Beyond Reason And Faith

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"I have no faith in reason..."
- Scott Turow, *Presumed Innocent*

THE CONCEPTS of "reason" and "faith" are inextricably linked, both with each other and as central ideas for exploration throughout the history of philosophy. Braver and more thoughtful individuals than I have been defeated in discussing them - by their intellectual resonance with the great philosophical tracts through the ages and by their emotional resonance with what we ourselves hold to be true and false, and our personal justifications for such categorizations. The easiest - and ultimately the most effective - way to deal with such weighty matters is to ignore them and their -isms completely, bounding the discussion with definitions of each gleaned from that well-known philosophical reference book and compendium, "Webster's Dictionary of the English Language", 2nd edition. Thus, reason is defined as, "...consideration, motive, or judgment inducing or confirming a belief, influencing the will, or leading to an action" and faith as, "belief in God, revelation, or the like". Both involve belief (defined as, "a conviction or persuasion of truth; intellectual assent") but the clear distinction between the two is the foundation of belief: reason depends on some form of rational justification, though not necessarily extensive enough to be considered a necessary and sufficient demonstration, while faith involves acceptance without

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justification. It is at this point that things start to get messy. What constitutes a rational justification? By what standards can a distinction be made between a "rational" justification and one which is not? Taking this further, where is the separation between "justification" and "rationalization"? Do beliefs have levels of certainty/confidence associated with them? Is there an identifiable point at which a belief ceases being reasonable and becomes a matter of faith? I could continue supplying words of wisdom from Webster's, but an interesting phenomenon occurs: if one looks up enough definitions, one finds that all of these concepts are being defined in terms of each other. Recursive definitions not being very useful or meaningful outside of mathematics, I will instead explore some of these concepts through the use of an example with which most readers will be somewhat familiar: the recent battle over the teaching of "creation science" in public schools.

"Am I a monkey's unc1e(aunt)?"

The evolution/creationism controversy represents a vast constellation of issues: the nature of science and scientific proof, the definition of religion, the limitations of what might be termed an educational "fairness doctrine", etc. For the purposes of this paper, the issues will be restricted to the confrontation between reason and faith, as represented by their extrema - science and fundamentalism.

Consider first the scientific concept of evolution. In the controversy, "evolution" is evolutionary biology, a subdiscipline of biological science dealing specifically with the development of life forms over time on this planet. At the time that Darwin's book - "The Origin of Species" - was first published, other areas of science (e.g., physics, chemistry, geology) were in the initial phases of laying a quantitative groundwork for organizing observations into sets of mathematical relationships in an intellectual dynamic that represented a fundamental shift in the way humankind defined its relationship to the universe. Darwin's (and others') careful observations of morphological relationships between living species, as well as between living species and fossil records, and his ability to create a developmental hierarchy relating complexity with species age, changed biology from natural description to a science in the nineteenth century mechanistic tradition.

Darwin's contribution to biological science was a "theory", or a conceptual framework within which observations can be organized to demonstrate significant relationships. It is the simplest representation that is consistent with all known information and, as well, will make predictions that can, at least theoretically, be tested. Thus, the Ptolemean universe represented a conceptual framework in which the earth was the center of the universe; it was superceded by the Copernican universe, in which the earth and other planets moved around the sun, because the description of the movement of "heavenly bodies" in the latter conception was comparatively straightforward and predictable (a few simple laws of motion vs. epicycles and other complexities) and because it could explain other astronomical observations that the Ptolemean representation could not.

The "theory" of evolution has stood the test of time. The science of genetics, whose laws would not become known until the early part of the 20th century, provided an underlying explanation for the development of new species, and the appearance of new traits in existing species. In the last 30 years, the development of methods for studying the structure and function of biological molecules has shown important homologies between related proteins from apparently unrelated species. Sequence analysis of, for example, hemoglobins from all over the phylogenetic tree has enabled the construction of an equivalent tree based upon the amount of divergence in amino acid sequence; this molecular hierarchy of degree of relatedness is the same in all essentials to the classical one based on morphological changes.

As with any scientific theory, there are areas for which insufficient evidence has been obtained. At the present time, evolutionary biologists (who all agree on the overall framework of evolution) are divided on the time course of speciation. Some hold the idea that the rate of evolutionary change is constant over time, while others believe that change comes in spurts, which in turn are followed by periods of adjustment in which little new change occurs. Neither side has strong evidence to support its contentions; equally, there is no strong evidence to contradict either side. One could say that each side adheres to a particular hypothesis - an idea about the system that must be tested. Aside from the overall framework of evolution, the two sides in this little scientific spat agree on one thing - this disagreement will eventually be resolved. Correlation of degrees of molecular divergence with the time course of species development will eventually allow either one hypothesis or the other to be discarded.

Belief in the scientific theory of evolution is "reason"able. There is a sizeable body of experimental studies and field observations which is consistent with the theory, and - to date - nothing which contradicts it or cannot be explained within it. Associated scientific areas (e.g., geology, genetics, molecular biology, organic chemistry), which are based on independent frameworks and bodies of experimental studies, have directly and indirectly accumulated evidence and/or mechanisms consistent with evolution. Finally, the disagreements between evolutionary biologists described above are not attacking the overall framework of the theory; rather, when resolved, the results will expand and enrich the field through more detailed explication of the evolutionary process.

It is important, however, that the reader keep one thing about science in mind: IT IS IMPOSSIBLE TO PROVE THAT SOMETHING IS TRUE. To support a scientific theory or model or description of a process, whether it be evolution or quantum mechanics or reaction mechanisms, one tests its ability to predict the outcome of certain trials and one tests observations against the framework. Since one can prove that something is NOT true (i.e, a result is obtained that is inconsistent with the theory and cannot be explained by the theory as it is constituted), the major unifying concept underlying all scientific enquiry is "falsifiability" - testing the validity of a framework in order to demonstrate its falseness or incompleteness or other inadequacy. Thus, in the Michelson-Morley experiment to determine the velocity of light, the investigators found that a light signal sent along the direction of the earth's rotation had the same velocity as one sent in the direction opposite. According to classical physics, the two velocities should have been different, so this observation called into question the classical theory of the nature of light and helped pave the way for the development of modern physics.

It is also important to distinguish here between theory and observation. One can perform an experiment and get a particular result; one of the bases of science is that a repetition of this experiment should lead to the same result. A theory is the scientific framework within which this result should fit, and should show how this result is related to other results and observations in a unified fashion. A theory, then, can be disproven by a well-formulated experiment, but the experimental result is independent of the theory. (If an apple falls off a tree, it will fall to the ground whether its motion is attributed to the goddess of apples or the force of gravity.) A different theory, in order to supplant the first, must explain all previously obtained results completely and at least as elegantly, must be consistent with the body of experimental observations that led the first theory to be called into question, and - most important of all - must itself be subject to testing (falsifiability).

Consider now "creation science", also called creationism. Creationism, based on the axiom that the Bible is literally true, explains the variety of life on earth in terms of the story of Genesis. Thusly the earth and universe were created by God a little less than 6000 years ago in six days, and the vast number of species - each with its own special characteristics - came out of

God's imagination. Man was fashioned in God's image, and Woman from a rib. Et cetera.

Based on the initial premise, the major ideas of creationism follow logically. If the Biblical account of Genesis is taken literally, then there was indeed no evolution, because all species were created within a day of one another. The "Big Bang" of modern physics describes how God created the universe initially and set up the laws by which it is governed, but it occurred rather faster than the physicists estimate (a few days versus about 20 billion years for the universe as we know it to develop). The fossil record, radio-dating of organic and inorganic matter which leads to ages greater than 6000 years, etc., were set up that way initially as a test of humankind's faith in a supreme being.

Creationism can be considered a framework within which results and observations are organized, and it is certainly logically developed, but is it a valid alternative scientific explanation of the origin and development of species? By the criteria previously described, the answer is obviously no. Although creationism can explain all results and observations in its own terms, it is not amenable to testing. How does one set up an experiment to test whether Genesis is literally true? There is no way to test the initial premise, nor whether God has the powers and attributes necessary to set up a completely self-consistent system which, if investigated, is totally misleading to the inquiring minds that God supposedly created in the first place. And, of course, there is the basic question that must precede any discussion of how literally to take the Bible, and God's existence.

Creationism, like science, cannot be proved true; unlike science, it also cannot be proved false. But, as mentioned, the entire framework follows logically from belief in the initial premise. Is the initial premise reasonable? Are there data or observations or experimental results which provide some "rational justification" for belief in the premise that the Bible is literally true, or even that God exists? Again, the answer must be no. The foundation of creationism is the acceptance of a concept for which no justification exists, and is therefore based on faith and not reason.

The creationism controversy is therefore a clash between reason and faith, and to compare creationism and ANY form of science is thus to compare apples and oranges. Of course, it should be emphasized in all fairness that creationism is being evaluated by the criteria of science, and in those terms it fails every test. If we change viewpoints, and try to evaluate evolutionary biology in terms of creationism, then evolutionary biology fails. It fails not only in terms of a literal interpretation of the Bible, but also in a much more fundamental (forgive the pun) fashion: it diminishes the attributes of a supreme being by making that being something less than omnipotent. For these reasons, a creationist and an evolutionist can never find a common ground for interaction - their premises and their faiths are in a real sense antithetical.

Faiths? What, you might ask, am I doing talking about faith in reference to evolutionary biology, or indeed in reference to any science? Faith is acceptance of a belief without rational justification, and as such is not an aspect of science. I would have to reply that ANY organized belief system is based, at least in part, on assumptions which are not falsifiable, whether that belief system be creationism, evolutionary biology, or quantum mechanics. We have already raised, and arrogantly dismissed, the articles of faith underlying creationism (and implicitly much of fundamentalism). It is time now to look at the articles of faith underlying most or all of modern science.

Is science a religion?

The most basic assumption of science has to do with the nature of the universe, and is in many ways only a more sophisticated version of the old clockwork/mechanistic universe. The universe, and all aspects of events taking place in the universe, is governed by fundamental sets of relationships that can be discovered. Some relationships, such as the value of pi or Planck's constant, are characteristic of this universe alone, and may well be different in other universes or in other incarnations of our own universe (assuming the cyclic big bang theory holds). Other properties of the universe derive from the fundamental forces and the various combinations of elementary mass/energy units that can be made, and would presumably be relatively invariant over the various universes.

A second assumption is that the laws/relationships that we as humans discover or derive hold true throughout the universe. Our conceptions about the nature of the universe, of time and space, and of cosmology depend on the assumption that the way matter and energy behave here on earth and in that portion of space to which we have direct (Le., experimental) access also holds true anywhere else in the universe. For example, one of the most fundamental precepts of modern physics is the limit imposed by the speed of light. We know that light speed is invariant from experimentation going back to the original Michelson-Morley experiment; almost all of modern astronomy, astrophysics, and cosmology, however, is based upon the assumption that this limit holds true everywhere in our universe.

A third assumption, which governs all of experimental science, is that

- since the universe is governed by laws/relationships which can be discovered - any experimental result should be reproducible if the experiment is performed the same way. And, as scientists, we have a vast arsenal of sophisticated mathematical tools to explain why, every time we repeat an experiment, we get a slightly different result; this collection of tools is called statistics. Note that I am not even talking about the strange results of quantum mechanics (which Einstein and Planck themselves refused to believe to their dying day), but standard tests of events that anyone could perform in their basements.

In order to "do" science, one must believe in these attributes of nature and the universe, but it should be clear that these assumptions are not falsifiable. How do we test the value of pi in another universe? What is the speed of light in the most distant galaxy discernible by astronomy and, if it changes over distance, how far away is that galaxy from ours in reality? While it should be theoretically possible to send a probe millions of light years away from us and measure the speed of light there, the process of doing the experiment and getting the results will itself take millions of years (and, of course, the experiment would have to be repeated, since no good scientist will accept the data from a single trial).

Keeping in mind what I emphasized before - that one cannot prove something is true, but only that it is false - it should be clear to the reader that science, like creationism, is based upon certain assumptions that cannot be tested, but only taken on faith. But, you will say, in terms of your definition of scientific "theory", these assumptions seem to work pretty well. At least you have never gotten any data that calls the framework into question. I would reply that, yes, these assumptions DO seem to work pretty well, assuming that I can rely on statistical analysis of my results to explain the variation from experiment to experiment. However, it could be said that quantum mechanics - or more generally all of modern physics - is based upon extensions of the basic assumptions that some great minds, most notably Einstein, refuse(d) to accept; and a good proportion of modern physical scientific thought is not currently falsifiable (e.g., string theory). Some of the results of modern cosmology and of quantum mechanics depend on "renormalization" - a mathematical transformation technique involving multiplication of infinities and infinitesimals whose application and results some mathematicians and physicists consider specious.

More fundamentally, the reliability of mathematics itself has been called into question. Kurt Godel showed over 60 years ago that, for any axiomatic system of a minimum degree of complexity, the system cannot be shown to be both complete and consistent. [An axiomatic system is one where a set of assumptions combined with a set of operations leads to the derivation of theorems from the axioms; the most familiar example to most is probably Euclidean geometry, but all of mathematics, including various forms of logic, are also axiomatic systems.] For example, for any system where all the elements are true, there is at least one true element that belongs in the system that cannot be derived within it; alternatively, if all the true elements belonging to a system can be found within that system, then there is at least one false element within that system as well. For simple axiomatic systems, such as arithmetic (confined to the operations of addition and subtraction) and two-valued Aristotelian logic, the systems are both complete and consistent. But if multiplication/division is added to the operations of arithmetic, the system is no longer both complete and consistent, and if two-value logic is extended to quantificational logic, the same holds true. The dividing line between certainty and uncertainty in these and other axiomatic systems appears to be whether the system includes infinities and infinitesimals, either explicitly or implicitly. (In simple arithmetic, for example, every possible number can be written down; if one adds multiplication/division to this system, what number does one assign to a division by zero?)

Clearly the fundamental assumptions of science, like creationism, are not falsifiable. The argument - that, like any scientific theory, all results obtained based upon these assumptions are consistent with the assumptions - can also be specifically attacked in at least some areas of modern science, and some of the contemporary thinking at the cutting edge of physics is not falsifiable (though very elegant). However, in most aspects of science, experiential and experimental information is consistent with the scientific world view as currently constituted. Where there is controversy - as in the question of the consistency/completeness of mathematics or that of the validity of renormalization in certain contexts - this controversy serves to place limits on what we can believe with great confidence, what we can believe with certain reservations, and what we must reserve official judgment about. For scientists and mathematicians, the limits of each category tend to be rather different on an individual basis, and this dynamic tension fuels scientific inquiry, tests for falsification (some very ingenious), and the formulation of new hypotheses to be tested. An example of direct testing of aspects of modern cosmology is the proton decay experiment. One of the corollaries of current thinking about the forpation of the universe is that protons have a long, but finite, lifetime (103 years, or ten followed by 32 zeroes). Therefore, if one collects, say, 100 times 1032protons in one location, one should see several proton "deaths" per year, since there is always a distribution about an average (i.e., some protons will have a shorter lifetime and some a longer one than 1032years). This experiment, which involves the placement of millions of gallons of water deep within the earth to shelter the water from other effects (e.g., cosmic rays) and allows monitoring of the water, is taking place in a number of mine shafts and other locations throughout the world. So far, no proton decays have been observed, even though by now a significant number should have been detected. (On one occasion, scientists thought they HAD made an observation, but it turned out to be due to the growth of certain bacteria; life develops and goes on under the most incredibly inhospitable conditions!) What do these negative results mean? One possibility is that the theory which the experiment is testing is wrong. Another is that proton decay has, in fact, been taking place, but that the detection devices (or more accurately the events associated with these decays that the devices are supposed to monitor) are happening differently enough to be undetectable. As more and more time passes without an event, despite the development of increasingly sophisticated monitoring devices, the theory will become more and more untenable.

Belief systems and rational justification

Up to this point, the concepts of reason and faith have been explored by consideration of the most extreme cases of each (Le., science versus fundamentalism). Both are based on untestable assumptions and both sets of axioms lead to concepts and statements about the universe that can be derived logically from the initial points. The difference between the two is thus not logic, but the nature of the initial assumptions. The implications of the assumptions underlying scientific inquiry are, at least in part, falsifiable, while those underlying fundamentalism are not, and must also be taken on faith. There is rational justification for "belief' in much of science and, insofar as a physical description of the universe is concerned, the scientific framework is reasonable, if limited. The fundamentalist belief system, while internally consistent and also successful in explaining the nature of the universe, must be taken almost entirely on faith; in addition, some of the tenets of fundamentalism are in direct contradiction to experience/experiment, which creates an even more difficult test of faith for such believers.

Neither extreme belief system can provide the individual with certainty, or even much comfort. Those who tend to treat science as a kind of substitute for religion are making as strong an act of faith as fundamentalists, since they are giving their philosophical allegiance to what is essentially a different set of untestable assumptions about the nature of the universe; they are, in addition, limiting themselves to an essentially reductionist and mechanistic outlook by limiting their "faith" only to that which can be tested scientifically. There is much less certainty in this position than non-scientists are perhaps aware (as I have tried to show), and cold comfort indeed in the attribution of the "cause" of good and bad events in one's life to probability. The fundamentalists, in contrast, have the certainty of absolute faith in "God's plan" for them; however, since "God's plan" is unknowable and is, experientially, as capricious as if there were no God running things, the eventual rewards of the afterlife are poor compensation for personal disaster and loss in the present.

"Reality is for those who can't face science fiction" - epigram from aT-shirt

For most people, the belief system by which they organize their perceptions of the universe and find meaning in their lives falls somewhere in the continuum defined by science at one end and fundamentalism of whatever sort on the other, and includes elements not explicitly a part of either. The blind faith of the religious fanatic of whatever ilk is matched by the wilful blindness of the logical positivist at the other end of the spectrum to anything not scientifically "proven". But "science" is not a synonym for "reason" any more than "fundamentalism" is a synonym for "faith"; both are extreme subsets of a more general attitude concerned with the basis for belief.

There is a vast midrange between the extrema of science and fundamentalism, where most of us live our intellectual lives. Let us leave, for the moment, questions relating to the fundamental assumptions underlying the whole of science and, recognizing that science per se can only inform on a limited range of subjects, consider the basis or bases for belief outside of sciencellogical positivism. Can we develop satisfying and satisfactory personal philosophies for ourselves that treat the whole of the human being based on a rationalist viewpoint, an extension of the scientific approach to matters outside of science?

The answer to this question is a definite no. In the introduction to this essay, I raised a number of questions about reason, faith, and the basis of belief which are objectively not answerable once one releases the constraints on belief of scientific proof. In trying to develop a personal philosophical approach to the question of the nature of human nature, or of what defines quality of life, or of how people should relate to one another, or whatever, we find ourselves in a scientific no-man's[person's]-land, where the questions we raise are essentially meaningless in that the answers we formulate are not objectively verifiable. This does not mean that we cannot raise questions or formulate answers, just that the results of such processes should not (and indeed cannot) be justified as pure rationalism; in fact, such an assertion on the part of an individual should immediately be distrusted and dismissed as an exercise in rationalization. Rather, our criteria for belief and a rational basis to justify that belief is filtered through our own unique perspective based in part on our expectations and in part on our life experience. Before being accused here of moral relativism, I must emphasize that the key factor in understanding or developing or evaluating belief is perspective.

The PERSPECTIVE of science can, in a metaphorical sense, guide and inform the development of an individual's life view. I have already used an inordinate number of pages trying to communicate the concept that certainty and/or Truth is not an attribute of science; science is rather a discipline of process, where frameworks of theory act as organizers or jumping-off points for further exploration. The development of a framework and a continuing, lifelong commitment to exploration can, in turn, be used as a paradigm for one's own personal development. While one lesson of twentieth century science is uncertainty (especially in the sense of absolute limits on what it is possible for us to know), the other more positive message is the interrelationship of things - animate and inanimate - at all levels. For me, this not only provides a place for my life in the cosmos, but also implies ethical and moral imperatives of responsibility in interactions between myself and the world around me (see also "Human Dimensions of Twentieth Century Physics" in *Humanism Today,* 4:13-23, 1988). In a more general sense, the same openness to discovery and continual questioning that are essential attributes of successful scientific inquiry can provide a continuing sense of wonder, personal growth, and sensitivity and empathy to others, without the loss of our critical faculties.

The Enlightenment brought to humankind's intellectual life the supremacy of reason, and this elevation of reason has, in general, served us well. From such a perspective has come the development of modern science and mathematics, analytic philosophies, the evolution of new forms and concerns in literature and the arts, and a more human-centered and now-centered emphasis in our culture. Clearly, however, reason alone cannot address the kind of questions that are formulated in this post-Enlightenment era or satisfy those ineluctible needs for meaning and relationships that are part of being human. The rational life is only a part of the whole we experience as Life, which must also include our non-analytic faculties, and both the life of the mind and (for lack of a better expression) the life of the heart are part of a meta-framework which involves the synergistic interplay bctween intellect and emotion. Just as reason took us far beyond the limits of faith, so we must now move beyond the limits of reason, incorporating the lessons we have already learned from both into a new and who listic philosophy that can address our continuing search for meaning.

Freud and the various ensuing schools seem to indicate that reason and logic do not go far in solving the ultimate personal problems of human existence. The true sources of one's being, happiness, and fulfillment appear to transcend the intellect.

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Existentialism and Ethical Culture