Spiritual Symmetry

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Dedicated to: Dr. Baig –

He introduced me to the science of life and who had, by the Grace of God, the requisite love, patience, wisdom, and tolerance to tutor a rebellious, slow learner. Whatever is correct in this book is due to the principles that he communicated to me and that somehow sunk in, and whatever is problematic in this work is entirely my own contribution.

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Introduction

During the course of my life, I have cycled through periods of time in which science, spirituality, and/or philosophy – either individually or collectively – have shaped my explorations for truth. The science/mathematical facets of the cycling process began to occur at least from the time I was a freshman in high school ... two years removed from the stir created by Sputnik.

More specifically, in addition to various regular high school courses in science and mathematics (physics, geometry, chemistry, biology, algebra, and earth sciences), I was able to participate in several programs sponsored by the Maine Department of Education dealing with various facets of science and mathematics that, generally speaking, were not taught in most high school curricula of that era. These programs were part of the governmental response – at least at the state level – which were directed toward starting to cope with the possible implications posed by the perceived superiority of the, then, Soviet Union with respect to technical abilities relative to the United States.

I did quite well in the science courses sponsored by the state government – in fact I was one of two high school freshmen in the state who placed in the top twelve among the program's several hundred participates, most of whom were juniors and seniors. However, I was fairly average

in the mathematics classes – although, on occasion, I surprised myself ... and, perhaps, a few others.

I could solve many of the problems in those math classes (I met with both individual tutors and, as well, gathered together, from time to time, with other participants in some of the high schools in northern Penobscot County). Moreover, I really liked learning about a variety of areas that – at least in the very small high school I attended (44 students, 11 in my freshman class) – were not part of the curriculum ... topics such as: infinity, groups, rings, fields, number theory, topology, and so on, but to be quite frank, I didn't seem to grasp what mathematics was all about ... despite the best efforts of my state-provided tutors and instructors.

Following my junior year in high school, I was awarded a National Science Foundation grant to study the theory of semi-conductors for six weeks at a college in New York City during the summer prior to my final year of high school. I learned quite a few things during that period ... one of which was that perhaps I was not cut out for a life of science.

I came to the foregoing conclusion not because I felt there was a huge gap in ability between the other students and myself even though almost all of them came from much bigger and better high schools than the one I attended in Maine. On the other hand, there were, in fact, a number of the young people in the summer program who were quite advanced in relation to science and math and who, as well, were probably a lot smarter than me.

Rather, my reluctance to pursue a technical career beyond the horizons of high school was rooted in something that gradually dawned on me over the six-week period during which the course on semi-conductors took place. I discovered that I didn't like doing science ... a fairly important empirical data point with respect to deciding what to do with the rest of my life, and something that I would have had a difficult time realizing in my high school because that establishment had extremely limited (almost non-existent) lab facilities and, in addition, none of my teachers (there were only four in the high school) were either equipped and/or inclined to do much with what little there was in the way of scientific paraphernalia at the school.

I liked reading about science. I liked thinking about science. I liked talking about science. I even liked taking and doing well on the standardized science and math exams that were imported for me by my science and math instructor. However, I didn't like doing experimental work.

Of course, I have since come to understand that not all scientific research is a matter of lab work. Nevertheless, at the time, I believed that if I didn't enjoy experimental work, then, I needed to look in other directions as far as deciding on a career choice was concerned.

Perhaps my feelings about lab work were due to a degree of impatience within me concerning my search for truth. Setting up experiments just took too long, and there were so many things that could

go wrong with, or mistakes that could be made in relation to, the set-up process. Furthermore, laboratory work was so much messier than the way textbooks made science appear to be ... even though, later on, I came to appreciate that encountering such technical problems and messiness were all part of the scientific process.

Then, of course, one had to go through the whole analysis process following the experiment and, along the way, trying to discover the best manner through which to mathematically give expression to the data. This led to the plotting of some further significant data points to assist me to better calculate the possible slope of my adult life.

More specifically, I didn't like doing mathematics. This realization came even as I was coming to grasp some of the value that math had with respect to providing tools through which to organize empirical data in order to try to make some sense of that information.

I didn't mind other people getting to the undiscovered country sooner than I did. I was content that they were willing to share the fruits of their explorations with me and with others like me.

While I was busy in high school with mathematics and science – the subjects that most intrigued me – I also began to become interested in spirituality. Even though much of this latter interest was entangled, so to speak, with the church activities in which my mother participated, I also began to read – quite sparingly at first – about

other forms of spirituality and mysticism beyond the horizons of Christianity.

Within limits, my mother was quite catholic and liberal in her approach to spirituality. For example, among other things, although we were Protestant, nonetheless, on occasion, she let me attend a Catholic church where some of my friends attended Mass.

My father was a believer of sorts ... albeit in his own private way. However, he was not much given to participating in organized religion ... although he consistently supported my mother's church activities in whatever way he could – which usually involved driving her to and from various church programs and, as well, showing up for Christmas and Easter services.

In part, I began to explore, and push, the boundaries of my spiritual horizons because the largely theological answers that I received from various ministers over the years in relation to my questions concerning spirituality were not very satisfying to me. On the other hand, although I was very inspired by the example of Jesus (peace be upon him) and by the example of those (including my mother) who were influenced by that remarkable life, I also began to become inspired by some of the individuals about whom I was reading who were from other spiritual traditions including those of several indigenous peoples.

These forms of existential inspiration -- more than theological doctrine or the Bible or church

membership – moved me in the direction of wanting to become a minister through that I might be able to live a life of spirituality and assist others to do so as well. This is the career goal with which I entered university.

University was the first step in beginning to consciously realize that life is a very complex experimental laboratory. Even as I was placing mathematics and science on the back burner, life was strapping me to an existential lab table and beginning to probe me in various ways to determine how I might respond.

Because the aforementioned exploratory probes were somewhat painful and confusing, I felt a deep need to go in search of some coping strategies through which to engage the on-going examination of my being that was being conducted by life. Among other things, data points were beginning to accumulate during my first year of university that, perhaps, being a minister was not the calling that seemed to best fit my personality or inclinations, and part of this realization was due to the fact that my spiritual orientation – such as it was – was not helping me to resolve any of my questions and confusions concerning life.

As a result, I awoke in the great Agnostic Desert. I began to wander about, reflecting on my sense of being lost, and thirsting for something to quench the yearnings of my soul.

For a time, I became very interested in philosophy. I read a great deal, and, in addition, I

had the good fortune to be able to attend classes being taught by some of the best philosophical minds of that era.

I liked the way philosophy seemed to be committed to critical inquiry ... and doing so in a very rigorous and relentless manner. Unfortunately, a great deal of this inquiry seemed – or, at least, this appeared to be so to me – to have a very tenuous and elusive relationship with truth. I often felt that all I was getting were some techniques for treading water and staying partially afloat in the turmoil of life's stormy seas.

Philosophy is sometimes described as a journey and not a destination. This is fine if one doesn't mind taking a trip to nowhere, but I did mind, and I began to look for some other mode of transportation ... something that actually might take me to a determinate destination where I could settle down and feel that progress – to whatever limited degree – was being made in the struggle toward something substantial in the way of truth concerning myself and the nature of the universe.

One of the first ports to which I journeyed was psychology ... as Sheryl Crow might say: "The brochure looked nice." The discipline often combined elements of science, philosophy, and a quasi-spiritual search for the self (transpersonal psychology had not really gained much transaction at the time of my initial visit) and, consequently, psychology appealed to various interests,

questions, inclinations, and concerns of mine ... at least up to a point.

I did receive a degree in psychology. However, the place where I went to school called it 'Social Relations' -- an interdisciplinary experiment that has since been abandoned, and I was one of the lab rats that had been let loose into, or upon, the world from that program.

A few years later, I started a graduate program in clinical psychology. Yet, despite some departmental assurances that I would be able to cobble together a curriculum that would permit me to explore various aspects of phenomenological, existential, and transpersonal psychology, the bugaboo of experimental work slowly began to be imposed on my life once again. Moreover, for many of the same reasons that had shaped my career decisions coming out of high school, I quickly became disillusioned with doing the experimental side of psychology.

I enjoyed reading about and reflecting on the implications of the experiments that others had done. This was especially true in relation to some of the experiments conducted by Solomon Asch (group influence in a perceptual task), Stanley Milgram (compliance or obedience), Philip Zimbardo (prisoner experiment), and Martin Seligman (learned helplessness) ... although, due to ethical considerations, the last three experiments probably would not be able to run today.

In addition, during my undergraduate days, I had been quite happy to participate in a slew of experiments as a subject in exchange for a few dollars to help me survive life beyond the psychology lab. Some of these experiments were quite interesting and some of them were rather mysterious – for example, there was one experiment in which the people conducting the process wanted me to undergo electrical shocks in order to see how far I would be willing to take it ... an experiment that I never quite understood – although it might have been a selection process for identifying "candidates" for further twisted experiments of the sort that allegedly were administered to, among others, Ted Kaczynski – the 'Unibomber' – when he was an undergraduate student, prior to his days of infamy, and who had attended the same university as I had.

In any event, despite its varied charms, psychology exited stage left as I dropped out of the graduate psychology program in which I had been enrolled. Education entered stage right.

Being somewhat naïve about things at times, I thought that, perhaps, there might be fewer problems in a graduate program in education than in psychology. Unfortunately, despite the transformation in names, places, and subjects, there are, nonetheless, certain structural invariants that are conserved across the twists and turns of most academic programs – including education – and, thus, I began to experience, in a deeply

personal way, the existential essence of the principle of symmetry ... even though, at the time, this experience of symmetry was far from the shores of my subsequent interlude with the mathematics and physics of symmetry (and a little later on I will return to this topic in a more formal manner).

In retrospect one might refer to the foregoing existential sequence of administrative and academic transformations as the 'educational symmetry group.' In other words, given the merry-go-round that I was on for many years (nearly seventeen) trying to obtain a doctoral degree, I am certain there is a suitable symmetry group that is capable of precisely describing (either with real or complex solutions) the many rotational permutations that my life went through during this period of emotional, physical, financial, economic, social, psychological, and spiritual transformations as the absence of a doctoral degree remained invariant.

Because of the almost endless loops of rotating permutations that characterized much of my graduate, academic life as I pursued a doctoral degree in education, I inherited a lot of time to reflect on many issues. Among other things, I invested this temporal windfall in a day trader program of re-immersing myself in both science and mathematics, as well as the philosophy of those two disciplines.

Quantum theory, cosmology, relativity (both special and general), black holes, antimatter, holography, chaos and complexity theory, the history of mathematics, topology, Gödel's work, ideas concerning infinity, neurobiology, evolution, biochemistry, membrane functioning, and pre-biotic chemistry were some of the topics in which I invested time. I explored these subject areas not for a degree – although, eventually, not all of this work was wasted in that respect – but because I was trying to struggle toward the truth of things. My academic life might have been on administrative hold in many ways, but my epistemological longings were not so tethered.

Beyond the foregoing travel plans, my interest in spirituality and mysticism had taken some strange but intriguing zigs and zags just prior to entering the aforementioned graduate program in education. More specifically, since obtaining my undergraduate degree, I had explored – with varying degrees of intensity – different spiritual traditions ... from: Gurdjieff, to: Buddhism, the Vedanta, Jewish mysticism, the spirituality of various indigenous people, and several forms of Yoga.

For a number of reasons, I began to concentrate on the Sufi path. In the beginning, this assumed the form of a lot of reading (although at the time of my initial interest there was far less being published in English concerning the Sufi mystical tradition than is the case today). A few

years later on, I took the experiential plunge by taking initiation with a spiritual teacher, and in the process, I became a Muslim by entering Islam through what some might describe as the back door ... although I like to think of it as the servant's entrance.

A Hilbert-like Challenge

When I became experientially involved with the Sufi path (including many of its practices such as: fasting, chanting, meditation, seclusion, prayer, night vigils, and community service), I continued to read a great deal of science and math. In fact, usually these interludes into science and math were fairly intensive and tended to occur approximately every ten years beginning in the late 1950s (high school) and have continued on until the present time.

The more I read on, and reflected about, science and mathematics, the more I realized that notwithstanding many superb accomplishments and breakthroughs across a litany of scientific and mathematical endeavors, nevertheless, in many ways scientists and mathematicians did not seem to be much closer to the truth of some rather important issues than were most other people. The main difference was that scientists were often able to couch their ignorance in technical terms and, thereby, were able to make it seem, on occasion, that they knew more than they actually did.

The foregoing contention becomes somewhat clearer if I draw a certain parallel with a challenge that David Hilbert extended to the world of mathematics at the beginning of the twentieth century. Hilbert initially broached the challenge at the International Congress of Mathematicians in Paris in 1900 and, then, several years later (1902)

the challenged was re-issued in the 'Bulletin of the American Mathematical Society'.

Although the latter, published list was more extensive than the former, spoken list, the complete challenge involved citing twenty-four problems in mathematics that had not been solved at the time the challenge was issued by Hilbert. Since that time, ten of the proposed problems have been treated in a way that the consensus of the mathematical community agrees constitutes a definitive solution to the problem in question, while seven of the other problems have led to solutions on which there is, at least, partial consensus that, within certain limits, viable answers have been given.

Several problems, such as the Riemann hypothesis/conjecture (i.e., The real portion of any non-trivial zero generated through the Riemann zeta function -- which is defined for all complex numbers in which $s \neq 1$ -- will be $1/2$ and lies on the critical line, '$1/2 + it$', where 'i' gives expression to imaginary units and 't' is a real number) are still unresolved. Four, or so, other problems posed by Hilbert have been thrown out by mathematicians as being too vaguely worded for them to ever be able to determine whether, or not, a solution had been found or could be found.

In any event, a similar set of challenges could be issued to the world of science ... in other words, problems that, at the present time, have not, yet, been solved by science. This itemized list could be stated in terms of the 'problem of origins'.

For example, what are the origins of the precise character of quantitative values such as: gravitation, the speed of light, Planck's constant, the charge of an electron, and the numerical values of the strong and weak forces? There are about 18 or 19 of these physical parameters that are steeped in mystery and cannot be derived from first principles in physics but must, instead, be hand-fed into equations based upon independently established experimental results rather than through a specific prediction that arises from some fundamental theory of physics and that subsequently becomes confirmed in the laboratory or the field.

Another problem of origins concerns the source of life. This is not about revisiting the creationist/evolutionist wars. Rather, it is a simple statement of fact -- namely, no one has come up with a plausible, defensible, consistent, precise, and rigorously tested theory for how life came to be on Earth.

There is a great deal of speculative smoke in this regard. However, no one has spotted the actual character of the fire that would be able to make sense of such smoke, and to date, anyone who claims otherwise cannot back up their contention with sound science.

Consequently, at the present time, the status of evolutionary theory as a complete account of the origins of life is somewhat akin to the status of physics at the turn of the century in 1900. More

specifically, although neo-Newtonian physics dominated the explanatory landscape at that transitional time, there were all kinds of problems lurking in the bushes waiting to pounce and that soon would attack normal, Newtonian and classical sensibilities through the work of Planck, Einstein, and others.

In the process, Newtonian physics was turned up-side down when, among other things, scientists tried to generate sensible solutions for dynamical systems involving: black body radiation; high velocities (e.g., near the speed of light); intense gravitational fields (e.g., hypothesized black holes); and quantum events (e.g., electrodynamics). Consequently, in 1900 neo-Newtonian physics was very much an incomplete theory that needed to be put in a more rigorous form through developments in special relativity, general relativity, and quantum dynamics.

Now, however -- and it only took about eighty years, or so, to accomplish -- Newtonian physics can be seen as a generally workable system for understanding how to solve a variety of physical problems. What makes this possible is the hard-earned understanding that classical, Newtonian physics constitutes a set of limiting cases that can be derived from more fundamental principles rooted in special relativity, general relativity, quantum electrodynamics and quantum chromodynamics.

One cannot say the same for evolutionary theory with respect to the origins of life problem. Evolutionary theory still stands in need of its own version of quantum and relativistic revolutions.

Presently, unlike the case in physics in which one can travel from first principles and make sense of classical Newtonian physics, in evolution, one cannot go from first principles concerning the origins of life and derive modern, Neo-Darwinian evolutionary theory. One cannot make the transitions from the inorganic to the organic to the living in any consistent, rigorous, empirically viable fashion.

In many ways, the scientific illumination that accompanied the discoveries of DNA and molecular biology has brought the problems surrounding the development of a viable account for the origins of life out of the shadows. Just as Planck, Einstein, Bohr, and others began to reveal the problems and incompleteness inherent in Newtonian physics, so too, molecular biology has disclosed the manner in which neo-Darwinian evolutionary theory is inherently incomplete and cannot explain the origins of life from first principles.

Most evolutionary theorists like to ignore the many problems that exist in the pre-biotic landscape leading up to Darwinian ideas. This is like writing only the third act of a play and assuming that the missing first two acts really won't matter all that much to the audience.

As a person of faith, I honestly can say that I don't have a vested interest in the issue, one way or the other. Evolution could be true because this is the means through which God created life, or Creation could be true because the major changes in the branches of the tree of life (including its origins) were introduced by God and not via evolutionary means ... even as population genetics, together with the idea of natural selection, might account for a considerable amount of observed variation among different species once they came into being.

Where I depart from evolutionary theory is in relation to the idea of randomness. In other words, I maintain that however life arose this was not the result of random processes.

I have no intention of trying to prove the foregoing claim. Rather, I am content to note that randomness is, itself, a concept with a faith pedigree, and, consequently, I see no reason for according such a faith initiative more credibility than a form of faith that rejects the assumption of randomness.

In fact, no process can be shown to be random -- whether in relation to the origin of life or with respect to any other phenomenon. There could always be some, as yet unknown, algorithmic set of processes (that is, an ordered, recipe-like group of steps for producing solutions to a given kind of problem) that led to whatever is currently being labeled as a product of randomness.

The most one can say is that based on a certain body of data and given certain very contentious conventions for testing the degree of confidence one has in conclusions drawn from such data, no algorithm has been scientifically identified as being the cause of the phenomenon in question. As such, the notion of randomness is, at best, an assumption rooted in an inductive argument that could be shown to be invalid during further rounds of refining the process of experimental analysis.

However, no matter what the character of the framework is in which faith might be embedded, faith is not other than faith. The idea of: degrees of confidence, is little more than a faith-based initiative concerning the truth in relation to a particular topic ... in this case evolution and the origins of life.

If people want to believe that the universe is random, that is fine. However, this is not a belief that can be proven to be true ... even though such an assumption does have its heuristic uses. Yet, notwithstanding the valuable role that such an assumption can play methodologically, the underlying assumption of randomness still stands in need of demonstration as an ontological reality.

In other words, methodologically speaking, one can use the idea of randomness -- construed as being a set of circumstances that seem to exhibit no discernible algorithmic pattern -- to establish a baseline against which one measures and evaluates experimental results. This helps one to generate a

benchmark through which one judges whether, or not, some given phenomenon might have occurred purely by chance or took place due to some other set of non-random factors.

Nonetheless, when one does this, one is not really talking about randomness, per se. Rather, one is talking about a process for decision making that sets up arbitrary cut off points that help one decide -- via a convention -- when to call something "random" rather than "determinate", even though such labeling has done nothing at all to prove that some given event is random rather than caused by, say, an, as of yet, unidentified algorithmic process or set of 'hidden' variables.

Attempts have been made to use perspectives such as: chaos theory, complexity theory, and far from equilibrium dynamics to explain how determinate structures might arise out of presumably random processes. Nonetheless, in each of these cases, assumptions are being made about the character of the initial starting conditions as well as the nature of the forces that are shaping such starting conditions.

The universe might be random, or, then again, the universe might not be random. Nonetheless, irrespective of which might be true, given our present state of knowledge (or ignorance), the claim that the universe is a set of random processes is nothing more than a declaration of faith about how someone believes the universe operates. Ensconcing that piece of faith within a scientific

framework does not suddenly confer upon it a status of truth or indicate that it should necessarily and automatically be awarded a greater degree of credibility than other forms of faith.

One might say that, in some ways, there is something of a Mexican-standoff between the two perspectives of randomness versus non-randomness. Neither side has the empirical leverage to topple the respective antithetical form of faith system -- even as both sides seek to raise the ante through this or that empirical chip or logical consideration and call for a hallelujah from their respective choirs.

Nonetheless, if evolutionary theorists want to have final bragging rights with respect to the claim that the origin of life is due to purely random processes, then, the burden of proof is on them. As the Cuba Gooding, Jr. character in Jerry Maguire might say": "Show me the money."

I have written about all of this in: Evolution and the Origin of Life so I won't repeat myself with respect to the technical details. However, when one begins to study: molecular biology, biochemistry, pre-biotic chemistry, membrane functioning, cell functioning, metabolic pathways, protein formation, DNA and RNA synthesis, gene expression, geology, hydrology, atmospherics, and other related topics and search for a clear, plausible, rigorous, demonstrable line of argument for how one goes -- via allegedly random processes (enhanced, if one wishes with ideas from chaos

theory, complexity theory, and far from equilibrium dynamics) -- from: Abiotic conditions free of living systems, to: biotic conditions containing even the simplest of life in the form of proto-cells, one tends to come up empty. In short, currently there exists no consistent, plausible, precise, and rigorous scientific theory capable of solving -- even in the flimsiest of ways -- the origin of life problem.

People (scientists and non-scientists) can argue all they like about the strength or weaknesses of Darwinian and neo-Darwinian theory. However, they are barking up the wrong tree of life, because Darwin has virtually nothing to say about the origins of life issue except to allude in On The Origins of Species to the possibility of there being a warm little pond somewhere during the history of Earth in which the inexplicable suddenly does its version of the 'dawn of the living dead' movies -- although Darwin, of course, did not phrase things in quite this way -- and require the audience to enter into a state of suspended belief in order to be able to get on with the story.

One cannot even say that evolutionary theory provides the best scientific account of the origin of life issue. This is because there is no general consensus within the scientific community about what such a theory looks like.

Instead, one has a gaggle of theories concerning the origin of life that all entail numerous, fundamental, unresolved, empirical and theoretical problems. Furthermore, there is

nothing on the scientific horizon that seems even remotely capable of handling such difficulties in a plausible, reliable manner.

Someone might maintain that if I am not willing to accept the current evolutionary perspective on the matters surrounding the origin of life, then it is my responsibility to provide an alternative hypothesis that resolves such a problem. Actually, this is not my responsibility. Epistemologically speaking, I have done my due diligence if I satisfactorily demonstrate what cannot be shown given our present condition of knowledge/ignorance.

When a mathematician has done all he or she can to demonstrate that a certain problem cannot be solved in a particular way, it does not, then, become the duty of that mathematician to show how the problem might be solvable in some other way -- although people might be very happy if he or she were able to accomplish this. Similarly, if I have rejected the evolutionary account of the origin of life on reliable scientific grounds (and there could be civilized debate about whether, or not, this conditional has been satisfied), then I cannot reasonably be expected to also come up with a solution to the origin of life problem any more than a jury can reasonably be required to continue on and prove who actually did kill someone after they have, beyond a reasonable doubt, ruled out a specific defendant as a viable candidate for the crime.

I don't have to prove some version of creationism, nor advance an argument from Intelligent Design. I am content to know that, currently, science has no reliable theory concerning the origin of life and, therefore, until new evidence comes along, I am free to go in whatever way is plausibly consistent with the available data.

In addition to the problem of origins concerning constants (which is really a set of 18 or 19 problems) and evolutionary theory (which, similarly, is really a set of theoretical and empirical difficulties rather than just one problem), another currently unsolved problem in science is the origins of consciousness. In fact, while raising the issue of consciousness, one might also add on several other related 'problem of origin' issues at the same time - - namely, the origin of rational/logical thought, the origin of language, and the origin of creative talent (whether artistic, musical, mathematical, or technical inventiveness).

Theories abound in all of the foregoing areas. Yet there is precious little that stands up to rigorous scrutiny and, as a result, enjoys anything close to a general consensus of support among scientists.

To be sure, there have been a lot of interesting results generated through, among other things, functional magnetic resonance imaging techniques and positron emission tomography. Some experimental results (recently reported on '60 Minutes' as well in a variety of books and magazine

articles) even seem to suggest that, within certain limits, the minds of people can be read with respect to what those individuals might be thinking about from one moment to the next.

However, at best, such studies are correlational in nature rather than causal in character. In other words, while one can concede the point that there are different portions of the brain that can be identified that are correlated with various kinds of thought processes, yet, when one pushes the interrogative envelope and asks how, exactly, does a complex of neurons, dendrites, axons, electrical impulses, glial cells, neurotransmitters, and synapses generate consciousness and/or the thoughts in question, there are, no reliable, definitive answers.

We don't know how, or if, the brain generates consciousness. We don't know how, or if, the brain generates thought, logic, understanding, belief, values, insight, or interpretation.

Brain functioning might be correlated with all of the foregoing. Nonetheless, the causal pathways, if any, between the two are steeped in mystery.

To date, there has been nothing uncovered by either cognitive psychology nor neurochemistry that can prove that the brain is anything more than a very sophisticated receiver -- like a television or radio set -- that organizes 'waves' (programs) coming in from some other source or dimension (station). In fact, a great deal of the empirical data that comes in from medicine and shows that, for

example, certain kinds of lesions in various parts of the brain lead to specific sorts of disabilities can be likened to what happens in a television set when something goes wrong with a transistor, capacitor, or circuit and, thereby, prevents the set from being able to properly receive information that is coming in via satellite, cable, or antenna from some other locality.

In the near future, science might be able to prove that consciousness, thinking, creativity, and language are entirely functions of brain activity. However, this is not the status of things at the present time, and, consequently, all of these origin issues remain unsolved challenges for science.

To kick a bit of additional sand into the face of some scientists at this juncture, I always enjoy talking to psychologists -- especially those who wish to reduce consciousness, thinking, and language down to processes that are nothing more than chemistry and physics -- about the work of John Lorber, a British neurologist who did some research involving hydrocephaly.

Hydrocephaly arises when, for whatever reason, the flow of cerebral-spinal fluid is blocked or trapped in some way so that the four ventricles within the brain begin to increase in volume through the accumulation of trapped cerebral-spinal fluid. If this continues on without intervention (such as surgically implanting a shunt that allows drainage to occur), the brain tends to get squeezed against the interior of the skull, and

over time, the brain is reduced to becoming a very tiny filament (perhaps a millimeter, or so, in thickness) running around the interior portion of the skull.

One of the interesting facets of Lorber's research is that he discovered some patients with hydrocephaly whose brain had been severely compressed in the foregoing manner (that is, down to a single or several millimeters). Yet, these individuals showed no cognitive defects ... in fact, at least one of them had earned a honors degree in mathematics.

Of the more than 600 CAT scans conducted by Lorber, about 50, or so, of the scans studied were of individuals in which at least 95% of the cranial cavity had been filled with cerebrospinal. Half of this group of scans came from individuals who were severely retarded and half of the group had IQs greater than 100 despite the severely compressed nature of their brains.

Roger Lewin wrote an article that was published in Science (210, December 1980) entitled: "Is Your Brain Really Necessary?" which summarized the Lorber research. The journal, Science, is fairly cautious about what it admits to its pages ... although over the years some mistakes might have been made. There are critics of the Lorber research who claim that interpreting CAT scans can be a tricky proposition and, consequently, it is easy to miss brain mass when attempting to interpret the scans.

Such critics claim that Lorber's research is invalid because he has committed such errors.

Lorber acknowledges the difficulties and problems that surround the interpretation of CAT scans. Nevertheless, he asserts that no mistakes of the indicated kind were made during his research.

Interestingly, I am not aware of any of Lorber's critics who have expressed an interest in going over the scans in question and demonstrating the error of Lorber's methodology. Apparently, like the church officials who condemned Galileo, none of Lorber's critics seem willing to look through his 'telescope' consisting of CAT scans of hydrocephalic individuals and see what, if any, brain matter actually shows up in the viewing process.

Some of Lorber's critics also talk about how there are redundant systems in the brain, and, if such system becomes dysfunctional, other back-up systems come to the rescue. However, none of these critics seems to have addressed the fact that the observable evidence (namely the CAT scans) appears to indicate that all such systems have been severely compressed and, as a result, one would have to wonder how any of the systems would have been able to continue to be functionally viable, no matter how redundant they might have been originally (that is, before the destruction of a given individual's brain).

Some of these same critics also like to use the idea of 'emergent properties' (a principle related to, among other things, certain aspects of

complexity theory) to explain how brain functioning might generate consciousness, thinking and so on. Yet, emergent properties require a certain threshold of complexity to plausibly speak about what phenomena might arise out of a given system that cannot be anticipated or predicted based on an examination of the basic components of such a system, and, therefore, Lorber's research seems to undercut the whole issue of complexity and emergent properties ... taking such possible explanations of mental functioning in a direction that is totally opposite to the one in which they need to go.

In any case, in the light of the Lorber research, one is left with a variety of questions concerning the origins of such phenomena as: consciousness, thinking, and creativity. Is the brain a complex receiver of thought and consciousness, or is the brain a generator of thought and consciousness, or is it some combination of the two? The mystery of origins continues on in these respects.

If one wishes to dismiss the Lorber research, one might like to consider the findings of Benjamin Libet. He ran an experiment in which subjects were required to flex a finger at a time of their choosing and, then, to note the time on the clock that marked the point of their decision.

The experimental data indicates that, on average, subjects took 0.2 seconds to flex their finger after they had decided to do so (at least as far as the subjects noting the time on the clock is

concerned). Strangely enough, the electroencephalograph that was monitoring their brain-wave activity, tended to record a spike in electrical activity some 0.3 seconds before the time of having decided (apparently) to flex their fingers.

What caused this spike? How did it arise? What does it signify?

Is some -- unconscious perhaps -- portion of the brain making the finger flexing decision ... a decision that we become aware of only 'after the fact'? Or, is the electrical spike an indication that some sort of non-physical mental process is occurring and that the time between the electroencephalographic spike and the motor firing underlying the finger flexing is the time interval necessary for the brain to translate or process a non-physical intention?

Libet referred to the pre-motor state of the brain (i. e., prior to the time of flexing the finger) that was given expression through the spike in the electroencephalograph as the 'readiness potential'. Libet and others interpreted the readiness potential as an indication of unconscious brain activity that led up to the conscious experience of having formed an intention and, therefore, an indication that human beings did not have free will.

However, the belief that the readiness potential is rooted purely and completely in unconscious brain functioning might be based on a failure to have traced conscious events back to their actual source.

In fact, even if one were able to map out the full pathway of the readiness potential with respect to all the neurological factors that are believed to culminate in the spiking of the electroencephalograph, there is nothing that prevents one from legitimately asking for an account of what caused all the collective brain processes that led to the occurrence of the readiness potential.

Maybe the readiness potential really just signifies the brain's staging process for translating a non-brain intention into a physical form. If so, then the precise character of the interfacing process between the mental and the physical is still mired in mystery, and the related origin problems remain.

Back in the 1970s, the splint-brain research of Roger Sperry and Michael Gazzaniga laid the foundations for, among other things, the idea that the human mind has a potential for maintaining multiple pockets of simultaneous consciousness that interpret reality according to the information that is available to these respective mental pockets. Consequently, it is entirely possible that physical and non-physical pockets of consciousness interact in order to translate non-physical mental intention into physically recordable impulses -- although this was certainly not the position of Gazzaniga, Sperry or Libet ... even as it is consistent with their collective findings.

'Problem of origin' issues tend to be frustrating and irritating for a lot of scientists. Such theoretical difficulties tend to suggest that, oftentimes, more questions need to be asked that place current -- supposedly established -- understandings at risk ... understandings in which some scientists might have a vested philosophical or ideological interest (e.g., that there is nothing beyond the physical, or that mental functions are purely a matter of brain states, or that the universe runs in accordance with largely random processes that, given the right circumstances, will generate organized structures and systems in accordance with certain basic laws of physics and chemistry).

Another mystery facing science is the problem surrounding the origins of the observed asymmetry between matter and antimatter in the universe. As far as scientists can tell, there is a lot of matter, and, relatively speaking, very little antimatter in the universe, but the reasons why this is so are not readily evident.

Although many cosmological theories suggest that prior to the 'Big Bang' the relative ratio of matter to antimatter should have been fairly close, such theories all allude to some unknown mechanism that might have led to a starting point -- namely, the time of the Big Bang -- in which there was a slight asymmetry between the two in favor of matter that, over time, would have permitted most of the antimatter to be annihilated while leaving behind a universe consisting largely of matter.

Nevertheless, there are no empirically verifiable theories currently in existence that plausibly account for how such an asymmetry might have come about ... assuming, of course, that it came about at all and that, at some point, matter and antimatter were in rough equilibrium with one another.

Two other cosmological themes that are still in the unsolved column involve: 'dark matter' and 'dark energy'. While it is entirely possible that no such "entities" exist -- and many scientists are quite willing to acknowledge such a possibility -- there is considerable evidence to indicate that many, if not most, galaxies appear to be rotating with velocities that cannot be explained given the amount of 'visible' matter that has been calculated to exist in the observable universe. Similarly, when scientists try to explain the large-scale character of the Universe and attempt to present a consistent picture of how they believe the cosmos might have unfolded across time from the instant of the alleged 'Big Bang' to the present day, more mass and energy is required -- by a factor of nearly thirty times -- than can be accounted for by standard theories of cosmology. As a result, the ideas of 'dark matter' and 'dark energy' have been hypothesized to account for what is being empirically observed in the cosmos.

Do such entities exist? Maybe!

On the other hand, maybe something of an even more mysterious and exotic nature is

responsible for what is being observed. Perhaps the idea and character of the 'Big Bang' is different from what many have assumed to be the case.

In either event, the mystery remains unresolved. Thus, it could be added to my list of origin challenges for science, since if 'dark matter' and 'dark energy' do exist, then one would like to know where they come from and how they arise, and whether, or not, baryonic and non-baryonic matter (since there seem to be no viable, baryonic candidates for dark matter) were ever unified in some unknown state prior to the Big Bang.

In fact, having mentioned the idea of the Big Bang at several junctures during the previous pages, one might note that the Big Bang is itself rather a big mystery. Scientists extrapolate back from the present and hypothesize a set of events that might have gotten us to where things stand today.

More than thirty years ago, the Nobel Laureate, Steven Weinberg wrote a book entitled: The First Three Minutes, which offered a description rooted in what modern physics could tell us about the events that might have transpired following the 'Big Bang'. To be precise, the frame for his story begins with the first one-hundredth second and proceeds from there, since at the time -- and, to a great extent, this still remains true -- too little is known about the physics of the particles that might have been in play prior to a time when temperatures were believed to exceed 100,000

million degrees Kelvin and indefinitely large densities might have had existed ... conditions that make it difficult to calculate the transaction rates of processes involving strong interactions that hold quarks together (the building blocks of, among other things, protons and neutrons) via exchanges of gluon bosons (one of the foci of quantum chromodynamics).

Prior to the first one-hundredth second, allusions often are made to conditions of infinite temperature and density. What created such temperatures and densities is unknown. What held those temperatures and densities together until the moment of the Big Bang is unknown. What would have permitted such 'forces' to be overcome, is unknown. Whether space and time existed prior to the Big Bang is unknown. Whether the initial starting conditions actually consisted of infinite density and temperature is unknown. Whether the four known forces (gravitational, electromagnetic, weak, and strong) were unified prior to the Big Bang is unknown. Whether there was some form of spontaneous symmetry breaking that led to the Big Bang is unknown. Whether the Big Bang is a unique or recurrent event is unknown.

One problem entailed by the Big Bang that was raised early on was that if the Universe expanded in the way initially believed, then one cannot explain why the cosmos seems so isotropic and homogenous -- that is, on average, the universe appears to be pretty much the same no matter that

way one peers into the cosmos. Furthermore, if this is the case (as observation seems to indicate), then 13 to 15 billion years (the calculated age of the visible universe) does not seem to be sufficiently long enough to be able to generate the isotropic and homogenous conditions that are observed today.

Alan Guth proposed a solution to the foregoing dilemma. He hypothesized that just 1×10^{-35} seconds into the Big Bang, there was a very brief period of inflation that allowed space to expand (by a factor greater than 10^{50}) for just the right amount of time and with just the right degree of intensity to, over time, generate the isotropic and homogenous universe we see today.

The only problem is that there are a lot of mysteries surrounding and permeating the inflation hypothesis. What caused it? Is space really 'something' that is subject to inflation? Why did inflation occur when it did? Why did inflation have the structural character it did? Why did inflation shut down when it did?

There are a number of theories that seek to answer the foregoing questions and, thereby, save the inflation hypothesis. However, none of these theories has yet to be empirically verified.

There is indirect evidence for the idea of inflation in the form of the 2.7° Kelvin background microwave radiation that was discovered by Robert Wilson and Arno Penzias -- but actually explained by Robert Dicke -- as to what one might

expect to see (and for which Dicke and his research team had been searching) if there were an 'afterglow' of radiation left over from the Big Bang that would become visible once the Universe had cooled sufficiently to permit such electromagnetic radiation to be detected amidst electron scattering processes that had rendered the visibility of such radiation opaque at higher temperatures.

However, the background microwave radiation that appears to permeate every facet of space also has been cited to serve as support for theories that reject Guth's inflationary Big Bang perspective. Yet, like Guth's theory of inflation, these alternative theories also stand in need of empirical confirmation.

All in all, there is an embarrassment of unknowns surrounding the so-called Big Bang. As a result, an increasing number of physicists have sought for solutions that might enable scientists to be able to avoid the many unexplained facets of the standard cosmological model while simultaneously offering a plausible account for how we might have arrived at the present state of things in the universe. Yet, these alternative theories concerning the nature and evolution of the universe each have their own set of difficulties with which to deal.

Currently, at CERN, scientists are looking for the Higgs boson, an elementary particle of spin-0 that is predicted by the Standard Model of quantum physics. Among other things, the Higgs boson is hypothesized to be the source/creator of mass (and

this is why some individuals refer to it as the God particle) and that if it existed might help to explain why photons, that mediate electromagnetic processes, are mass-less, while the W and Z bosons that mediate weak force interactions are, relatively speaking, quite massive.

The predicted mass of the Higgs boson is thought to be below 1.4 Tera-electron volts. If this is true, then, the Large Hadron Collider that recently went on line at CERN is capable of generating the sort of collision energies out of which the Higgs boson might precipitate, so to speak.

Does the Higgs boson exist? Or, is some other non-Higgs model needed to help complete the Standard Model of quantum theory?

We might soon find out? Then, again, nothing like the Higgs boson might be seen at CERN, and, if so, scientists will have to determine whether this means that the Higgs boson does not actually exist or it means that the predicted mass of the Higgs particle has been incorrectly calculated and one must set about generating still higher collision energies if one hopes to catch sight of such a particle.

In any event, the questions surrounding the Higgs particle are related to the problem of origins ... namely, the origin of mass. So, we can add it to the list of currently unsolved problems involving origins.

A further candidate for the proposed Hilbert-like list has to do with gravity. More specifically, although a value for the gravitational constant has been precisely established, no one knows what constitutes the source or origin of gravity.

The consensus preference among quantum physicists is the graviton. The graviton is a hypothetical -- so far, at least -- gauge-field particle that is believed to be massless and characterized by a spin-2 property and, therefore, if it existed would behave in a way that made it capable of providing descriptions of gravitational phenomena that are indistinguishable from the descriptions that are given through general relativity theory. One of the problems with the foregoing possibility is that there might be a basic incompatibility between quantum dynamics (in the form of the graviton) and the tensor geometry of general relativity. For example, one facet of this incompatibility arises in the form of the infinities that are generated when calculating values for the gauge field of the graviton at certain high energies that are relatively close to, or which exceed, the Planck scale (1.22×10^{28} electron volts), and unlike the case of quantum electrodynamics -- however ontologically suspicious that mathematical technique might be – a way has not been found to "renormalize" the field calculations associated with the graviton as has been done for photon dynamics. String theory claims to have a way to avoid the foregoing infinities. However, in a sense string theory employs its own version of a renormalizing

technique when it uses hidden dimensions to get rid of the offending infinities.

The introduction of additional dimensions might dissolve one problem -- namely, infinities (or sweeps it beneath the dimensional rug). However, in the process, string theory might lead to another kind of problem -- that is, whether or not such dimensions actually exist mathematically … however elegant they might be.

Some Methodological Considerations

None of the foregoing brief excursions into physics touch upon the whole issue of the precise character of the relationship between, on the one hand, the classical-visible world of large objects traveling with velocities well-below the speed of light through non-extreme gravitational fields and, on the other hand, the quantum world. Although many scientists appear to believe that Bohr and the so-called Copenhagen Interpretation of physical reality won out over Einstein's hidden-variable perspective that, among other things, insists that 'God does not play dice', there is considerable unsettled business surrounding the matter.

According to the principle of superposition, it is possible for, say, a particle to exist in many states simultaneously. Schrodinger's wave equation -- augmented by Max Born's interpretive adjustments -- permits one to calculate the probabilities of likelihood of occurrence with respect to such states, but until the equation is solved, all states are said to be existent simultaneously.

The collapse of the wave function -- that is, using the equation to solve for specific values -- 'selects' the real world value that emerges from the cloud of quantum unknowing that is encompassed by the principle of superposition that rules over the unsolved wave equation. However, the ontology of this process of collapse is shrouded in mystery.

There have been many theories advanced that purport to describe what happens during the collapse of the wave function. Besides the 'Copenhagen Interpretation' that was set in motion by Niels Bohr, one also has: Hugh Everett's many-world's interpretation, John Wheeler's theory about the role that consciousness plays in the collapse of the wave function, and David Bohm's wholeness and the implicate order approach, which are some of the proposals that have been set forth in an attempt to make sense of alleged 'quantum weirdness'.

Personally, I like the frankness of Richard Feynman's response when he gave some advice to an individual who was concerned about not being able to understand what was going on at the quantum level. More specifically, Feynman told the individual to just do the mathematical calculations because, ontologically speaking, no one knows what is going on at the quantum level.

Beyond such bouts of honesty, however, I've always felt that there is, sometimes, a tendency to confuse, if not conflate, scientific methodology with ontology. For instance, I believe that the principle of superposition is just a methodological statement -- with no ontological implications or reality -- and that Max Born's probabilistic rendering of the Schrodinger wave equation is an alternative way of giving expression to the same idea.

If the foregoing is true, then the probabilistic interpretation of the wave function has no

ontological counterpart. In other words, although the wave function does have a relation to what is going on in reality, the nature of that relationship is not one of tracking a real world probability wave out of which a particular quantum state ontologically precipitates in mysterious fashion when the wave equation is solved.

Schrodinger's wave equation is a search function. It assists one to identify that state-candidates in a probability distribution are most likely to be found in a given set of circumstances.

Like a GPS device, the Schrodinger wave equation should not be confused or conflated with that for which a position is being determined. Similarly, I have no problem in understanding that as an ontological entity I can exist quite independently of whether, or not, I have a GPS device (the Schrodinger wave equation in the case of a particle) to locate where I am (it is). Nor, do I believe that I am brought into existence simply because a GPS device is somehow turned on which can locate my position ... or that I don't have a position until that device is turned on and viewed by someone.

Quantum weirdness is largely, if not entirely, a function of scientists trying to interpret ontological phenomena that -- as Richard Feynman pointed out -- no one really understands. Not content with having worked out a variety of methods (Heisenberg's S-matrix mechanics, Schrodinger's wave equation, the Dirac's equation, and

Feynman's sum-over histories method ... all of which have been shown to be roughly equivalent to one another) for determining various values concerning quantum states, many scientists have sought to have the methodology do double duty by providing an alleged ontological explanation for what is going on, and the results have given birth to a lot of philosophical and ideological speculation concerning the nature of reality. This is like expecting a GPS device to provide an explanation for: who I am, and why I am where I am at the moment of its fixing my location, and what the purpose of life is.

Similar confusions/conflations arise in conjunction with other aspects of physics with similar sorts of weirdness bubbling to the surface as a result. For example, consider the special theory of relativity and the accompanying infamous time paradoxes that seem to be implied by the Lorentz transformation.

Einstein made time operational by claiming that time is what a clock measures. Actually, clocks have a determinate character that time permits to be expressed through the structural nature of the clock.

Sundials, hourglasses, mechanical clocks, electric clocks, and atomic clocks all have their unique ways of serving as an index for the passage of time. If we have all of these devices simultaneously marking time and some of these indices are more periodically regular than others,

we don't say that there are different temporal realities going on, each of which is generated through a different kind of clock. Rather, some of the devices are more reliable -- more precisely periodic -- than others for, say, purposes of measurement.

If one places the various devices on a rocket ship that travels near the speed of light, or if one place the devices in an intense gravitational field, one would expect there to be some kind of effect on the 'workings' of each of the clocks due to the effect of the near-light velocity or intense gravitational fields, but none of this necessarily implies that anything is happening to the ontology of time. Indeed, observations have been made (by Leon Lederman among others) in relation to the decay rates of particles that demonstrate that those decay rates are affected by the nature of the physical circumstances in which they are observed, and experiments also have been done (with airplanes) in which atomic clocks that began in synchronous harmony will deviate from one another if they are subjected to different intensities of gravitational field (e.g., at the Earth's surface versus in the air at some distance from that surface).

What has any of this got to do with the ontology of time? Nothing really!

However, it has a lot to do with the measurement of time. The Lorentz transformations permit measurements to be translated in such a

way that the laws of physics are conserved in all frames of reference.

From the perspective of one frame of reference, it might seem like some other set of physical laws are manifesting themselves in another frame of reference in which measurements of velocity, mass, length, and time have not been properly translated in relation to the two frameworks. Nonetheless, if one feeds the measurements into the Lorentz transformation, one comes to understand that despite the differential surface appearances generated by the measurement process exactly the same laws of physics are taking place in each of the frames of reference.

Measurements of time, mass, velocity and length might vary as a function of the conditions of gravitation and velocity that are engaged by, and engaging, the measurement process. However, the ontology of time is not necessarily affected by any of this, and, in fact, given the principle at the heart of all relativity theory that no frame of reference has a special relationship with the universe that would enable one to identify physical absolutes of any kind, one could never actually determinately establish whether, or not, the ontology of time was affected by any set of physical circumstances, although we might have substantive evidence that the measurement of time can be so affected.

Put a person in a vehicle traveling at the speed of light and the measurement of time might slow

down to zero. However, the ontology of temporality ticks on in its own independent, inimitable fashion ... or, given that I have never actually performed such an experiment, that's my intuitional assessment of the situation.

The slowing down of a clock will not necessarily affect the ontological age of an individual. In fact, increased velocities and/or gravitational fields might affect the metabolic processes related to ageing.

However, aging is a clock-like process that could be affected by the circumstances of life but does not, itself, necessarily affect the general ontology of life in any fundamental manner.

Time and circumstances affect clocks and measurement. Clocks and measurement have no capacity to affect time or circumstances ... unless, vis-à-vis Heisenberg's uncertainty principle, one wishes to note that the process of measurement has the capacity to interfere with our ability to precisely measure the character of some aspect of reality in a given set of circumstances. However, the foregoing is a statement about the epistemological and methodological character of our attempt to engage reality and is not at all -- Bohr's protestations to the contrary -- a statement about the inherent structural character of reality.

Let's take a brief look at one last example in which methodology might be getting confused or conflated with ontology. More specifically, consider

the ‘space-time’ concept that is inherent in the mathematics of general relativity.

Space-time needed to be invented in order to be able to construct a mathematical means (with help from Hermann Minkowski and Marcel Grossmann) that was capable of accurately describing gravitational phenomena through a sort of tensor geometric mapping process that was given expression through the equations of general relativity. Nonetheless, although Einstein is reported to have said that gravitation is geometry, this is really nothing more than a shorthand form of expression that actually means that certain forms of geometry are capable of generating descriptions that are able to accurately reflect various structural features of gravitational phenomena.

One might ask, therefore, whether there actually is some ontological entity that is space-time? Asked in a slightly different way, one might ask: What is the “fabric” of either time or space -- or space-time? Does space, time, and/or space-time have any ontological “fabric” that is capable of being affected by physical processes such as gravitation (or inflation)? Do we actually know what space or time is ... even as we construct mathematical systems for describing what takes place within the mysterious ‘containers’ of space and time?

Does gravitation really warp space or space-time? Or, is it the gravitational field within space

and time that is distorting itself, and this distortion can be measured through tensor calculations that map the nature of such deformations across the space-time dimensional system of methodology that is used for keeping track of such changes?

General relativity is a methodological means for describing ontological phenomena, and space-time plays an important role in that descriptive process. However, general relativity, and its component space-time, might only be an analog for certain facets of reality rather than reality itself, and if so, then, space-time is nothing more than a methodological means (ingenious as this might be) for representing or reflecting certain structural features (of a gravitational nature) that are being manifested through ontology and should not be confused or conflated with the actual nature of the ontology being represented.

A mirror reflects some portion of the real world. Although there might be occasions in which one might not be sure whether one is looking at a mirror reflection of reality or one is looking at reality (and usually for this to happen there has to be a symmetry in the real world setting that, when reversed through the left-right shift of reflections, cannot be detected), we do not suppose that the mirror reflection and the real world are the same thing. There is a relationship between the two that allows certain real structures to be preserved across the several dimensions of reflection, but

there are aspects of the real world that do not exist in the mirror reflection.

Similarly, methodologically speaking, one might be able to generate a mathematical system that is capable of mirroring certain structural features of the facet of the real world that is being modeled. Nevertheless, this doesn't necessarily entitle one to say that the model and the real world are one and the same.

In fact one might be willing to predict that certain differences are likely to show up over time or when different variables are manipulated in an appropriate way. For example, the infinities that plague certain aspects of physics, including quantum mechanics, could be seen as a natural concomitant of treating the idea of a mathematical point as that which occupies position but is dimensionless ... something that does not appear to be true of the physical world. Or, one might note that the self-energy problem of the electron that also seems to lead to infinities when calculations are made (and for which mathematical techniques have been constructed to help lessen or eliminate such infinities) could be traced back to the defining of the electron as a point charge that might not reflect the actual structural character of an electron ... and this is a possibility that gives expression to some of the excitement that has been generated by string theory since the electron is no longer considered to be a geometric point particle, and, as a result, the self-energy problem doesn't arise.

Moreover, one might take a look at chaos theory and consider how rounding off mathematical calculations even to n-places will, over time, lead to wildly diverging results within a fairly short period of time with respect to the mathematical description of a system and that which is being represented through such a mathematical model. Again, this is an indication that there are important distinctions to be drawn between the nature of a mathematical system and the portion(s) of reality the system seeks to reflect, model, or represent, and that the one is not necessarily the other.

Hard and Soft Sciences

Within a hundred years, or so, of David Hilbert issuing his 24-part challenge in 1900/1902, most of his problems had been solved -- wholly in some cases and partially in others -- to the satisfaction of most mathematicians. Perhaps, within the next 100 years, or so, most of the currently unsolved mysteries on my 'the problem of origins' list (constants, life, consciousness, rational thought, language, creativity, dark matter, dark energy, matter/antimatter asymmetry, the Big Bang theory, inflation, the collapse of the wave function, Higgs boson, the graviton), but at the present time, this is not the case.

Aside from what I believe to be the intrinsic interest of the foregoing mysteries, there is a more fundamental reason for providing a brief overview of such topics and some of the concomitant questions permeating them. Whether, or not, some scientists wish to admit it, the empirical truth of the matter is that we know very little about the actual nature of the universe -- especially when it comes to the origins and place of human beings in that universe.

Many of the physics questions entailed by my 'the problem of origins' list could be settled in the near future or within the next hundred years, or so - - the length of time it took for most of Hilbert's purely mathematical list of challenges to be solved, wholly or partially. However, I am less inclined to

believe that physical sciences will be able to successfully solve -- partially or wholly -- any of the mysteries surrounding the problem of origins involving: life, consciousness, thought, logic, language, or creativity.

I will admit that the aforementioned disinclination to believe that any of the physical sciences are likely to come up with satisfying answers that are verifiable and capable of explaining the origins of say, consciousness, is largely a matter of faith, or lack thereof, with respect to the capacity of the physical sciences to be able to provide a purely physical account of, among other things, human existence. On the other hand, those scientists who believe that the physical sciences have a potential that, sooner or later, will crack the, allegedly, purely physical secrets surrounding the origins of consciousness, thought, creativity, and language are also operating out of a framework of faith.

Furthermore, nothing has been said -- at least directly -- in the foregoing pages with respect to the issues of: human potential, identity, morality, or spirituality. Are these rooted in purely physical processes? Or, are they rooted in something that transcends the physical, even as it permeates the physical? Are morality, spirituality, and identity merely arbitrary human constructions, or is there something that is ontologically present that can be discovered about identity, morality, and spirituality

and, if so, how might one go about this process of discovery?

Usually speaking, there is a distinction drawn between so-called 'hard sciences' and 'soft sciences'. According to this distinction, sciences like physics, chemistry, and biology are considered to be hard sciences because of their emphasis on experimental method, empirical rigor, and so on. In fact even within the 'hard sciences' there tends to be a pecking order of hardness, with physics considered to be the hardest of the hard sciences, followed by chemistry and biology.

The soft sciences are considered to be anything that does not manifest the priorities and methods of the hard sciences. Thus, and to take but one example, for much of its history, psychology has often been considered to be something of a 'soft science' because of its lack of rigorous methodology and, for ethical reasons, its inability to perform certain kinds of experiments.

The more physics, chemistry, and biology have been incorporated into the 'science' of psychology, the harder the discipline has been perceived to have become -- at least, in the view of some. Such hardness, however, has not necessarily translated into concrete results concerning the unraveling of any of the problem of origins issues concerning human beings that were touched on earlier.

One could argue that the hard-soft distinction needs to be altered somewhat. In other words, the so-called hard sciences of physics, chemistry and

biology are actually fairly soft in as much as they tend to tackle only the most tractable problems -- that is, ones that are likely to yield determinate solutions – and, as a result, have largely avoided all of the really difficult issues involving the origins of: consciousness, life, thought, logic, language, creativity, morality, spirituality, and human identity.

In fact, more often than not, when the so-called 'hard' scientists have scientifically engaged the latter sorts of problems, they usually fail to provide much of lasting merit.

Indeed, as impressive as the accomplishments of science have been over the last three hundred years, they are, in a sense, like the competitive diver who selects a dive of a relatively low order of technical difficulty (compared to the many mysteries of human existence) and swaggers about while being unable to perform -- or even attempt -- the dives of a much higher order of technical difficulty. Yet, the individuals of the lower-order of technical difficulty dives often laugh at, and ridicule, anyone who attempts the harder dives with less than stellar results. Moreover, oftentimes when someone does come up with a proposed solution for the more difficult dives, many of the practitioners of the less technically difficult dives claim foul because the techniques and standards of the less difficult dives have been abandoned, to varying degrees, in the dives with a harder, higher level of technical difficulty.

A Matter of Faith

Quite frequently, one of the lines of demarcation that is drawn between science and spirituality involves the idea of faith. For example, spirituality is supposedly rooted in a blind faith toward the theological themes inherent in some given species of faith, whereas science is allegedly rooted in purely empirical considerations that must be rigorously analyzed and, where possible, tested and confirmed.

While it might be true that all too many people do engage spirituality through fixed filters of an unchanging faith, this is not my understanding of the structure of faith. Sincere faith gives expression to a dynamic with many complex dimensions, including a willingness to make a rigorous analysis of empirical data and, where possible, to try to not only test and confirm the viability of some, given species of faith but, if possible, the character of the faith should be broadened, deepened and made richer than it was before any given instance of analysis, testing, and confirmation began.

If the available evidence warrants it, the character of one's faith should move in the direction of the evidence. On the other hand, arriving at a sound conclusion concerning whether, or not, in any given set of circumstances, the evidence does warrant such a transition in faith might be as contentious and problematic as what

has happened time and time again in scientific circles during the last four hundred years.

In any event, faith is not meant to be a static affair. Moreover, faith should not be governed by considerations for anything but seeking the truth of a matter.

Let me provide a few concrete examples to lend a bit of substance to the foregoing. Suppose I hire two individuals for some entry level position and, then, begin handing out assignments to them.

One of my supervisors monitors the work of the new employees. From time to time, the supervisor reports back to me on how they are doing.

Over time, it becomes clear that one of the new employees seems to be a more efficient and productive worker than the other new worker. As a result, my confidence in the better worker increases, and my feelings toward the apparently less able worker are shrouded in concerns and, perhaps, even a growing lack of trust.

The empirical data I am receiving from my supervisor is shaping my attitudes toward the two new workers. If additional information should come in from some other independent source that makes me question the reliability of the supervisor's reports concerning the two workers (e.g., I learn that the supervisor is dating the woman employee who is getting a favorable rating and that the supervisor is giving negative reviews

to the other new worker -- a male -- in order to curry favor with the woman employee), then I will have to investigate the matter further in order to try to determine what is actually going on.

For the sake of argument, let us assume that the supervisor's reports are accurate and unbiased. As more time goes by, I discover that the apparent better worker is calling in sick, while the worker who has been sliding down my favorable opinion scale and hovering dangerously close to getting fired is proving himself or herself to be a reliable worker in the sense that the individual always shows up for work and seems to be making a sincere effort to do the assigned jobs -- although perhaps not as well as I might have liked.

When the "better" worker doesn't show up, I am forced by circumstances to assign various tasks to the "poorer" worker. The individual seems to respond well and does a fairly good job.

As a result, my confidence in the "poorer" worker increases. I become more inclined to trust that person with more challenging assignments.

One could add any number of themes to the foregoing scenario to enhance the complexity of the situation. Substance abuse, single parenthood, family problems, money difficulties, career aspirations, chronic illness, relationships outside and on the job, issues of self-esteem, performance anxiety, and depression are just a few of the wrinkles one might consider that could affect a worker's performance over time and, in the

process, force me to reassess my feelings about, and attitudes toward, the two workers.

If I am to find out more about the off-job lives of the two individuals, this might affect my judgments concerning them. On the other hand, while learning more about their lives might alter my perspective concerning them, there might come a point when the company's welfare might require me to make a decision about which one of the two will be retained and that of the two will be laid off or fired.

The ups and downs of this decision process mark the fluctuations in my faith with respect to the two workers. The more information I have, then the sounder, hopefully, will be my judgments, but I am unlikely to ever have a perfect, complete data set concerning the two individuals.

Decisions often have to be made in the context of an array of uncertainties of one kind or another. Faith marks the ratio of what is understood about a situation relative to what remains unknown or not understood with respect to that same situation ... a ratio that moves me in one direction rather another.

Over time, the differential faith invested in the two workers, might prove to be justified or warranted in the light of new empirical data. Or, the faith one has in one individual or the other (or both) might turn out to be unjustified, and, as a result, one alters the character of one's feelings toward them.

The foregoing scenario concerning the structural character of faith tends to be manifested in nearly every aspect of life. Friends, marriages, family, government, businesses, creditors, career, teachers, students, health, the media, doctors, products, other countries, contractors, the justice system, and banks all contribute their share to stirring the cauldron of life and setting in motion the dynamics of faith.

The same is true in science. Scientists, of course, might be uncomfortable with the lexicon of faith and, as a result, prefer terms like: judgment, belief, opinion, confidence, reliability, likelihood, and probability, but a rose by any other name is still a rose.

Consider the state of science at the turn of the 20th Century. The problem of blackbody radiation was confounding classical theory.

Black bodies are entities that, theoretically, absorb all electromagnetic radiation that impinges on them and, in the process, radiate only heat -- which is, itself, a form of electromagnetic radiation. At different temperatures, the black body will change colors, becoming, in part, visible light through the color changes.

According to classical mechanics, when a black- body is in thermal equilibrium -- that is, a point is reached when the amount of electromagnetic energy being absorbed by a black-body is equal to the amount of electromagnetic radiation being released from the black-body -- the

black-body should be emitting radiation in the form of ultraviolet light, gamma rays, and x-rays depending on the frequency of the light being released. Moreover, according to classical mechanics, the calculated emissions should be approaching infinity.

Since the foregoing does not happen, there obviously was a problem with the way classical mechanics understood things. Max Planck sought to solve this problem and discovered that if he treated the emissions as being discrete units of a certain size rather than being continuous in nature, he could get the calculations to come out correctly -- that is, match what was observed under any given condition of emitted radiation and, thereby avoid the so-called ultraviolet catastrophe that was entailed by classical mechanics.

Planck had no idea what was going on ontologically. However, he had found a way to solve problems in a way that could be reconciled with observed, empirical data and, simultaneously, avoid some disturbing scientific and philosophical problems.

The crisis of faith in the reliability of classical mechanics as a means of understanding the physical world -- which had been given expression through the ultraviolet catastrophe -- had been given a reprieve of sorts. At the same time, Planck's solution raised a lot of questions.

As additional pieces of the puzzle began to emerge through -- to make a much longer story

very much shorter -- Einstein's photoelectric effect (which indicates that light, in the form of photons, seems to behave like a particle when it causes electrons to be knocked out of certain metallic and non-metallic materials), De Broglie's electron-wave notion, the Compton Effect (which suggests that the scattering of, say, X-rays and gamma-rays involves a particle-like phenomenon), Pauli's exclusion principle (which holds that no two identical fermions -- such as, say, electrons -- could occupy the same quantum state simultaneously), as well as the work of Heisenberg's S-matrix mechanics, Schrodinger's wave equation, and the Dirac equation, physicists were accumulating faith in the capacity of the new physics to rectify some problems inherent in classical mechanics.

The enhanced faith came as a result of the increasing capacity of quantum physics to solve a variety of theoretical problems in a way that could be empirically verified. Nonetheless, there remained a whole range of uncertainties surrounding quantum theory that were given expression through all the interpretations that were emerging in relation to so-called quantum-weirdness ... that is, and in the opinion of Richard Feynman, himself a partial architect of modern quantum dynamics, no one really knew what was going on in the quantum world even as more and more facets of that world could be exploited mathematically to generate workable solutions for all kinds of real-world physical problems.

For example, among other things, the Dirac equation that was introduced in 1928, predicted the existence of a particle that was like the electron in all respects except electric charge. Four years later, Carl Anderson experimentally discovered the positron – an 'electron' with a positive charge -- thereby lending additional credence to the viability of Dirac's theoretical equation.

During the 1950's and 1960's, a new crisis of faith began to arise among physicists. Despite the many strengths and breakthroughs of quantum physics, various kinds of accelerators were producing a plethora of particles that could not be made sense of within the theoretical framework of the quantum physics that existed during those decades. The collection of exotic entities was known as the 'Particle Zoo', and it exhibited an array of quantum properties that could be catalogued but that could not be derived from first principles of physics.

Were all these particles fundamental in some way? Or, were they a function of something more fundamental ... something not, yet, theorized and/or seen?

Eventually, and again oversimplifying the story considerably, people such as Steven Weinberg, Abdus Salam, Murray Gell-Mann, Franklin Yang, Robert Mills, Julian Schwinger, George Zweig (and many, many others) -- along with concepts like gauge fields [a mathematical treatment of fields that exhibits symmetry groups capable of

preserving basic laws of physics across the many transformations and transitions entailed by particle dynamics) and renormalization (a mathematical technique for ridding calculations of unwanted infinities)] -- joined together to create quantum electrodynamics (which describes the unification of weak nuclear forces and electromagnetic forces) and quantum chromodynamics (which entails the theory of how strong nuclear forces are generated through the exchange of gluons among different kinds of quarks, the fundamental components of, among other things, protons and neutrons) -- although the latter theory (that is, quantum chromodynamics) still has not yet been 'renormalized'.

Following the foregoing breakthroughs, a further crisis of faith arose. Can one -- and if so how -- unify the strong forces with the electro-weak forces, and, can one -- and if so how -- unify the general theory of gravity with the other three forces (strong, weak, and electromagnetic)?

In response to such questions, a variety of theories arose in an attempt to resolve the problems. Among these theories were various ideas concerning super-symmetry (which is really the search for the appropriate kind of symmetry mathematics that would be capable of linking elementary particles of integral spin units (e.g., bosons such as the photon, gluon, weak force particles Z and W) with other elementary particles with 1/2 spin (such as the electron, various forms

of neutrinos, and the muon) in a way that is capable of both reflecting experimental realities as well as solving real world problems in a consistent fashion). In addition, various kinds of string theory arose that took one-dimensional vibrating entities called 'strings' (rather than the hypothetical zero dimensionality of electrons and quarks in quantum theory) and sought to construct a mathematical model that would bring all the four forces together under one theoretical roof as well as be able to avoid the embarrassing infinities that haunted the so-called Standard Model of physics that had been cobbled together by the mid-to-late 1970s [several of the particles predicted by the Standard Model -- such as the bottom quark and top quark -- were not experimentally confirmed until later ... 1977 in the case of the bottom quark and 1995 in relation to the top quark.

There is not, as of yet, any experimental confirmation (of the smoking-gun variety) with respect to any framework of super-symmetry, string theory, grand unified theories, or various 'theories of everything'. Consequently, once again there is a crisis of faith of sorts.

Much of this current crisis is manifested as a discussion -- sometimes civilized and sometimes rancorous -- between those who have faith in the ability of string theory to lead scientists to the 'promised land' and those who have little or no faith that string theory will be able to deliver on its promises. Whose faith will be rewarded and whose

faith will be proven to be misplaced is an open question ... but either way one cannot ignore the qualities of faith that are present on all sides.

One of the primary points of the foregoing very abbreviated overview of twentieth century quantum physics is to indicate how -- like the earlier employee hiring example -- physicists went through many ups and downs in their level of confidence concerning the ability of quantum physics to provide a workable path through the many mysteries and uncertainties that arose when theory clashed with empirical data. There were many crises of faith that occurred across the unfolding of events.

Some ideas, concepts, models, theories, and mathematical treatments eventually came to justify the faith that had been invested in them. Other ideas, concepts, models, theories and treatments did not fare so well and people lost faith in them as their shortcomings and problems were revealed in the harsh light of reality.

Believing in something on the basis of a variety of empirical and theoretical considerations but maintained in the face of: uncertainty, unanswered questions, and possibly contradictory data is an expression of faith. Sometimes this faith is warranted, and sometimes it is not.

The only thing one can do is to continue to move in the direction that the changing landscape of faith seems to indicate might assist one to discover an oasis in the epistemological desert.

Sometimes, this sense of direction might be referred to as intuition, induction, extrapolation, interpolation, inference, implication, scientific judgment, or confidence, but in reality it is a species of faith that seeks to plausibly transport one from the problematic confines of the present into the expanded (hopefully) hermeneutical horizons of the future.

As pointed out earlier, there are an array of uncertainties, unanswered questions, and problems that populate the world of science. Against this backdrop of unknowns, there are many successful algorithms that have been found through which one might successfully journey amongst the ontological mysteries.

In time, some of the mysteries being alluded to might be de-mystified, even as others continue to cast shadows and create difficulties in trying to navigate a viable path. In between the darkness and the light resides the character of one's faith in how best to proceed.

Will science be able to solve the outstanding problems? Will science come up short in certain respects? How long should a person wait for possible solutions? Culturally, it might make sense to take the long-term view and keep plugging away through the scientific method despite whatever problems might arise in the interim period. Individually, such a strategy might not always make sense because the exigencies of life often require decisions to be made

in the present despite on-going uncertainties. Indeed, the faith of the average person is often more complicated and problematic than is the faith of a scientist since the former group of people do not always have the luxury of waiting for fully formulated scientific positions to mature in order to better inform their choices.

Does the 'faith' of a scientist in the rigorous methodology and discipline of science have a counterpart in the 'faith' of those who are committed to spirituality? I believe the answer is yes, but one will not be able to find this counterpart amidst the caverns of theology.

The Nature of Science

In order to better understand what I have in mind here, a brief excursion should be taken into the nature of the scientific method. I'm getting a little bit ahead of myself but many people might be surprised to discover that most of the fundamental themes of the scientific method that are applied to the physical world are also present in spirituality -- especially its mystical dimensions ... although there are some important caveats that need to be stated in this regard that I'll address a little bit later on.

I believe there are six or seven features that constitute the essence, so to speak, of science. These features are: (1) the interrogative imperative (the persistent asking of questions in the search for truth and/or solutions to problems); (2) empirical observation; (3) the use of instrumentation to enhance and complement the five basic senses of human beings (i.e., seeing, hearing, touch, smell, and taste); (4) objectivity (the elimination of as many sources of bias and error as is possible methodologically; (5) recursive procedures (the generation of results that are fed back into the scientific process for further treatment and analysis); (6) replication (the ability to reproduce significant results through independent means; (7) the organization and analysis of results from the first six steps (which would include mathematical treatments, logical assessments of consistency, and critical reflection); (8) an on-going, rigorous,

conceptual exploration of all of the above by a community of individuals who are considered to be knowledgeable about such matters (which could be done via journals, symposia, lectures/talks, conventions, papers, books, e-mail lists, and/or informal discussions).

Some might want to insist that a 'facility for making accurate predictions concerning various issues' should be added to the foregoing set of features -- in other words, according to such individuals, real science means being able to have a theory that can predict, with some degree of precision, things that have not yet been observed but that come to be empirically verified at a later time. However, not all science necessarily entails such a dimension of predictability, or does so only within very narrow parameters

Examples of the foregoing contention concerning the issue of predictability can be found in most, if not all, of the biological sciences, as well as in many facets of astrophysics and cosmology. Yet, one would be reluctant to say that such disciplines do not constitute sciences.

Furthermore, even in physics -- the frequent poster child for issues of prediction -- while there have been some very dramatic experimental verifications of prior theory (for instance, the discovery of the positron predicted by Dirac, or the discovery of the W and Z bosons predicted in conjunction with the weak force, or the different varieties of quark predicted in relation to the

quantum chromodynamics) much physics takes place in a variety of interstitial nooks that inhabit the scientific countryside beyond (or between) specific predictions and confirmations. This aspect of things is, perhaps, best summed up by I.I. Rabi's comment of "Who ordered that?" with respect to the appearance of the muon -- something that had been empirically uncovered but that no one had been anticipating.

A great deal of science arises as a result of trying to make sense of: real-world phenomena, or empirical results, or trying to solve different kinds of problems. Theory might follow from such attempts and, then, lead the way to certain kinds of predictions, but there frequently is considerable conceptual conflagration prior to this point, and, as well, there often are a great many theoretical adjustments that are made even after experimental results have confirmed some specific prediction of a given theory.

Aside from the issue of prediction, some individuals also might wish to contend that the experimental model is a sin qua non of science. However, I feel that the idea of experimental research is inherent in, and derivable from, a number of the principles that have been stated earlier, while, simultaneously, the same list of principles is sufficiently flexible to accommodate a variety of naturalistic, participant observer research, case studies, survey methods, non-intrusive, cross-cultural, and comparative models

that fall outside the strict confines of the experimental method and, yet, are scientific in character.

In any event, I believe the entire set of eight previously noted mainstays that collectively give expression to the scientific method also constitute fundamental elements in any form of authentic mysticism. Unfortunately, there also are many counterfeit versions of mysticism that help to muddy the epistemological waters ... just as there is something called 'junk' science that masquerades as real science but is not, and, yet, it shows up in a variety of research venues -- from: various forms of pharmaceutical research, to: various aspects of medicine, engineering, environmental research, and the chemical industry.

Many people might be of the opinion that mysticism is as far removed from science as one can get. However, as a person who has pursued the Sufi mystical path for nearly 40 years, I know that such opinions are not well founded.

The following eight numbered and labeled sections correspond to the previously noted set of eight features of the scientific method. Due to space considerations, the discussion that is advanced in the following eight sections will be a relatively abbreviated one. Nevertheless, I feel enough will be said to provide the reader with some perspective concerning the idea that inherent in authentic mysticism are the eight elements of the scientific method.

(1) The Interrogative Imperative -- A faith that is not willing to question itself, is not a sincere faith. One of the motivations driving human existence should be a willingness to seek out the truth in any matter -- including spirituality -- and if one's faith will not help one do this, then that form of faith needs to be re-constructed to better reflect the truth.

On the other hand, the foregoing admission does not mean one needs to become a perpetual skeptic. A skepticism that is not willing to question itself is not a sincere form of skepticism since as a methodological tool, skepticism should be directed toward struggling toward uncovering the truth of a matter rather than being mired in a philosophy of skepticism that tries to claim that nothing is worthy of being called the truth ... except, of course, skepticism.

Only through a constant exercise of the interrogative imperative can one learn how to ask the right kind of questions ... that is, questions that have heuristic value with respect to a productive and constructive probing of experience. All authentic mysticisms are geared toward assisting the individual to ask pertinent questions concerning: the structural character of human existence; the nature of reality; one's relationship with reality; the methodological means for engaging different facets of reality; the value system, if any, which should guide the asking of

questions in relation to the pursuit of truth, and so on.

(2) Empirical Observation -- In addition, all authentic mystical traditions emphasize the importance of empirical observation. Pay attention to what is going on within one and without -- not just in a physical sense, but in an emotional and behavioral sense as well. Try to observe and identify the forces that are acting on one and that are seeking to influence thinking, feeling, believing, judging and behaving.

Thoughts, beliefs, behaviors, dreams, emotional states, intuitions, motivations, intentions, and an array of other experiences are all grist for the empirical mill. Try to trace the elements of these phenomenological conditions back to their origins. Attempt to make sense of what it all means through the asking of pertinent questions.

Ultimately, the understanding one develops must correspond with, or be congruent with, what has been observed. If such an understanding does not reflect experience or what has been observed, then understanding stands in need of some adjustment -- either partially or entirely.

(3) Use of Instrumentation -- In physical sciences, instruments come in many forms and permit one to observe that which might be invisible to our normal modes of engaging experience -- namely seeing, hearing, smell, taste and touch. For example, there is an array of instruments that are

capable of registering data beyond the limits of visible light and, in the process provide information about such things as: cosmic rays, gamma rays, X-rays, infrared rays, radio waves and microwaves.

In mysticism, instrumentation of different kinds is manifested through internal capacities such as: the: mind, heart, sirr (mystery), kafi (hidden), spirit, and aqfah (more hidden). All of these faculties are potential ways of transcending and complementing the data gained the limited capacities of our five basic senses (seven if one includes proprioceptive and interoceptive senses – various kinds of senses of orientation (e.g., spatial) and stimuli (e.g., having to do with internal functioning) that arise within an individual).

If a person has little experience with, or understanding of, linear accelerators, functional magnetic resonance imaging, spectroscopes, or electron microscopes, it would be foolish for that person to claim that such instruments have nothing of value to say about human beings or the physical universe. Similarly, if an individual has little experience with, or understanding of the instrumentation of, say, the heart (which extends beyond the biological organ in our chest cavity) or the spirit, then such a person would be equally foolish to try to claim that such instruments have nothing of value to contribute to helping one struggle toward an understanding of either human beings or those dimensions of the universe that might not be physical in nature.

Obviously, we tend to be suspicious of that with which we might not be familiar. Consequently, many people are likely to be skeptical concerning the ability of unknown methods or instrumentation to be able to produce credible results.

On the other hand, an individual who never gets his or her feet wet with respect to hands on experience in relation to operating some given form of instrumentation is really in no position to make informed judgments about the range, quality, or value of the data generated through the use of such instrumentation. Critical comments arising out of uninformed speculations are relatively worthless.

Like physical instruments, spiritual instruments need to be kept in proper working order and, among other things this requires one to work through some form of appropriate calibration process. In other words, one needs to be able to establish reliable base readings against which subsequent findings can be assessed as being credible indices for whatever phenomena are being considered.

In the Sufi mystical tradition, a person's mind, heart, sirr, kafi, spirit, and aqfah are all internal instruments that have a structural character that operate in characteristic ways. They each have forms of calibration that are appropriate to such instruments ... just as fMRIs and EEGs have modes of calibration that are unique to those instruments.

To give just one example, the calibrating process for the internal faculty referred to as the sirr (mystery) is known as maraqabah. During this process, the individual seeks to empty out anything other than the remembrance of God, and when the sirr is operating properly in this respect, it is said to have been calibrated in a way that guards against influences that could contaminate those spiritual manifestations or tajalli that might be displayed in the heart.

Furthermore, just as a telescope -- or any physical instrument -- has a set of parameters within which it will generate the most useful results and beyond which it will not produce useful results, so too, spiritual instruments all have their characteristic ways of engaging reality and issuing useful results. The way in which the mind experiences and understands existence is not the way in which the heart experiences or understands things. Moreover, the way in which the heart understands and experiences life is not the way in which the sirr, kafi, spirit, or aqfah understand and experience life ... and so on.

However, the understandings that arise through the different faculties are not in opposition to one another. Rather, like the various forms of understanding that arise in conjunction with different instruments that probe the phenomenon of light, the internal spiritual faculties tend to complement one another and assist the individual

to develop a fuller understanding of spiritual realities.

(4) Objectivity -- Every form of authentic mysticism places great stress on the need for objectivity during the exploratory probing of life's experiences. This is why a methodology of purification is intrinsic to all authentic mysticisms.

Fasting, seclusion, service to others, meditation, contemplation, night vigils, as well as struggling against the appetites or inclinations of the ego and the body are all part of the purification process. Until one gains control over the forces that might be biasing and undermining one's judgments, arriving at a judicious assessment of life events might be difficult, and, as a result, one's search for truth is likely to be impeded.

Until the struggle toward truth becomes the sole focus of a person's efforts, then one begins at no beginning and one works toward no end. This is as true in mysticism as it is true in the physical sciences.

The ego -- or nafs in Sufi terminology -- is a constant source of error, distortion, delusion, corruption and fantasy in relation to our attempts to understand the nature of experience and its possible significance. When properly trained, the ego/nafs can become an ally in the search for truth, but even in the physical sciences, an undisciplined mind that is governed by the weaknesses of the ego is more likely, than not, to adversely affect the

process of science ... both in relation to oneself, as well as in conjunction with others.

Furthermore, all instruments (whether physical or spiritual) need to be kept as clean and as free of contaminants as possible. So, in addition to the process of calibrating instruments, one must keep them in spotless working order ... and just as there are procedures for maintaining cleanliness and order in a physical laboratory, the same is true with respect to our internal, spiritual laboratory.

(5) Recursive Procedures -- Modern science uses a set of recursive feedback loops to continually replenish the supply of empirical data through which we need to sift for valuable clues concerning the possible nature of reality, truth, or the solution to a problem. In addition, these recursive feedback loops include a sort of value-added component that is constantly seeking to improve the fit between the structural character of one‘s understanding and the structural character of some aspect of experience that one is trying to probe.

So, too, mysticism engages in recursive practices (e.g., fasting, prayer, chanting, and seclusion) that are designed to help refine one’s understanding of oneself and one’s relation with Being. Such recursive practices not only generate new experiences, but they provide one with an opportunity to process such experiences in a manner that allows the practices to be altered in a constructive fashion that enriches, broadens and

deepens those practices through an enhanced understanding of the search for truth concerning a variety of matters.

Like authentic physical sciences (i.e., non-junk science), authentic forms of mysticism are a cumulative process that needs to be altered to keep abreast of changing data, circumstances, problems, and understandings. Like physical sciences, mysticism is not a static process but a progressive endeavor that is in constant transition as one works toward increasingly viable and credible results against a backdrop of varied experiences (data).

(6) Replication -- If only Noble laureates could produce certain kinds of results, then science would have limited value. However, once something has been done or proposed in science, then others are in a position to try to reproduce the same results through venues that are independent of the former sorts of individuals. The ability to replicate the results of some given line of scientific research is a key element in the scientific process.

Similarly, mysticism would be of little value to the generality of humanity if it were restricted to, say, only the Prophets and saints. The appeal of mysticism, like the appeal of science, is that anyone who follows the prescribed directions might be led to certain kinds of results ... in other words, results can be replicated.

More specifically, suppose a person is informed that if one does things in a certain way, then one

will observe certain phenomena. If one follows such directions but does not experience what is indicated, then one likely will question the integrity either of what one did, or what the other person did, or what both have done. If, on the other hand, one does observe what is indicated when one follows certain procedures, then one's confidence or faith is enhanced to some degree with respect to the whole process.

Will those who seek to replicate the prescriptions of the Prophets and saints necessarily get exactly the same out-come as did their more illustrious counterparts? Probably not, but this is also true in the physical sciences.

Replication does not mean that the results sought will be precisely the same on each occasion. Rather, there are acceptable degrees of variation within which a given result will have been said to have been replicated and outside of which one might be inclined to say that a given attempt at replication has not occurred, and if this is the case, then, one must go in search of trying to determine what, if anything, went wrong during one's attempt to replicate results.

Oftentimes, as is true of so-called single-blind experiments, a mystical seeker will not be told what to expect in the way of specific experiences. Expectations can introduce considerable contaminants to the mystical path just as such expectations can contaminate results in relation to research in, say, psychology and medicine.

However, since throughout the mystical journey, a primary focus is on becoming purified or objective in one's pursuit of the truth, then one of the results that could follow from sincerely following the methodological prescriptions of an authentic spiritual guide should be in the form of an improved character. Indeed, a strengthening of character is one of the most important forms of replication within the mystical path, since in many ways, further progress cannot be made until a person's character becomes more developed and stable.

Among other things this means that enhanced: humility, patience, gratitude, honesty, sincerity, nobility, courage, equanimity, love, tolerance, compassion, and forgiveness are all elements that can, and need to be, replicated. On the other hand, a decrease in: arrogance, impatience, ingratitude, dishonesty, insincerity, ignobility, cowardice, injustice, hatred, intolerance, indifference, and resentment would also be consistent with the structural character of replicating spiritual results.

Furthermore, just as it is the case in the physical sciences that being able to properly set up an experiment can take many years of: calibrating and recalibrating instruments, hunting down sources of experimental error, eliminating unwanted influences, and changing the laboratory set-up to produce more definitive sorts of results that can be measured in increasingly reliable ways, the same is also true of authentic mysticism.

Therefore, one should not be surprised to discover that it could take many years of making adjustments in relation to some given mystical methodological process before one is likely to be in a position to replicate certain kinds of results ... and, unfortunately, this possibility also encompasses a set of issues that renders someone potentially vulnerable to spiritual charlatans since a spiritual seeker might be told by a false teacher that the reason certain results are not occurring is because of that seeker's need to continue working on refining the experimental process rather than being told that the false teacher is a junk-scientist of the mystical way and, consequently, no credible results are ever likely to arise in conjunction with such a charlatan.

Like particle physicists, authentic mystical guides do speak about different forms of tajalli or manifestation that are displayed in the bubble chambers of the heart, soul, and spirit when fundamental forces are brought together under certain circumstances. In the case of particle physicists, these circumstances involve accelerators of one kind or another that bring various particles together in a way that permits one to observe, among other things, elemental forces at work. In the case of mystics, the circumstances are the practices of seclusion, zikr (remembrance), contemplation, prayer, and meditation in which the elements of the soul are brought together in a way that permit's the individual to observe, among other things, elemental forces at work.

Just as it took physicists the better part of seventy years to sort out the 'particle zoo' of modern science and develop an understanding concerning the nature of the physics that governed the 'particle zoo', so it takes a human being the better part of seventy years -- if she or he is fortunate -- to sort out the 'zoo' of: states (hal), stations (maqam), flashes of intuition (ilham), unveilings (kashf), and experiences that happen in the collection chambers of the 'mystical accelerators' inherent in the: mind, heart, sirr, kafi, spirit, and aqfah of a human being.

(7) Organizing and Analyzing Results and (8) The Community of Knowers -- Like the physical sciences, authentic mystical traditions also engage in an on- going process of organizing and analyzing the empirical data generated by following a spiritual methodology. Moreover, this process of critical reflection is done not in isolation but in conjunction with elders of the methodological way who are considered to be knowledgeable in the ways of mystical science ... elders who can assist one to fine tune the methodological process ... elders who can help one find solutions to problems that have risen during the course of pursuing the methodology ... elders who can lend a considered and tempered presence with respect to interpreting the nature of the states, stations, and experiential conditions that have arisen along the path ... elders who have no interest in controlling another human being but only constructively

support and help enhance another individual's search for the truth.

Furthermore, just as physical scientists often go through an apprenticeship process, first as a graduate student, and then in various post-doctoral appointments in different research programs, so too, the mystical novitiate goes through an apprenticeship process in a research program with this or that mystical elder. Eventually in both cases, the individual is deemed ready to pursue the way of methodology as a full-fledged individual researcher who is always free to consult with other elders in the community.

Although the foregoing comparisons between the scientific method and the methods of mysticism have been brief, I believe enough has been said to lend credence to my previous contention that there are direct parallels between, on the one hand, authentic scientists (as opposed to 'junk' scientists) who have faith in their discipline to generate constructive, useful, reliable and demonstrable results and, on the other hand, authentic mystics (as opposed to spiritual charlatans) who have faith in their discipline to generate constructive, useful, reliable and demonstrable results. In both cases, faith plays a dynamic, rather than a static, role in helping explorers from the respective disciplines to

push the envelope with respect to the search for truth and solutions to problems.

Naturally, a proponent of physical sciences might be a little reluctant to ascribe much credibility to the mystical methodology. However, if this is the case, then one might suggest something to such a person that is quite consistent with the methodology of physical sciences: namely, only if one pursues the relevant mystical methodology in a persistent, rigorous, and sincere fashion with the assistance of an authentic teacher, will one have an opportunity to come to understand the nature of what is being discussed by the mystics.

Shari'ah: Confusions and Realities

One of the most misunderstood terms in Islam is 'shari'ah'. Surprisingly, this misunderstanding is as prevalent among many Muslims as it is among non- Muslims -- and in fact, Muslims have no one to blame but themselves for the perpetuation of such misunderstanding within and without the Muslim community.

One phrase that usually is used to translate the word 'shari'ah' is 'Islamic law'. Islamic law, in turn, is construed in terms of some form of legal system that many fundamentalists (and even less fundamentalist-inclined individuals) believe (quite erroneously) must be imposed on other people -- whether Muslim or non-Muslim. Two other phrases that are frequently used to translate the idea of 'shari'ah' are: 'God's Law' or 'Divine Law', but, once again, the intention underlying such usages is often to claim that the word "law" in all these cases is a function of some sort of legal system.

The word 'shari'ah' does appear in the Qur'an. In Surah 45, verse 18, one finds:

"O Prophet (Muhammad)! We have put you on the right way (shari'ah) concerning spirituality, so follow it. ..."

However out of more than 6,000 verses in the Qur'an, the indicated term 'shari'ah' occurs just

once -- not as a legal term, but as a term that alludes to a path or way or method.

More specifically, in Arabic the literal meaning of 'shari'ah' is a place where animals gather to drink water. There also is a related verb form that refers to the drinking of water at such a place of gathering. By implication, the issue of shari'ah entails the path or way that leads to a watering area or place to drink.

In both instances, the idea of 'shari'ah exists in the context of: a path and/or place through which one might access water. Just as H_2O is necessary for physical life, spiritual water is necessary for the sustenance of the soul, and it is to this kind of water that the 'right way' in the Quranic verse is alluding ... spiritual water that flows through the Qur'an as a whole, not just part of it ... spiritual water that includes guidance that flowed through Jesus and Moses (peace be upon them), among other spiritual luminaries, as well.

A further word that is tied to the same underlying root from which 'shari'ah is derived refers to someone who is a lawgiver or one who determines the law. From an Islamic perspective, God is the One Who establishes the laws of the universe -- both physical and spiritual -- but this is not necessarily a matter of putting forth a legal system ... although many Muslims appear to believe this is so.

The idea of "law" can be construed in at least two senses. One sense involves the natural laws of

the universe, and the other sense involves systems of law (whether cultural, social, institutional, or legal in character) that are generated by human beings.

Among other things, the 'right way' to which the foregoing verse of the Qur'an alludes encompasses: patience, compassion, gratitude, humility, honesty, sincerity, steadfastness, courage, nobility, love, charitableness, remembrance, tolerance, friendship, piety, and forgiveness. Yet, although such qualities might be of great value in any given legal system, they are not primarily legal terms even as they do give expression to laws of the Universe that govern the proper behavior of human beings.

Principles of character are not, for the most part, legally enforceable. Although human beings do, for example, construct laws governing certain aspects of lying -- or failing to be honest -- in relation to such issues as perjury or misleading police officers, by and large, nonetheless, there are few, if any, legal laws governing the practice of lying to one another throughout an average day ... and, yet, such lies often tend to be far more destructive than are instances of perjury -- if for no other reason than that they are more prevalent and pervasive than are purely legal issues of perjury.

There is no necessary inconsistency between having a legal system in which the public space is regulated, even as human beings are cruel and uncivilized in relation to one another within that

society. Consequently, people who believe that legality is the royal way to spirituality have a steep slope to navigate if they want to prove that the laws that govern the universe are primarily functions of legalities rather than, qualities of, among other things, developing spiritual character or realizing the potential of such internal faculties as the heart, spirit and so on.

Nowhere does the Qur'an refer to itself as a legal book. On the other hand, the Qur'an does set forth many criteria for differentiating between the true and the false. In addition, the Qur'an explores many examples of good and bad character. Moreover, the Qur'an does encourage the development of spiritual qualities such as piety, while simultaneously warning about the consequences of pursuing a life rooted in qualities that are directed exclusively through the filters of ego/nafs and the world (dunya – that is, the problematic product generated through the entanglement of the collective set of egos that make up the population of a given society).

Just as there are laws of physics, chemistry, and biology that govern the way in which the physical dimensions of the universe are manifested, so too, Sufis believe there are laws that govern the way in which the spiritual dimensions of the universe are manifested. Moreover, just as there are consequences for ignoring the laws of physics, chemistry, or biology, there also are

consequences for ignoring the laws governing spirituality.

However, in neither case are the laws at issue, legal injunctions. Rather, one is being informed about the ways of the universe.

We have free will to make whatever choices we like in conjunction with the ways of the universe -- both physical and spiritual. Nonetheless, choices that do not take the nature of the universe into account do so at the peril of the individual who is making such choices.

Much to the likely chagrin of many Muslims and non-Muslims, I would like to advance the idea that shari'ah -- at least, in the sense in which I believe the word is actually used in the Qur'an as opposed to the sense of legalisms that have been imposed on it -- is really co-extensive with the eight principles of scientific method that have been outlined previously. I also feel that the foregoing way of treating the term 'shari'ah' is more reflective of the fact that roughly 89% of the Qur'an explores the possibilities and problems of spirituality in general, while only 11% of the Qur'an addresses specific formulae for addressing issues such as: marriage, divorce, inheritance, and dietary restrictions.

Furthermore, while issues such as adultery, theft, and murder are touched upon in the Qur'an, there is nothing in the Qur'an which indicates that one is forbidden to take the 89% of the Qur'an that gives expression to general spirituality and bring it

to bear on how one proceeds with many of the specific issues that fall within the aforementioned 11% category. More importantly, there is nothing in the Qur'an that indicates that this latter 11% should be imposed on others.

The Prophet did not encourage people to report their misdeeds to him. Indeed, he tended to discourage them from doing so and, instead, encouraged them to seek God's forgiveness. In addition, there is absolutely no evidence to indicate that if the Prophet were physically alive today he would necessarily handle specific instances involving breeches of public morality in precisely the same way in which he did more than 1400 years ago.

The 'right way', or shari'ah, is the path that an individual needs to pursue in order to be able to struggle to realize truth in one's life. Shari'ah is an individual pursuit of the truth that needs to be encouraged and supported, not a legal system that needs to be oppressively imposed on the collective.

In fact, I can think of nothing that has been more injurious to the process of seeking spiritual truths than has been the inclination of all too many Muslim leaders and theologians to treat shari'ah as a collective legal issue rather than as a methodological process capable of assisting individuals to learn about, and come to understand, the ways of the universe across all dimensions of Being. Individuals are more likely to be enthusiastic toward, and committed to, an activity -

- in this case spirituality -- if they are shown how they can take command of a situation in their own way and at their own pace and in accordance with their own capabilities, rather than being force-fed a theology of oppressiveness.

True spirituality comes from within, not from without. True science comes from within, not from without.

Consequently, I believe it is a fundamental mistake to try to legalize spirituality. I do not believe this is the intention of the Qur'an -- indeed, I feel that the clear intention of the Qur'an, taken as a whole, is to encourage people to struggle toward understanding the 'right way', or 'shari'ah', as a rigorous process of establishing a methodology that would enable the individual to gradually come to be able to distinguish the true from the false in a wide variety of issues involving: the self, people, history, society, the world, forces of nature, the universe, choice, character, and spiritual possibilities.

The inclination of many Muslims to try to legalize spirituality has led to disastrous results. One can see evidence concerning this mistaken approach to the idea of 'shari'ah' virtually everywhere in the Muslim world in the form of: corruption, endless sectarian strife, misogyny, arrogance, so-called honor killings, hypocrisy, infibulation (female genital mutilation), intolerance, and frequently oppressive, sterile

systems of education, justice, scientific research, and governance.

Whatever the role of Western powers might have been in the colonial and imperialistic exploitation of, and injustices toward, the Muslim world -- and that role has been considerable -- all too many Muslim theologians, mullahs, muftis, imams, educators, jurists, and leaders have, across the centuries, greased the skids of cultural collapse by seeking to induce Muslim people to pursue an incorrect understanding of the process of 'shari'ah that has, for the most part, led Muslims away from reality rather than toward the truth of things. If Muslims had been encouraged to pursue 'shari'ah in the sense that is being outlined in this article/essay (and I do not take credit for this idea since it has been inherent in Sufi teachings for more than 1400 years) -- that is, as a rigorous form of critically reflective inquiry that is, among other things, capable of eliminating bias and error through the mutual collaboration of sincere seekers -- I believe the Muslim world would have been a lot better off.

However, such has not been the case. Things are the way they are because all too many Muslims have continued to make the wrong kinds of choices in relation to their understanding of the idea of shari'ah and because God has permitted Muslims to persist making such problematic choices ... indeed, as the Qur'an indicates, God will not change the condition of a people until first they change their

own condition -- something that has not yet happened in the Muslim world as far as the issue of shari'ah is concerned. (Those who wish to read more on the foregoing topic might enjoy: *Shari'ah: A Muslim's Declaration of Independence*).

The Notion of Symmetry

The idea of a mathematical group is considered to be at the heart of the notion of symmetry, one of the most important ideas of modern physics. A group consists of a set of components or elements that satisfy certain conditions.

For example, for any operation or law of composition involving two members of the aforementioned set of elements, then the product of that composition must also be a member of the set of elements if that set is to constitute a 'group'. In other words, the property of closure must be present if the set of elements is to be considered a group.

Every group is also characterized by the presence of a unique identity element. For instance, I (the identity element) times 'X' (some element in the group) equals X times I equals X.

A third property of a group revolves around the idea of an inverse element. In other words, in every group there is a unique inverse element for each member of a set such that X (an element of the group) times X^{-1} (the inverse element) will yield 1, and it is permissible that X and X^{-1} could be identical to one another.

The final condition that a set must exhibit in order to be considered a group requires that the operation of multiplication within the set of

elements must be associative in character. That is, X x (Y x Z) is equal to (X x Y) x Z.

Usually, the elements of a group involve numbers or geometric forms. For example, Evariste Galois introduced the idea of groups as a way of engaging various problems in the theory of equations and deciding whether, or not, a given equation could be solved through certain methods.

He maintained that if one examined all of the permutations of a set of elements that retained the algebraic relations among the roots or solutions for a given equation -- that is, if one examined the symmetry for the group being considered -- one could discover whether or not the requisite sort of internal structure was present in such a symmetry through which one would be able to solve the equation in question through a particular path ... such as, say, by radicals.

However, the idea of symmetry actually is capable of encompassing any set of elements whether algebraic, geometric, or something non-mathematical in character. In fact, the essence of symmetry can be reduced down to three features.

First, the elements of any set have certain structural features. This structure gives expression to the character of the set members.

Thus, if one is talking about the structure of Euclidean triangles, then features such as: having three sides, being closed, the sides must be straight, and the interior angles must total 180°, are all part

of the structure of the elements of such a set. If one is considering non-Euclidean triangles or topological structures or some other kind of mathematical structure, then other structural features come into play through which one identifies exemplars or elements of the set being considered.

A second essential feature of symmetry revolves around the concept or notion of transformations. Transformations allude to the operations that are permissible to be performed in relation to the features that give expression to the structural character of the members of a given set.

A third and final factor is the most critical of the three general facets of symmetry. This aspect of symmetry requires that the structural character of the set of elements be preserved across whatever transformation operations are performed with respect to, or that might occur in conjunction with, the members of such a set.

Although the foregoing outline is fairly abbreviated, I feel enough has been said to lay the basis for a conjecture. More specifically, I maintain that science -- when properly pursued -- constitutes a symmetry in which the relation among the structural features of experienced reality are preserved across the transformations (the eight principles of science noted earlier) that are performed on the elements (components of the physical universe) that constitute the members of the symmetry set.

A second, related conjecture follows from the earlier discussion in which I drew parallels between authentic physical science (i.e., non-junk science) and authentic mystical methodology (i.e., not involving counterfeit mysticism led by fraudulent guides). More specifically, I believe that shari'ah -- when construed in terms of a rigorous, reflective, inquisitive, methodological process of experiential feed-back loops that generate results that can be replicated and critically explored by a group of knowledgeable elders -- also constitutes symmetry in the foregoing sense.

In other words, the spiritual nature of the universe gives expression to certain structural features that can be engaged through the eight principles or steps of operational or transformational methodology outlined earlier. If the methodology one uses is capable of preserving the relationships among the structural features of the spiritual universe through which viable roots or solutions to life problems are to be derived, then the methodology gives expression to the principle of symmetry.

The internal structural of the spiritual symmetry (in my case, shari'ah) must be capable of accurately reflecting the structural features of experienced reality and the structural features of the actual nature of spiritual reality (assuming, of course, that it exists) in order for it to be properly said that symmetry is present. This, of course, raises the problem of whether what one takes to be

a spiritual symmetry is genuine, illusory, or delusional.

Not every hypothesis, theory, or conjecture in physical research leads to success. The methodology of science serves as a mediator of sorts among alternative possibilities and assists researchers to differentiate the wheat from the chaff, but the ultimate arbiter of truth is reality itself.

Similarly, not every understanding in the mystical journey necessarily leads to success. Spiritual methodology -- e.g., shari'ah -- serves as a mediator among alternative descriptions and explanations of what is taking place and, as such, helps an individual to differentiate between, say, genuine spiritual experiences and illusory ones. However, once again, the ultimate arbiter of truth in such matters is reality itself.

The task of a Sufi -- as it is the task of a scientist exploring the physical world -- is to go in search of symmetry. This begins with methodology ... that is, one must have access to a methodological process that is capable of preserving the structural character of the relations among the different facets of reality one is investigating.

As a Sufi, I have been in search of symmetry in the foregoing sense for much of my adult life. Each internal faculty -- mind, heart, sirr, kafi, spirit, and aqfah -- gives expression to its own modality of symmetry relations, and the challenge for a Sufi is to seek out such symmetries through the symmetry

of a rigorous methodology (which again, for me, is shari'ah) and, God willing, witness an array of truths (tajalli, manifestations) concerning the nature of the spiritual universe that might be disclosed to such modalities of understanding according to one's capacity or potential.

Physicists have been singing the praises of symmetry for ninety-odd years. Furthermore, they have been searching for the right sort of symmetries throughout that period of time -- symmetries that would permit them to give expression to, and preserve, physical principles in an elegant manner.

Not all symmetries necessarily reflect the structural character of fundamental dimensions of the physical world. However, when such symmetries are found, they have an inherent beauty and provide rich, deep insights into the way of the world -- at least those parts of the world that can be given expression through those symmetries.

I believe that one of the reasons why science constitutes such a compelling method through which to engage the unknown is precisely because when it is properly pursued it exhibits symmetry. I also believe that one of the reasons why spirituality (and not theology) constitutes such a compelling method through which to engage the unknown is precisely because when it is properly pursued it exhibits symmetry.

I have faith in both of these methodological frameworks. They both are invitations to engage in

a rigorous methodology of inherent beauty through which each, in its own way, is capable of preserving essential truths concerning the nature of Being.

Epilog

The foregoing synopsis of issues involving science, spirituality, symmetry, and life events camouflages a great many twists and turns that tend to arise in the details of things but are lost within a necessarily abbreviated overview such as the present work. Those details are both quite amazing and fraught with many difficulties, but there is one rather intriguing dimension to such lived experience.

More specifically, as indicated early on in this book, or extended essay, one of the primary reasons for my deciding not to pursue a career in science -- despite a deep love for the many interesting facets of science -- was because I didn't like the experimental side of things. It was too tedious; it was too exacting; it was too messy; it was too complicated; it was too open to error and problems; it took too long to set up, analyze, and confirm.

Oddly enough, for the last 40, or more, years of my life, I have been engaged in nothing else but experimental, empirical work. Life has been my laboratory, and I have been the focus of my studies.

Previously, when I was in high school, the idea of spending days, weeks, months, or even a few years in a lab trying to grab hold of this or that small piece of truth felt overwhelming and was not at all appealing to my impatient nature. However,

the experiments that have been run in my life lab have taken decades for me to set up and run -- involving many problems, errors, and cul-de-sacs. The thought of having to take only a few months or years to complete an experiment appears somewhat illusory ... albeit inviting.

The analysis of the empirical data that have been generated in my laboratory has been detailed and very rigorous. Indeed, there is no part of my life that has been spared scrutiny, critical examination, questioning, or relentless probing.

I have found life – at least my life – to be a very messy affair that cannot be reduced down to a set of simple formulae. My life is given much more to: non-linear processes than linear ones ... where much has to be hand-fed into whatever qualitative and quantitative equations I have formulated in order to be able to try to make any sort of sense out of what has transpired in my lab. As a result, I am more than a little amused at my earlier concerns about the messiness of doing experimental science.

Over the last 40, or so, years, I have come to appreciate, in a very intimate manner, the importance of, and problems surrounding, issues of: the interrogative imperative, empirical observation, objectivity, calibrating instruments, recursive procedures, replication, and the idea of a community of knowers. In the process, I have become all I didn't want to be more than fifty years ago: an experimental scientist.

During this time, I have written some 30 books, released two CDs of floetry (poems set to music), one DVD directed toward interfaith harmony, and produced more than 80 hours of a podcast (Sufi Reflections) covering all manner of topics – from: the Sufi path, to: music, education, philosophy, science, constitutional issues, poetry, terrorism, Islam, and democracy. These works are my lab journals and they are open for anyone to examine, critique, and build upon in whatever way they choose.

I don't claim to know the truth of all manner of things. However, there are, I believe, some limited truths that have emerged during my years as an experimental scientist that I hold on to and cherish as the precious remnants of the complex and nuanced sifting process that constitutes my particular approach to conducting empirical science.

I might never win a Nobel Prize. Nonetheless, I have been engaged in a noble enterprise.