Science as a Belief System

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Although some scientists balk at the notion that science is a belief system, there can be no doubt that it is. Science asserts that it offers a way to understand and operate in the world so that the actions and decisions of humans are well informed with reasonable impacts to themselves, their societies, and the ecosystems within which they must live. And Science – and its "believers" as scientists – assert that science offers the best and most legitimate approach, among the alternatives that are out there, for determining how "things" work! Science claims that following its methodology, it can accurately describe the nature of reality. That is a belief system!

The question is not whether Science is a belief system but rather what kind of belief system it is and how it compares to other belief systems that make similar claims. To elect among belief systems, we need to identify the distinctions.

We can start by recognizing that adherents within the scientific belief system – as in any other belief system – rarely live up to all of the ideals as expressed in the philosophy of science. Nevertheless, it is the case that scientists subscribe to the goals of science as expressed in this consensus philosophy. So, the failure of scientists sometimes to achieve the ideal does not negate the legitimacy of the belief system itself.

Recognizing the distinction between the real and the ideal, what are the key components that distinguish science from other belief systems?

1) In Science there are no absolute truths. Everything is under question – including the most basic assumptions – with current consensus conclusions, held to be accurate only considering the current collective state of knowledge.
2) Science demands flexibility and open mindedness in its adherents.
3) Science accepts that change is inherent/inevitable as the cumulative state of knowledge changes [hopefully to become more comprehensive and adequate].
4) Even what scientists take to be constants in their prevailing paradigms/ theories at any one time may become variables later in light of more complete information, or understanding at greater or lesser scales of consideration. [Examples: time, space and gravity – constants in Newtonian physics – are challenged by General Relativity and Quantum Mechanics, which assess lawful relationships at much greater macro and micro physical levels]
5) Science requires evidence from objective reality to confirm or reject its hypotheses about the way things are and the way they operate/relate.
6) Scientific theory includes informed conjecture based on reasonable

assessments of current objective evidence. Some scientific theories provide consistent results in application for a rather long time, but until direct evidence emerges to support these theories, they remain hypothetical. “Black” matter, “black” energy, elemental vibrating strings, and the Big Bang are presently four such informed conjectures in scientific theory. Gravity waves are an example of an informed conjecture that has recently been confirmed by objective evidence through controlled experimentation.

7) In science no black boxes are allowed, that is no proposed entities or phenomena for which there is no objective evidence or any opportunity for such evidence. In science no legitimate theory or conclusion can be based on faith – which requires appealing to black boxes. God, gods, saviors, purgatory, judgment by the gods, heaven and hell, apocalypses, second comings, etc. are all examples of entities and actions that by their very nature cannot be confirmed by objective evidence, that must be accepted on faith, and that exist in “protected” black boxes.

8) Science requires evidential confirmation in objective reality from independent sources to support any proposition, hypothesis, or theory. “Proof” begins with other scientists conducting parallel experiments which demonstrate the same results and which reach the same conclusions.

9) <u>“Absolute” proof/truth does not exist in science!</u> Anomalies – phenomena not adequately explained by existing theory – are always expected to exist or to be discovered in further investigation.

10) Science demands great care in the methodology of its experiments into the nature of objective reality in order to avoid false assessments and unjustified conclusions. At a minimum, scientific methodology and process include:

a. A clearly stated hypothesis based on a clearly identified theory. If the theory is not well established, the informing paradigm must be identified.

b. Data necessary to test a hypothesis must be identified and the data collection process must be fully described. The data must be available to other scientists for examination and review.

c. Sufficient/Complete evidence. The factual evidence must include all of the relevant known facts. There can be no selection of evidence to support a proposition or opinion. Where the evidence is known to be partial or incomplete, this must be identified. Known anomalous evidence/facts must be identified.

d. If the analysis of the data relies on statistics, this process must be fully disclosed and subject to verification.

e. The theory upon which the interpretation of the results is based must be clearly and fully identified.

f. Interpretation of the results must be logical and clear.

g. Research must be reported in independent, unbiased, peer reviewed publications. Issue: the more challenging research is to prevailing theory and/or established paradigms, the more difficult it is to find unbiased reviewers.

11) Science relies on the sophisticated use of human intellect and rational thought. Inspiration/Insight coming from human intuitive capabilities play a very significant role – especially in the realm of scientific theory, but the results of the overall scientific thought process must be able to be expressed, explored and confirmed in rational terms.

Most alternative belief systems – whether of a material, social, psychological, political, economic, or religious nature – generally cannot pass the test of at least some of the above eleven scientific criteria. And some – especially religious belief systems – fail on most of these criteria. Individual belief systems can be compared and assigned a relative science associated "value" based on the results of an analysis using these eleven criteria.

Does Science have its limitations, its challenges? You Bet! What follow are five of the greatest weaknesses in science.

1. There is a tendency to claim causality after demonstrating only correlation among variables.
2. There is a tendency to conduct experiments that attempt to isolate a single variable and to attribute causality to this variable. To the extent science can fully illuminate causality, it must respect the fact that causality is inherently a systemic phenomena with many inevitably interacting variables. There may be one or two primary or major causal variables involved in any phenomenon, but attributing cause to these variables alone – especially after only demonstrating a correlation – is almost certainly incomplete and insufficient,
3. There is a failure to adequately consider the influence of bias and/or vested interests in scientific investigations and their reported results. Most experimental hypotheses are ones that the proposing scientist(s) would like to see confirmed. So, there exists a built in bias in selecting the relevant data, determining exactly how to conduct the experiment, and assessing the experimental results. In addition, some experiments are sponsored/supported by parties/corporations that have a significant ideological or economic interest in seeing certain results obtained. So, given the potential influence of bias and vested interests, the questions arise as to whether the experiments conducted constitute real and full tests and whether all results are accurately and fully reported. This bias and vested interest problem is one of the main reasons why independent confirmation is so important before reported experimental results are fully credited and accepted.
4. There is a pervasive inclination to deny the existence and relevance of the subjective domain of reality because of its association in complex societies with institutional religion. This amounts to the problem of throwing the baby out with the bath water. Perhaps also mixed up in this is the ancient need scientists feel to avoid conflict with influential religious interests! So, just leave it all alone!

As impressive as the practical results of science have been to the present, it is necessary to keep in mind that as belief systems go, Science is in its infancy! It has yet to crawl out from under its heretofore exclusive focus on human rational competence and the pursuit of understanding in objective/ material reality. The entire domain of human intuitive competence and subjective reality is mostly unexplored. And the connections of the intuitive and the rational to the instinctual and emotional aspects of humans have hardly been sketched.

5. There can be a failure to avoid hubris; this is the "know it all" temptation of any belief system. The very contention that science can achieve a "theory of everything" is itself unscientific. "Everything" is not available to humans, even with the advancement of an ideal technology of discovery. There will always be the realm "beyond" where we are able to reach: current examples: What comes before the Big Bang?, What are vibrating strings made of?, Where does matter go when it is consumed by a super massive black hole?, What is the nature of reality when all theories and fundamental assumptions in science are inadequate at the point of a singularity?

If science obeys its basic principle that its understanding is always in process of development because its state of knowledge is always incomplete – awaiting additional information/evidence/facts, then it can never propose itself as developing a "theory of everything." Steven Hawking in his work, The Grand Design (2010) gets it right when he proposes that science must be satisfied with an understanding of reality based on the concept of "model dependent reality." Science must always be seeking to develop the most complete and competent models to account for the nature of reality at different scales. As knowledge evolves, some of these models may merge, some may divide, but neither individually nor collectively can they ever account for it ALL.

In legitimate science, there can only be approximations to the Absolute Truths that other belief systems so confidently claim for themselves. Of course, this required "humility" of Science is both its apparent "weakness" and its real "strength" when we compare it to other belief systems.

Ultimately the evidence for the comparative value of science as a belief system rests on the progress – particularly over the last three centuries – in humankind's understanding of nature from the micro to the macro levels and the spectacular technological achievements – practical consequences – that have resulted from the implementation of this understanding. On this basis alone, no other belief system even makes it into the minor league ball park to compete!

On the other hand, science has been so productive technologically that, when this effect is combined with a competitively oriented, vastly expanding economy, the pace of change has become so rapid that the needed social and political

adjustments to assure a higher level of cooperation and regulation have lagged behind to the point of potential catastrophe. The overall result is that the modern human species has flourished to the point both of exceeding the ecological carrying capacity of the planet and of risking loss of the civilized state of society. At international scale, modern humans need to rapidly commit themselves socially, culturally and politically to provide the required control of the combined global economy and ever escalating technology. If they fail to do this, science may end up being at one and the same time the liberator of the species to potentially populate the cosmos and a root cause of the demise of the human species – having provided the basis for the next major global extinction event [catastrophic climate change].

With respect to the challenge of climate change, it is worth noting that four of the five major planetary extinction events have been associated with significant changes in climate. The latest such event some 252 million years ago occurred in conjunction with a 5 degree Celsius average elevation in Earth's temperature. 96% of all species went extinct in this event! And here we are currently "planning" for a 2 degree such change and facing a potential 6 degree change – CAUSED BY OUR OWN SCIENCE AND TECHNOLOGY BASED BEHAVIOR [ENERGY FROM FOSSIL FUELS]!

In socially immature human hands, science is a spectacular double edged sword! Scientists need to respect this fact and not just celebrate the positive consequences of dwelling within the Belief System of Science.