

(b) point (a) follows from Riemann's discovery that the relationship of points in the neighborhood of any given point is the same as the relationships of points in the neighborhood surrounding any other point. This means the geometric properties describing a given coordinate system will actually be a transform of the properties describing some other coordinate system. This is the case since underlying both coordinate systems will be a common structural bond in the form of the basic unit of curvature.

(c) the property of least curvature constitutes the structural theme that is at the heart of the transform operation linking one coordinate system with any other coordinate system.

Using the basic ideas of Riemann, Pietsch attempts to construct a holographic theory of mind. For example, Pietsch treats any instance of periodicity in perceptual space as a set of coordinates that can be given transformational expression in an appropriate counterpart coordinate system in the mind. Moreover, such a transform will be an expression of an operation revolving around the basic notion of least curvature.

Thus, the constructs of perceptual space will be built from the units of least curvature that are inherent in perceptual space, whereas a corresponding construct in mental space will be built from the units of least curvature that are appropriate to mental space. However, in each case, the units of least curvature of perceptual space are transforms of the units of least curvature of mental space and vice versa.

One of the problems with Pietsch's foregoing position is the assumption that mental space actually has units of least curvature. This assumption geometrizes the mind and makes it a function of geometric conceptions of, and approaches to, ideas concerning the identity of the structural character of basic building blocks in the mind (assuming, of course there are such things as basic building blocks). With this geometrization of the mind comes the spatialization of the mind.

When one tries to represent other, non-spatial dimensions through the perspective of spatial coordinate systems, then, irrespective of how many coordinate axes one uses to construct this representation, the representation will always be problematic in its presentation. This is because each of the additional spatial axes being used is constructed from points whose structural character is peculiar to the spatial dimension and might not be translatable into, or reflective of, the structural character of the 'points' of the dimension being represented - assuming, of course, that non-spatial dimensions can be analyzed in terms of points of any kind whatsoever.

At the very best, the relationship between the spatial axis and the non-spatial dimension that that axis purports to represent might be an analog one. However, even if the spatial axis could have an analog relationship with the dimension being represented, one needs to understand the non-spatial dimensional significance of the structural character of the complex function to which each point on the spatial axis will give expression.

In other words, the 'points' of another dimension - to the extent that they can legitimately be referred to as points at all - will have a significance and meaning peculiar to that dimension's latticework nature. As such, these 'points' give expression to that dimension's unique set of constraints and degrees and freedom that describe what can and cannot occur through, or within, such a dimension.

What is expressed as curvature in the spatial dimension might not be expressed as curvature in the other dimension in question. In fact, the idea of spatial curvature might have no meaning or significance or counterpart - analog or otherwise - in a non-spatial dimension.

Curvature is but one instance of structural character, and an important question to ask oneself in this regard is this: Is any function based on curvature - no matter how complex that function might be - capable of generating a model that is congruent with the structural character of a non-spatial dimension being represented through a spatial axis system? The answer to this question will depend on whether or not an analog relationship between the spatial and non-spatial dimensions can be generated.

The capacity to plot the graph of a function in a spatial context is a very fruitful procedure. It provides a way of helping one to visualize and see relationships that might not be readily apparent in the functional form of those relationships.

This heuristic component carries over into the realm of transforms in which a transform of a structure in perceptual space might permit one to interact with the underlying set of constraints and degrees of freedom to which the perceptual structure gives expression, in a way that would not be otherwise possible. Nonetheless, if the initial functional characterization of something - in this case, some dimension 'x' - is problematic, this will carry over into the graph of that function.

When it comes to the representation of non-spatial dimensionality through the use of n-axes of a spatial coordinate system, people seem to forget that such systems are expressions of the constraints and degrees of freedom characteristic of the geometrization of space. Consequently, the point-structures of spatial systems, whether considered in Euclidean or non-Euclidean terms, have the potential for distorting, if not totally obscuring, the actual structural character of the non-spatial dimensions being represented. In short, the structural character of points in the spatial dimension (and, again, Riemann views this structural character as a matter of curvature) might not be capable of capturing, or be translatable into (as a transform operation of some sort), or be an analog for, the structural character of some other non-spatial dimension.

The geometric perspective assumes, in principle, that a spatial transform or spatial analog or a function based on the spatial property of curvature inherent in the basic building blocks of space - namely, points - can be found for any and all other non-spatial dimensions. More specifically, in the case of the mental realm, the geometric perspective assumes: (a) that the mind is continuous in the same way that such a perspective claims space is continuous (i.e., as an infinite set of infinitesimal points); (b) that the mental realm is constructed from basic unit points in the same way that space is thought to be constructed from basic unit points; (c) that such points give expression to the idea of least curvature in the generation of lines, surfaces/contours and solids that occur in both physical and mental space and that the structures generated in these respective 'spaces' are transforms of their corresponding counterparts in the other mode of space; and, finally, (d) that there is a one-to-one correspondence between the structures are capable of being generated in physical space and the structures that are capable of being generated in the mental mode of space.

The foregoing assumptions should be questioned very closely, if not abandoned altogether. A tremendous amount of distortion, error, problems and biases enter into the idea of dimensionality as a direct result of a failure to examine the assumption that underlies the geometrization and spatialization of dimensionality.

To be sure, where analogs or transforms or functions can be established that permit one to develop a heuristic dialectic between non-spatial dimensions and spatial coordinate systems, then, one should pursue this opportunity. However, one also should approach such a dialectic with a healthy amount of circumspection and reflect, from time to time, on what one is doing and what is meant when one uses the structural units of the spatial dimension to construct representations of non-spatial dimensions.

According to Paul Pietsch, all forms of feeling, thinking, motivation and so on which occur in the mental realm constitute least curvature structures capable of being expressed in transform space as a particular kind of phase spectrum. As such, behavior -- whether as an explicit form or in the form of thoughts, feelings and so on -- is a mental transform of sensations and perceptions.

The 'mechanism' making transformations, of whatever sort, possible is rooted in the idea of tensors. Tensors were developed after Riemann's introduction of curvature into the vocabulary of geometry. Just as Riemann had discussed the manner in which the relationships about a point (relationships that constitute curvature) remain invariant, even under transformation, tensors also describe a set of relationships that remain invariant across transformation operations.

One might argue, however, that tensors constitute a methodology for handling the dynamics or dialectics of the ways in which the points of a region or neighborhood interact with one another. Thus, whereas curvature represents a sort of static kind of look at the structural units of which geometric figures are constructed, tensors appear to involve a dynamic exploration of how the structural units of space interact with one another under various conditions of stress and strain. In short, tensors are used to represent and explore the idea of change.

Tensor relationships are very much like relative phase relationships in the way in which they behave when subjected to transform operations. For example, the absolute values of change being described by tensors might be quite different in various situations to which identifying reference is being made.

Moreover, these absolute changes are often not accessible to measured determination, any more than absolute phase relationships are accessible to measured determination. Nonetheless, the relative aspects of change occurring in the context of such absolute changes tend to transform in the same way from situation to situation.

Tensors have the capacity to capture the structural character of the relative relationships in conditions of change or transition and to be able to preserve that structural character (usually in the form of complex ratios) as one goes from one coordinate system to another by way of transform operations. This capacity goes to the very heart of the idea of a tensor.

Because of the capacity of tensors to preserve the structural character of relationships across coordinate systems, Pietsch argues that tensors actually define the coordinate system into which they are transformed. In other words, most mathematical operations presuppose the existence of an already defined coordinate system of given structural character and are, then, introduced into a given coordinate system in terms of the basic structural properties of that system.

Apparently, however, tensors actually determine the character of the structural properties out of which the coordinate system is constructed. As such, rather than being thrown into a pre-defined coordinate system and adapting itself to conform to that pre-defined coordinate system, a tensor actually gets a coordinate system to conform to the invariant properties of the tensor.

In other words, a tensor shapes a coordinate system from the bottom up rather than merely being grafted onto that system in an adapted form. Therefore, a tensor imposes its own invariant infra-structure on a coordinate system and, in a sense, forces that coordinate system to observe or respect that invariance.

A coordinate system is relative or derived in the sense that it constitutes a representation of some other previously manifested reality- of a physical, material, mental or spiritual nature. A coordinate system, at the very least, presupposes a hermeneutical orientation toward, or approach to, certain aspects of the phenomenology of the experiential field.

In effect, a coordinate system constitutes an expression of this orientation in the form of a geometrization of an aspect of the phenomenology of the experiential field to which identifying reference is being made. Therefore, to argue, as Pietsch does, that tensors define a coordinate system by virtue of the way they impose their invariant, relative relationships onto a coordinate system does not necessarily really say something about the structural character of ontology apart from, or beyond, the character of the interaction of a given tensor with a given coordinate system.

As geometrizations of various aspects of the phenomenology of the experiential field, a coordinate system is generated from a certain arrangement of basic geometric units - namely, points. In geometry, of whatever sort, straight lines, curves, surfaces, contours, solids and dimensions are all generated by ordering points in a prescribed fashion. This prescribed fashion is the methodological process that is required to produce a geometric figure of a given structural character.

Tensors also are about points. More specifically, tensors describe the structural character of the relative relationships that occur during processes of change or transition involving these points. In this sense, tensors presuppose the existence of points.

In fact, one might suppose that points represent something like the simplest possible structures one can imagine that are capable of undergoing processes of transition and change. If there were no points undergoing transitions, then, there would be nothing for tensors to describe.

One cannot have relationships in the abstract that do not relate to, or are not linked to, interacting structures, of some sort, that undergo change. The very concept of relationship, especially of a relative nature, presupposes the existence of some sort of structure (or structures) which is (or are) being explored in terms of the character of the network of relationships linking two or more aspects of the structure (or structures). These "aspects" that are being referred to, and that are being studied in terms of the character of their linkages, are geometrically represented by points.

To be sure, one can drop these points or aspects from consideration once one has a handle on the structural character of the relationships among them and, thereby, derive an abstraction or abstract representation of the original context of change. However, one must not forget that a tensor - as an example of one kind of possible abstraction of such a context of change - is derivative, ultimately, from a context in which the structural character of relationships is a function of the structures being related, together with the dialectic that is made possible by the spectra of ratios of constraints and degrees of freedom encompassed by those structures.

Relationships are not independent of structures being related. Relationships are not autonomous, self-sustaining entities. The character of a relationship is colored by the structures that it ties together.

The very character of a tensor's unique manner of abstraction is the way such an abstraction zeroes in on the character of relative changes in various contexts and eliminates all other properties from consideration. What colors the character of those relationships is very much a function of the structural character of the aspects or points that are being studied vis–à–vis the character of their relationships.

As indicated previously, Riemann argued that the measurable relationships in the neighborhood of a given point are exactly the same as the measurable relationships in the neighborhood of any other point, irrespective of the coordinate system in which the point exists. Similarly, in the case of tensors, the argument seems to be that the measurable relationships of change in the neighborhood of a given point are the same as the measurable relationships of change in the neighborhood of any other point irrespective of the coordinate system in which such change occurs. Thus, the structural character of the relationships involved in relative change remains the same irrespective of the kind of coordinate system one uses to give representational form to the character of that change.

In the foregoing sense, the structural character of the relationships that are captured and preserved by tensors actually represent a set or envelope of constraints and degrees of freedom that specify how any given coordinate system can give expression to the structural character of that change in the context of the properties of that coordinate system. Therefore, tensors do not so much define a coordinate system as they are a means of guiding, orienting, and ordering a coordinate system in terms of the structural character of the relationships of relative change that the system is attempting to capture and preserve vis–à–vis some other coordinate system.

In general, from the perspective of tensor analysis, there are two kinds of relationships that can be used to describe the structural character of the dynamics of change: covariation and contravariation. Covariation refers to relationships of transition having the same directional character; that is, they proceed in the same direction. Contravariation, on the other hand, refers to the sort of contrary relationship that the opposite ends of a stretched rubber sheet or rubber band have with one another.

Tensors are able to give representation to either of these sorts of change relationships individually, as well as both of them together in whatever combination suitably captures the structural character of the change to which the tensor is making identifying reference. These latter forms of tensor are known as mixed tensors.

Tensor transformations consist of a set of rules for translating a given tensor, R, into a different coordinate system. If a given tensor R in one coordinate system does not equal a given tensor counterpart, R, in another coordinate system after the rules of tensor transformation have been applied to the first tensor (or vice versa), then, the changes being described do not constitute a true tensor - that is, they are not invariant changes.

Such changes are, instead, fluctuations of a local nature and reflect, at best, conditions of local constancy in the relationships of change that are manifested in the system in question. In other words, these sort of fluctuations are thought of as being empirical in nature. They are not analytical as supposedly is the case in instances of true tensors.

This empirical/analytical distinction seems a little odd in light of the fact that the structural character of a given tensor is derived originally from examining the nature of change in some region of the phenomenology of the experiential field. To be sure, to the extent that a tensor is supposed to capture and preserve, in abstracted form, the structural character of a given instance of changing conditions, then, a given tensor, once it has been determined, should remain invariant across coordinate systems. In this sense, of course, the tensor is somewhat analytical, but this quality or property of analyticity is predicated on, and presupposes, an empirical context. As a result, thinking in terms of such an analytic/empirical distinction, might be somewhat misleading.

Seemingly, what really is being referred to in the foregoing is a distinction between: (a) conditions of change manifesting relative relationships that are invariant across coordinate systems, as opposed to (b) instances of change manifesting properties of relative relationships that do not remain invariant as one moves from one coordinate system to another via the agency of transformation operations. In essence, the distinction between tensors and relationships of change restricted to localized, coordinate contexts is that the former exhibit the quality of symmetry, whereas the latter do not.

Symmetry relationships in a given coordinate system reflect, or are alleged to reflect, the structural character of some aspect of ontology or some aspect of the phenomenology of the experiential field or both, to which the coordinate system is making identifying reference. Consequently, when one seeks to understand something, there will be tensors on each side of the hermeneutical equation that purports to reflect congruence between ontological and hermeneutical/phenomenological structures.

One side of the hermeneutical tensor equation consists of the aspect(s) of ontology that help make possible an experience of a given structural character to which identifying reference is being made through the focal/horizonal character of a given aspect of ongoing phenomenology. The other side of the hermeneutical tensor equation consists of the aspect of understanding/orientation that the individual has with respect to, or has toward, the aspect of the phenomenology of the experiential field to which identifying reference is being made.

The tensors on each side of the hermeneutical equation must have the same character in order for that equation to have epistemological status or meaning. In other words, such an equation needs to give expression to a tenable, if not accurately reflective, relationship between, on the one hand, certain aspects of the ontology and, on the other hand, certain aspects of the hermeneutics of the phenomenology of the experiential field that are being linked through the hermeneutical tensor equation.

Thus, hermeneutical applications of the idea of tensors is a matter of seeking symmetry - that is, relationships of invariance - which are preserved across different contexts. In the hermeneutical frame of reference, these contexts do not necessarily represent geometric coordinate systems. Nonetheless, one needs to discover tensors whose structural character remains invariant as one moves from the context of the phenomenology of the experiential field to the context of ontology to which that phenomenology is making reference but that is, to some extent, independent of that phenomenology.

In effect, hermeneutical field theory can be construed as involving an attempt to establish hermeneutical equations that contain tensors displaying the same character. When the tensor components on each side of the hermeneutical equation display the same character this indicates that some feature of invariance concerning the structural character of change has been preserved in both ontology as well as phenomenology. The existence of such symmetries permits the structural character of an aspect of phenomenology to reflect the structural character of an aspect of ontology.

Seen from a slightly different perspective, hermeneutics involves, among other things, a study or exploration of the structural character of the properties of change occurring in and around the neighborhood(s) of one or more aspects of the phenomenology of the experiential field. This exploration is done in an attempt to determine the structural character of the forces of stress, strain and vectoring being exchanged with different aspects of ontology and that together (that is, as a dialectical function of both phenomenology and ontology) generate a focal/horizonal 'point'-structure of an observed experiential character.

There are many aspects of the holographic process that cannot be easily, if at all, subsumed under the structural wing of ordinary transformations. Use of tensor transformations renders the idea of decoding the data of transform space into the structures of perceptual space much more tractable than do ordinary transformations.

From the perspective of tensor transformations, the transition from transform space to perceptual space can be described in terms of how a given set of relative values concerning the structural character of certain changes is preserved as one moves from one kind of space to the other. Through the maintaining of symmetry with respect to the property of the relative values of structure to which a given set of changes give expression, tensors are able to show how the underlying structural character of change is able to manifest itself across coordinate systems.

In short, tensors can be used to represent phase relationships in a way that is independent of any specific coordinate system. Because Pietsch believes tensors actually define, through the rules of tensor transformation, the character of the coordinate system into which the tensors are introduced, he maintains that when tensors are used to represent relative phase relationships, then, in effect, phase relationships can be said to define the coordinate system into which the phase relationships are introduced by means of tensor transformations. Pietsch believes this would be the case irrespective of whether one was talking about memory, perceptions, thoughts, and so on.

Pietsch summarizes his position in the following way:

(a) mind can be treated as a species of complex information-namely, information concerning phase;

(b) as a methodological starting-point, one approaches the phase information of (a) by characterizing and exploring it in terms of the geometry of a Riemannian universe in which the basic unit of structure is that of curvature in a continuum of indefinite dimensions;

(c) the relative phase values that are used to describe different aspects of mind are expressed as ratios of curvature;

(d) tensors can be used to represent the ratios of curvature;

(e) the activities of mind can be treated as instances of tensor transformation in which the same underlying structural character of relative change is preserved as one moves from one mental modality or operation to another;

(f) due to the manner in which tensors allow one to consider the structural character of change independent of any given coordinate system, one has no need to specify whether one is dealing with perceptual space or some other transform of perceptual space such as Fourier transform space;

(g) the structural character of coordinate systems are a function of tensor transformations rather than tensor transformations being a function of the structural character of a given coordinate system.

Relationships involving relative phase values in perceptual space are said to be time-dependent. This time dependency is translated into a spatial dependency in the transform space of, say, Fourier analysis.

However, both the time-dependent, as well as the space-dependent, relationships of relative phase values are governed by a set of constraints and degrees of freedom that are manifested in each coordinate context. In other words, in the case of ordinary transforms, the coordinate axes don't expand or contract. As a result, the ordinary transforms give expression, in each coordinate context, to an inherent structural framework on to which, respectively, the time-dependent or space-dependent relationships are grafted - a structural framework to which these relationships must accommodate themselves.

Thus, there is an analogical relationship between perceptual space and transform space in the sense that phase relationships in transform space are required to obey a set of rules or principles that are comparable to, or analogs for, the sort of rules or principles that the phase relationships in perceptual space are required to obey. Furthermore, in each case, these rules or principles are reflections of the fixed character of the coordinate structure of the respective spaces.

Tensors, on the other hand, are independent, supposedly, of the sort of rules and principles that the structural character of any given coordinate system imposes on ordinary transformation. Therefore, the distinction between, on the one hand, perceptual space, and, on the other hand, various kinds of transform space becomes empty.

There is only the underlying structural character of relationships that are undergoing transition. If these relationships in transition are expressions of true tensors, then, that underlying structural character will remain the same from one coordinate system to another.

For all practical purposes, the structural character of different coordinate systems ceases to have primary importance as a shaping force. In other words, from the point of view of tensor symmetry relationships, the structural character of any given coordinate system becomes derivative from, and predicated on, the character of the shaping force that the form of a given tensor has on such coordinate systems.

Seemingly, on the basis of what has been said above, a tensor would appear to be a fundamental shaping force in determining the structural character of curvature. After all, curvature is said to be at the heart of the geometry of any coordinate system.

Since tensors are said to be the defining determinant of the shape of a given coordinate context, presumably, curvature is really giving functional expression to the structural character of some underlying dialectic among a set of changing - relative to one another- phase relationships. The feature of capturing the structural character of symmetry (i.e., invariance) in an underlying dialectic among a set of changing phase relationships is precisely what constitutes a tensor.

Therefore, in view of the foregoing considerations, tensors represent the internal dialectics of curvature dynamics. This is the case since tensors establish the set of constraints and degrees of freedom that will regulate how a coordinate system must manifest itself if the structural character of the conditions of change being undergone by a set of relative phase relationships in one coordinate system are to be preserved in some other coordinate system.

According to Pietsch, subjective constructions concerning the structural character of space and time represent information transforms of those aspects of ontology being gauged by various modes of operationalizing methodology such as rulers, clocks, and so on. However, whereas the methodology of measurement is rooted in issues of physical structure, the character of subjective constructions are rooted in the realm of ideas. Both, however, are said to be expressions of nature.

The above position seems to be somewhat shaky since one could easily argue that the methodology of measurement is, in fact, a subjective construction and, therefore, squarely rooted in the realm of ideas and the mental. As such, the methodology of measurement is as much an expression of information transforms as are other modes of subjective constructions.

To be sure, the methodology of measurement tends to focus on how to establish congruence between the structural character of a given mode of measurement and the structural character of a given aspect of reality that is assumed to be independent of subjective constructions and that is referred to as being physical/material. Nonetheless, the characterization of something as being physical/material is itself a subjective construction that might or might not reflect the actual character of the aspect of ontology to which identifying reference is being made, depending on what one means by the idea of 'the physical' or 'the material'.

The distinction between, on the one hand, subjective constructions, that are inclined to focus on so-called non-physical aspects of experience, and, on the other hand, modes of measurement, that tend to explore the properties of supposedly physical aspects of reality that are encountered and engaged through experience, is really a matter of what sorts of things each mode of engagement is inclined to focus in on and emphasize. However, both constitute instances of subjective construction seeking congruence between a structure of experience and that aspect of ontology that would make experience of such structural character possible.

The search for, and attempt to establish, congruence relationships marks the dialectic of the hermeneutical realm. This realm consists of an overlap of structures-namely, those structures that are rooted in the phenomenology of the experiential field and those structures of ontology that are, to a certain extent, external to the phenomenology of the experiential field but that touch upon, engage, interact with, shape, affect, or are affected. as well as shaped and engaged by, the phenomenology of the experiential field. When operating properly, this realm gives expression to the merging of horizons.

A fundamental part of the hermeneutical challenge is the need to search for, and struggle to determine, the precise nature of the appropriate hermeneutical tensor equation in a given context of ontological/phenomenological interaction. The nature of what is appropriate in any given situation will be a matter of what permits one to grasp the structural character of that aspect(s) of ontology that helps make a given aspect of one's phenomenology of the experiential field have the character it does.

Hermeneutical field theory involves the problem of how one goes about identifying, reflecting on, characterizing, questioning, and mapping the character of the 'point-structures' of the phenomenology of the experiential field so that one can try to establish congruence relationships with the character of the 'point-structures' in the fabric of ontology that are of the same tensor character as the point-structures of the phenomenology of the experiential field. The dynamics/dialectics of point-structure interactions and the use of point-structures to generate configurations, not merely in the form of geometric lines, contours, surfaces, solids and so on, but also in the form of hermeneutical latticeworks of varying degrees of complexity, non-spatial dimensionality and discrete continuity, etc., become extremely important components of the process of understanding.

This all could go under the rubric of the manifold problem introduced in a previous chapter in relation to a brief discussion of some of Kant's ideas. In other words, the foregoing makes reference to the problem of determining the structural character of both the phenomenological manifold as well as the ontological manifold.

Furthermore, questions are raised about what these two manifolds have to do with one another, as well as what principles of dialectic govern the interaction of these two kinds of manifold under different circumstances. Here, of course, one enters the realm of hermeneutical tensors and hermeneutical tensor equations.

Brillouin speaks of tensor density and tensor capacity. Capacity and density are not the same things.

Density concerns the ratio of how tightly a given magnitude, quantity or substance is packed into a given context that constitutes an independent magnitude from the first magnitude. Capacity refers to the maximum magnitude to which a given degree of freedom of a latticework can be extended before it is constrained by other aspects of the structural character of either that latticework, or before it is constrained by the structural character of other latticeworks with which it interacts.

Brillouin maintains that a true tensor is "the product of a density and a capacity". Under normal circumstances, density and capacity are independent of one another. However, when one is dealing with a true tensor, Brillouin contends that the respective operations of density and capacity cancel the features that make them independent under normal circumstances.

In this sense, capacity becomes a set of constraints and degrees of freedom that shape the way in which density can be manifested in the context of that capacity's structural character. Of course, density is also a set of constraints and degrees of freedom, but it is the expression of a dialectic that occurs within the context of, and is encompassed by, the structural character of capacity.

Every capacity has its own unique density. Density is an expression of how that capacity's latticework distributes the set of constraints and degrees of freedom to give expression to that latticework's structural character.

Moreover, every density has its own unique capacity. Capacity marks the parameters or limits within which, and through which, a given density of constraints and degrees of freedom can be distributed in order to give expression to a latticework's structural character.

Capacity and density represent two facets of the dialectic of structural character, either with itself or with some other, independent latticework. As such, every structural character constitutes a tensor.

This tensor determines the shape or form of the 'point-structures' giving expression to the manner in which a given capacity and a given density engage or encounter one another in the region of intersection. This is the case irrespective of whether: (a) the region of intersection is a function of the way a given latticework spontaneously distributes its own set of constraints and degrees of freedom; or, (b) the region of intersection is an induced function of the way two or more latticeworks dialectically engage one another to generate interference patterns that re-distribute and shape and vector their respective sets of constraints and degrees of freedom.

In short, every structural character is a product of, at a minimum, a capacity (which is the thematic woof and warp that establishes the envelope of possibilities constituting a latticework) and a density (which is a distribution pattern of relative phase relationships within the set of constraints and degrees of freedom that give expression to capacity's structural themes). Furthermore, every structural character is a true tensor as long as the integrity of that structural character is preserved across coordinate systems - that is, as long as the spectrum of ratios of density to capacity characterizing a given structure retains its essential integrity across transformations

The rules of transformation permitting one to move from one kind of representational space to another kind of representational space (e.g., from perceptual space to Fourier transform space - both of which are, actually, species of representational space) are the various hermeneutical operations. These operations seek to establish or discover the identity of the tensor character that might permit one to treat one species of representational space as an analog for the other species of representational space.

From this search, one hopes to establish a tensor equation. This equation needs to show that, despite the differences of 'curvature' in the two species of representational space, nonetheless, the structural character of the latticework in question has been preserved, both with respect to its thematic characteristics (i.e., its capacity) as well as with respect to its dialectical characteristics (i.e., its density), as one moves from one representational space to another such space. Thus, one can say that a true tensor is an analog structure whose properties are independent of the curvature medium (including hermeneutical, phenomenological and ontological mediums) through which they are given expression or into which they are introduced.

Chapter 25: A Few Notes on Consciousness

Within consciousness, there are different elements that simultaneously reflect both aspects of reality as well as give expression to dimensions of unreality. Our task is to try to differentially sort out those two sources of information as best we can, and the degree to which a given individual is successful with respect to the foregoing task tends to have a considerable impact on how that person proceeds through life.

For example, consider the relationship between the biological activity of our eyes and what we see. The two are not necessarily the same.

Our eyes contain photoreceptors that transduce different wavelengths of light into various kinds of electrochemical signals. In addition, the biological dynamics of the eyes are capable of identifying differences of contrast in a visual scene that allows boundaries to be detected and through which a great deal of information concerning the nature of the world can be deduced and/or inferred.

The band of fibers leading from the eye to various areas of the brain is known as the optic nerve. The foregoing bundle of fibers transmits electrochemical signals that carry visual information concerning the world.

The visual signals carried by the optic nerve are in the form of various kinds of patterns. Subsequently, different portions of the brain assemble those patterns in a way that generates a holistic, integrated representation of the visual information that entered the human brain through the eyes.

According to modern neuroscience, the visual information flowing through the optic nerve is delivered to the thalamus … a region of the brain that, among other things, plays a role in processing sensory information. After the thalamus has done its thing in relation to such visual information, that information is forwarded to the primary visual cortex that is the gateway to approximately 30 other cortical areas that, in succession, continue to process the visual information that has been routed through, first, the optic nerve, and, then, the thalamus.

Some of the cortical areas being alluded to earlier are specialists in detecting edges. Other cortical areas specialize in the detection of:

Corners, lines, movement, contours, curves, direction of movement, color and many other dimensions that might, or might not, be connected to the visual information that originally entered the eyes.

Eventually, all of the foregoing cortical processing activity is integrated into a visual representation that contains information such as shape, contours, size, contrasts, distance, and color concerning the aspect of the world that had been engaged by the eyes. During the foregoing set of processing activities, many kinds of interpolation and extrapolation are involved.

The representation produced through the processing of visual information is rooted in all manner of interpretation and distortion. For example, the world is (at least) three-dimensional, and, yet, the retina begins with a two-dimension rendition of – at a minimum -- a three-dimensional world.

As the two-dimensional nature of the retinal information is further processed by the visual system, many guesses, interpretations, approximations, and inferences are made. Perception is more akin to an artistic representation of reality than it is a photographic-like process.

In fact, in many ways the human visual system consists of a very low-resolution arrangement. More specifically, each optic nerve gives expression to the collective efforts of approximately one million axon processes that are bundled together and collectively referred to as the optic nerve.

The foregoing facts mean that each optic nerve carries, roughly, a megapixel of information. Given that, today, many relatively cheap smart phones are able to take photographs that contain 8 megapixels, or more, of information, then, relatively speaking, the optic nerve is a low-resolution phenomenon.

Yet, the quality of human phenomenology seems to give expression to very rich kinds of visual experiences. How does such a relatively low-resolution process yield results that appear to be so richly textured?

Of course, part of the issue is that it is hard to understand just what the quality of our visual ability is when this is all that we experience. We feel that our visual experience is very rich, but this might only be because we don't know what we are missing when it comes to those sorts of experiences.

For example, human beings are trichromats. In other words, there are three kinds of cones (color-oriented photoreceptors) in the retina of the eye that are capable of perceiving combinations of three colors -- red, blue, and green -- that range between 390 and 700 nanometers in wavelength.

There also are organisms (including certain, reptiles, amphibians, arachnids, and fish) that are believed to be tetrachromats. Thus, in addition to having photoreceptors that perceive colors such as green, blue, and red, the foregoing sorts of organisms also are able to see light in the range of 10 to 400 nanometers, and as a result, they can see ultraviolet colors.

There are also are organisms (such as butterflies and certain birds) that appear to possess five kinds of photoreceptors, several of which appear to be capable of receiving colors in wavelengths that fall outside of human visual abilities. They are referred to as pentachromats.

The visual experience of tetrachromats and pentachromats appears to be richer than that of human beings. Thus, although human visual experience seems to be quite rich when considered only in its own terms, this sense of richness might only be because we tend to be biased by the limits of our capacity to engage the world visually.

There are other kinds of biases affecting human visual experience. For example, human beings cannot actually see the color that has been labeled "magenta" (a sort of soft, purplish red), and, instead, the human visual system tends to fill in such a gap in color vision with a blend of its own that is similar to magenta without actually being magenta (i.e., the human visual system engages in a certain amount of confabulation or visual fabrication).

The inclination of the visual system to engage in its own version of confabulation (memory, at times, also exhibits this sort of behavior) is not limited to inventing a color to fill in for, say, magenta. There also is a great deal of evidence to indicate that the sensory system fills in, or invents, details for quite a few facets of experience that are not actually captured by our sensory capabilities.

For example, consider the McGurk effect that was stumbled upon accidentally in 1976 by Harry McGurk and his research assistant, John MacDonald. They were engaged in research that sought to determine how the language behavior of infants was affected by different developmental stages.

At one point during their research, they arranged for a technician to dub a video with a set of phonemes (basic units of sound) that were different from the ones actually uttered by the individual who was speaking in the video. When the dubbed video was run, the two researchers perceived the presence of a third phoneme that was different from either the phonemes that were actually spoken or the phonemes that was dubbed into the video.

For instance, let us suppose that the person in the video said: "Da, da, da". If one closes one's eyes (and, as a result loses the visual information involving the movements of the videoed individual's mouth) one might hear: "Ba, ba, ba".

On the other hand, if one turns off the sound for the video and just watches the movement of that individual's lips, one might perceive something different. For example, one might believe one is seeing the person in the video say: "Ga, ga, ga".

In effect, a perceptual illusion of sorts takes place. This illusion occurs when an auditory element in one sound is associated with visual information involving another sound, and, in the process, gives rise to the perception of a third sound.

The McGurk effect is quite strong. In other words, even when a person knows what is going on, nonetheless, that person still might remain under its sway.

Nonetheless, not everyone is subject to the McGurk effect to the same degree. Individuals who are good at integrating sensory information tend to be more prone to the effect (the visual data such individuals receive alters the manner in which they perceive sound), whereas individuals with, say, brain damage (and, therefore, might have trouble with integrating sensory information), might be less susceptible to that effect.

The foregoing considerations tend to raise a few questions. For instance, one wonders how the human species acquired the capacity to fill in or generate details that were not actually sensed such as occurs in conjunction with the magenta phenomenon, and, to some extent, is also present in the McGurk effect. One also wonders how such acquired capabilities often are able to confabulate in a seamless-like fashion that does not appreciably interfere with being able to understand what is taking place in the world.

Of course, there are times -- such as in the McGurk effect when one is trying to understand what someone is saying – when our capacity to confabulate sensory data might interfere with our ability to determine the nature of the aspect of reality that is being engaged. And, yet, that kind of interference is often of a limited and minor nature, and, consequently, our capacity to confabulate doesn't necessarily get in the way of being able to make accurate contact, to varying degrees, with different facets of reality.

The foregoing wonderment also leads to further questions. For example, earlier in this section, mention was made of the 30, or so, cortical regions involved in the processing of visual information coming from the retina and its photoreceptors (cones and rods) via the optic nerve, and, consequently, one also would like to know how those cortical regions of specialized visual processing came into being and, as well, one would like to know how the cognitive capacities came into being that are able to integrate all that visual information into a representation that actually corresponds, within limits, to elements of reality that are on-going in the world along – and, presumably, beyond -- the horizons of visual engagement.

In addition to the specialized capabilities within cortical regions of the visual system that are processing subsets of patterned visual data (such as contours, edges, lines, movement, and so on), there also are an array of interpretations that assign meaning, value, significance, beliefs, and judgments concerning what is being visually processed into a representation, of some kind, that alludes to a world or realm of reality beyond such a representation … a hermeneutical representation that might, or might not, faithfully reflect – to varying degrees – that which is being represented. Consequently, one also wonders how the capacity (capacities) arose to hermeneutically engage the raw data of visual experience … or, the raw data of sensory experience in general.

The origin(s) of the capacity (capacities) to process raw visual data into a workable representation of that which helped give rise to such raw data is steeped in mystery. The origin(s) of the capacity (capacities) to confabulate missing details into a seamless-seeming phenomenology is also shrouded in mystery … as is the origin(s) of the capacity (capacities) to generate hermeneutical and epistemological renderings that are intended to account for why experience has the qualitative characteristics to which it appears to give expression.

Consciousness consists of a phenomenological medium populated by contents of one kind or another … a surface that has the capacity to reflexively engage itself to varying degrees. Consciousness also seems to consist of a deeper set of processes that appear to be generating – seemingly with some degree of awareness and intelligence -- the structural features of 'surface' phenomenology for if that process of generation were not rooted in an intelligent awareness of some kind, one has difficulty understanding how completely blind, random, automated and computational sets of processes (whose origins are unknown) could generate experience that has an intelligible relation with that (i.e., reality) to which such experience alludes.

Flowing through all of the foregoing considerations is the need to be able to distinguish between truth and falsehood – between, on the one hand, reality or truth and, on the other hand, illusion, delusion misperception, or misinterpretation. Human sensory capabilities have limits, and human processing of what is sensed involves a certain amount of confabulation, interpolation, extrapolation, inference, expectation, and assumption, and, finally, the means through which raw data becomes transformed into a representation of reality is surrounded by clouds of unknowing, and, yet, somehow -- within one, or another, level of intelligent, reflexive awareness -- human beings come to have demonstrable epistemological relationships with that which makes experience possible.

The foregoing relationship can be corrupted because it is subject to the distorting influences of illusion, delusion, bias, error, and confabulation. And, yet, if the issue of corruption were the whole story, then, we could not possibly know there are such things as illusions, delusions, biases, confabulations, or errors.

Up until a few years ago, many neuroscientists believed that nothing much went on in the brain when, say, an individual was not engaged in any sort of overt, mental activity but was just idling or resting. Or, said in a slightly different fashion, neuroscientists were of the opinion that whatever might be taking place in the brain during such "down" periods was little more than random noise.

Modern neuroimaging techniques have indicated that there seems to be more going on in a so-called idling or resting brain than previously was believed. Apparently, when people aren't doing anything in particular or when they are anesthetized and waiting for an operation of some kind, different regions of the brain are engaged in various forms of patterned chatter in which signals of different kinds are being transmitted from one region to another.

The aforementioned resting state represents a form of baseline activity within the brain, and it is now referred to as the 'default mode network' (DMN). Conscious activity appears to constitute a move away from the activity of the default mode network.

To understand what the last sentence of the previous paragraph means, let us begin with an interesting fact. The resting state consumes approximately 20 times the amount of energy than is used when some sort of specific, conscious response is made in relation to a given stimulus.

One might suppose that such a differential in energy consumption between the resting state and conscious activity is somewhat counterintuitive. However, there are, at least, several ways to interpret such differences in energy usage involving conscious activity and the DMN.

For example, prior to directed conscious activity, various parts of the brain might be operating like military operatives who are scouting different regions of the experiential landscape and, periodically, reporting to one another about whether, or not, anything is going on in their sector that might be worthy of attention. Such on-going, cyclic reporting activity is likely to consume a fair amount of energy.

Alternatively, the DMN activity of the brain might serve as something akin to an electrified grid. Such a grid automatically identifies when there is some manner of physical or mental stimulus breach in any particular sector, and, once again, this sort of constant electronic monitoring would consume a fair amount of energy.

In either case, once a ‘sentry’ has reported that there is some sort of sensory or conscious activity in a given sector or if a ‘breach” of the electrical grid arises in some given region of the brain, the chatter tends to die down and lends support to the newly emergent activity in accordance with whatever the nature of the report or breach might be. Consequently, prior to the report of a ‘sentry’ or a breach of the grid, a lot more energy is likely to be used than when the field of possibilities is narrowed down to focus on a specific instance of mental activity.

The idea that the brain’s electrical activity is always busy doing ‘something’ is not a new one. What is new is that such activity might have some role to play with respect to prepping, priming, and/or organizing mental activity in some fashion.

Nearly a hundred years ago – back in 1920s – Hans Berger, inventor of the electroencephalograph, argued in a number of articles that the brain never really rests but is continuously engaged in activities of various kinds … some of those activities are electrical in nature. His perspective – although not his invention – was largely ignored.

The limits of what neuroscience could discover by means of the electroencephalograph were exceeded during the latter portion of the 1970s with the advent of PET scans. Positron-emission tomography uses oxygen uptake, glucose metabolism, and blood flow as indices to measure neural activity.

In 1992, fMRIs were introduced. Functional magnetic resonance imaging uses the differential magnetic properties of blood-rich and blood-poor activities in the brain to measure neural activity.

Use of PET scans and fMRIs led some neuroscientists to believe that the brain didn’t seem to do much except when it was engaged in specific sorts of mental tasks. Such an impression might have been an artifact of the kinds of experiments that were being conducted in which two kinds of activity might have been tested against one another in order to try to pin down that area of the brain was more involved in, say, reading aloud rather than reading to oneself.

Early PET and fMRI cognitive research was not concerned with what the brain did in the absence of an assigned task. Such research focused on contrasting different kinds of task-oriented activity in order to be able to map the brain according to what metabolic activities took place in which regions of the brain during various kinds of focused tasks.

Eventually, however, cognitive researchers began to take a look at what was occurring in the brain apart from the relatively localized nature of the activity that was switched on while performing some particular form of mental or behavioral activity. Among other things, such research discovered that the focalized neural activity associated with the performance of specific tasks tended to increase the amount of energy being consumed by the brain by less than 5 % relative to the baseline of energy consumption that was taking place independently of such mini-spikes in energy consumption.

Some researchers (e.g., Marcus Raichle) referred to baseline energy consumption as the 'dark energy' of the brain. This term was used because despite being elusive and relatively intangible -- except in terms of gross energy consumption measurements – the dark energy of the brain appeared to dominate the activity of the brain … as its astrophysical counterpart seems to be doing with respect to the universe.

In the middle of the 1990s, a research group led by Dr. Marcus Raichle discovered that a certain region of the brain (medial parietal cortex) -- which seems to have something to do with memories involving personal events in an individual's life -- underwent a decrease in activity level relative to the resting state when some other region of the brain was occupied with performing a given task. The portion of the medial parietal cortex that exhibited the greatest drop in neural activity under the foregoing circumstances was dubbed the MMPA … the letters stood for the 'medial mystery parietal area'.

Other investigators have replicated the foregoing research. Moreover, the foregoing findings were extended to several other regions of the brain (e.g., the medial prefrontal cortex that appears to play a role with respect to the so-called mirror neuron phenomena).

The principle underlying such discoveries seems to be that the brain is engaged in on-going activity even when an individual is resting. Yet, when the need for more focused activity arises, then, the baseline energy consumption in areas that are not involved in such focal activity appears to decrease.

The acronym BOLD is often used in conjunction with fMRIs. The former letters stand for: Blood oxygen level dependent.

BOLD signals tend to fluctuate or cycle approximately every ten seconds in areas of the brain that – relatively speaking – are at rest. Initially, the BOLD signals were considered to constitute random electrical noise in the brain and were subtracted from the imaging process in order to better enhance the resolution of the brain activity being focused on in conjunction with the performance of some given task.

However, beginning in 1995 discoveries were made that changed the way that cognitive scientists interpreted what was taking place in the brain with respect to the possible significance of so-called baseline resting activity. More specifically, first, a group of researchers led by Dr. Bharat Biswal, found that when a person is not engaged in any specific mental or behavioral task, the aforementioned 10 cycle, slow waves fluctuated in unison in the areas of the right and left hemispheres that controlled left and right-handed movement respectively. Next, a few years later, another research group found the same sort of ten cycle, slow waves in the DMN – i.e., the aforementioned default mode network – of individuals who were at rest.

The foregoing slow wave cycles showed up not only when individuals were at rest, but they also showed up under other conditions. For example if a person were in a light sleep or was under a general anesthetic, the same slow wave cycles occurred.

Another set of researchers, using a different detection methodology, had been studying a form of electrical activity in the brain that is known as SCPs or slow cortical potential. The research team investigating the groups of neurons that exhibited SCP, cyclic, electrical activity found that SCPs were identical with BOLD signals.

There are many frequencies of electrical cycling in the brain. Those frequencies range from the relatively slow cycles of SCPs and

BOLD signals (10 cycles per second) up to frequencies involving more than 100 cycles per second.

Researchers, such as Matias Palva, have shown that a rise in SCPs tends to be followed by an increase of activity among electrical signals involving other kinds of frequencies. Pinning down what any of this ultimately means, however, continues to be elusive.

Apparently, each neural network/circuit appears to give expression to its own, unique electrical SCP (slow cortical potential) signature. As a result, different neural networks are ready to spring into action when called upon to do so.

According to some researchers, the DMN (Default Mode Network) that is responsible for consuming so much energy during the resting state, plays a role like that of a musical conductor with respect to all of the foregoing neural networks or circuits (which are like individual instruments or musicians) that consist of signature frequencies that can be called on to perform, or be silenced, as required by the DMN. How the DMN knows how to organize all of the foregoing activity or how the DMN knows how to call on – or silence – a given signature frequency at the right time and for the appropriate amount of time is not known.

An international team of researchers did discover in 2008 that by observing electrical activity in the DMN, they could predict – as much as 30 seconds ahead of time -- when subjects in a scanner apparatus were going to make mistakes in some assigned task. The sign that an error would be forthcoming was indicated when (a) the DMN's activity increased, and (b) the activity in the neural network/circuit associated with directed awareness decreased.

What caused DMN activity to increase or what caused a given kind of focal activity to decrease is not known. Whether the increase in DMN activity caused focal activity to decrease, or whether the decrease in focal activity caused DMN activity, is not known.

One might also question whether, or not, the brain and/or mind is ever really at rest. Based on my own observations of what takes place in my mind – at least on the surface – there don't seem to be many instances of resting or inactivity.

Quite apart from whatever tasks of life might require my attention, daydreaming, thinking, remembering, planning, considering possibilities, critically reflecting on the events of life, worrying, and so on, all seem to follow upon one another in an almost seamless stream of sequential, conscious events that emerge one after another, stay for awhile, and, then, disappear … even as I go about fulfilling the requirements of life.

Conceivably, DSM might give expression to the brain activity that is associated with the constant chatter that is taking place mentally as a sort of default mode of activity. However, when we focus on something specific, this marks a departure from the regularly scheduled programming of one's mental life (such as daydreaming, remembering, worrying, and so on), and, as a result, energy consumption goes up slightly due to this increased focal activity, but there also will be a decrease in the activity of background mental activity that is unrelated to on-going focal engagement of some task.

Filtered through the foregoing prism, the aforementioned 2008 international study can be re-interpreted. More specifically, the reason why researchers can predict that an error is going to be made by subjects up to 30 seconds prior to the mistake being made might be because the decrease in focal activity and the increase in DMN activity indicates that some sort of default activity (e.g., daydreaming, remembering, worrying, and the like) is competing with focal activity and, as a result, undermining the efficacy of the latter … thereby increasing the likelihood that a mistake will ensue.

Moreover, one doesn't necessarily have to conclude that the changes in the electrical cycles of the DMN are disrupting focalized electrical cycles. Instead, the transitions in electrical activity with respect to both the DMN, as well as the circuits involving focalized activity, might merely be neural correlates that reflect the manner in which the phenomenology of mental life is undergoing various kinds of conflicting or competing fluctuations. Since we don't know what the relationship is between the dynamics of brain activity and the phenomenology of mental life, one cannot automatically assume that one understands the significance of the transitions in electrical activity in the DMN or in certain neural circuits that are involved in focused forms of activity.

Transitions in the electrical activity of different regions of the brain serve as markers or indicators concerning the presence of certain kinds of behavioral phenomena. However, we are not, yet, in any position to state scientifically that the presence of such markers or indicators is causal in nature.

Finally, there is a certain amount of evidence indicating that such mental disorders as depression, schizophrenia, and Alzheimer's might be functionally related to the sort of activity that is taking place in the DMN. For example, individuals who have been diagnosed as being clinically depressed seem to show a decrease in connectivity between a certain facet of DMN activity and regions in the brain associated with emotions, whereas individuals who have been diagnosed as schizophrenic exhibit an enhanced level of signaling activity within the DMN.

Do changes in the signaling activity of the DMN constitute a cause of mental disorders such as depression and schizophrenia? Or, do changes in the signaling activity of the DMN reflect the presence of forces that are disrupting DMN activity … forces that are a function of something other than changes in DMN activity?

Changes in the electrical activity within the DMN might well serve as a diagnostic tool for detecting the presence of such disorders as schizophrenia, depression, and Alzheimer's. Nonetheless, being able to diagnose the presence of some sort of disorder is not necessarily coextensive with understanding the etiology of the disorder being diagnosed.

Some neuroscientists believe that the DMN is at the heart of a system that is capable of organizing how, when, where, and why the so-called dark energy of the brain is used. Even if foregoing belief turns out to be true, one still won't necessarily be in a position to be able to account for: (1) how the DMN knows how to allocate its energy, or, (2) what, precisely, such organizational activity accomplishes with respect to the phenomenology of everyday experience, or, (3) how the DMN came to acquire such capabilities.

In 1985 Benjamin Libet, an American neuroscientist, released a paper entitled: "*Unconscious cerebral initiative and the role of conscious* *will in voluntary action*". The paper consisted of an overview and analysis of experiments that had been conducted by Libet … experiments that revolved around the apparent differences between, on the one hand, the point in time when a subject's brain indicated that a choice had been made and, on the other hand, the time when a subject indicated that his or her subjective state of mind was conscious of having made a choice.

Neuroscientists had known since the 1960s that voluntary motor action follows the emergence of a 'readiness potential' or RP. An RP consists of a slow, negative transition in electrical potential that takes place, on average, about 800 milliseconds before a subsequent motor behavior occurs.

Did the subjective awareness of choosing to move, say, a finger take place: Before, simultaneously with, or after a related finger-movement RP signaled its presence? An inquiring mind (i.e., Libet) wanted to know.

Libet's experiment needed to make three kinds of temporal measurement. He needed to know: (1) When a person subjectively was aware of choosing to do something (designated as 'W' – for "will" -- in the experiment); (2) when the readiness potential occurred that preceded the action chosen (labeled 'RP' in the experiment), and (3) when the actual action took place (designated as 'M' – for movement – in the experiment).

Determining the values of 'M' and 'RP' in any given experimental trial was relatively easy to measure. Electrodes attached to muscles revealed the value of 'M', and 'RP' was determined by averaging the shift in negative electrical potential that was exhibited by a subject over a number of trials (40) involving movement of a certain kind.

The method that Libet used to measure the point in time when a subject became aware of having made a choice to flex her or his wrist was a little bit more complicated. A clock face was displayed on a screen, and the face of the clock was swept once every 2.56 seconds by a spot of light.

The experiment required the subjects to indicate where the spot of light was on the face of the clock when they were aware of having chosen to flex their wrist. Several independent means were used prior to running the experimental trials to ensure the reliability of the subjects' estimates concerning when their choices had been made, and, on average, the subjects indicated that the choice to move their wrists was made approximately 120 milliseconds before M -- that is, the movement – occurred.

Surprisingly, Libet discovered that the RP (readiness potential) showed up prior a subject's awareness of having made the choice to move his or her wrist. The average value of that differential was 350 milliseconds.

In other words, 350 milliseconds before a subject was aware of choosing to flex her or his wrist, an RP (indicating that movement was imminent) was present. If choice is what causes movement, then, why did the awareness of having made a choice follow the appearance of electrical potential in the brain … an electrical potential that indicated that the wrist movement was about to take place?

Libet – as the aforementioned title to his article suggests – believed that the cause of the wrist movement resided in the unconscious. Conscious awareness of choice came after the brain's change in electrical potential indicated that a movement of the wrist was imminent, and, therefore, conscious activity (W) could not be considered to cause that (i.e., RP) that clearly came before such activity.

As a result, Libet raised a question in conjunction with his experiment. Does consciousness have anything to do with the choices that are made?

Libet did seem to believe that subjective consciousness might have the capacity to assent to, or veto, the 'unconscious' choice that was made prior to the emergence of subjective awareness of such a choice. However, if this is the case, Libet did not explain how the assenting or vetoing process took place in subjective consciousness.

More importantly perhaps, whatever questions (and interpretive responses) Libet might have had with respect to his experiment there are some questions, apparently, that he did not ask himself. For example, what transpired before the RP emerged?

Libet assumed that what took place prior to the emergence of the RP was of an unconscious nature. However, he had no idea what actually was occurring during the period that occurred prior to the appearance of the RP.

How is an 'unconscious' process capable of being aware of the nature of an experiment, and how does such an 'unconscious' understanding know when or how to respond? Can we assume that working memory – i.e., normal, waking consciousness – is the only form of awareness that is present?

The earlier discussion involving split-brain research (along with the 'hearing voices' issue in schizophrenia, the idea of personalities in identity dissociative disorder, as well as the four decks of two-colored cards experiment performed by Damasio) indicated there might be parallel, active modalities of awareness taking place within us simultaneously. Isn't it possible that some other locus of awareness makes the choice to, say, flex a wrist and that information concerning such a choice is transmitted to working memory within a time frame that only shows up in a subject's working memory dominated awareness after the appearance of the RP?

We think we know who we are. Supposedly, we are the entity that is trying to construct an understanding of experience through the activities of working memory.

Attention is dominated by the activities of working memory. In fact, attention is dominated by the activities of working memory to such an extent that we become inclined to identify with such activities and, in the process, we often shy away from looking too closely at what is transpiring beyond the horizons of working memory because this sort of scrutiny tends to lead to: Problems, questions, doubt, uncertainty, instability, anxiety, confusion, and a sense of losing touch with that which we have deluded ourselves into believing we are … i.e., working memory.

Libet's experiment suggests there is something deeper in us that has the capacity to be aware of circumstances and make relevant choices concerning those circumstances … a 'something deeper' that appears to be somewhat different from – and, perhaps, to some degree independent of -- that which transpires in working memory. This 'deeper something' is not unconscious but, rather, the nature of working memory is such that it tends to give expression to a form of awareness that has blinders on and, therefore, is not aware of lots of other things that are going on within the mind … things that are going on in a quite intelligent, understanding, willful, and conscious manner.

It is working memory that is relatively unconscious. Every so often, however, working memory notices experiential data – such as in the Libet experiment -- which alludes to the possibility of dimensions of reality that might exist beyond the limited horizons of working memory, and, what working memory does with such disturbing/exciting information will go a long way toward determining whether – and how -- the great unknown will be engaged or largely ignored … if not actively denied by working memory.

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