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The Need for Venture Science

Posted: 08/27/2015 3:17 pm EDT Updated: 08/27/2015 3:59 pm EDT

I just spent several hours down a rabbit hole. The topic was the "electric universe," an unconventional cosmological theory that emphasizes electromagnetism rather than gravity as the primary structuring force of the universe. It offers alternative explanations of redshift, cosmic background radiation, cosmogenesis, star formation, galaxy formation, solar physics, and more.

After re-familiarizing myself with the theory (it has been ten years since I first explored it) I proceeded to read a number of its critics (most of whom used the term "debunking"). What a fool I'd been for giving such a theory, "popular on the Internet," any credence! The critics pointed out elementary errors that proponents of the Electric Universe (EU) commit, revealing them as little more than cranks and crackpots. Case settled, right?

Not quite. Next, I read some responses to the debunkers, which refuted the criticisms point by point in considerable depth. Whom am I to believe? I don't have a Ph.D. in physics, and even if I did it apparently would be of little use, since many of these experts who so violently disagree with each other have Ph.D.'s themselves.

Although I, as a layperson, have difficulty evaluating the claims and counterclaims on their own merits, I did notice a disturbing asymmetry in the debate that has ramifications far beyond cosmology. The situation I describe below has parallels across science, medicine, education, economics, and really any of our institutions that produce and legitimize knowledge.

One aspect to this asymmetry is that one of the two sides can invoke the authority of the scientific establishment, while the other consists largely of marginalized heretics. These dissidents complain about the difficulty they have obtaining research funding, getting published in journals, and getting their arguments taken seriously. Meanwhile, the defenders of orthodoxy cite the self-same lack of peer-reviewed journal publication as reason not to take EU theories seriously. Their logic is basically: "These theories are not accepted; therefore they are not acceptable."

How to view this? If you have faith in the soundness of our scientific institutions, you will assume that the dissidents are marginalized for very good reason: their work is substandard. If you believe that the peer review process is fair and open, then the dearth of peer-reviewed

citations for EU research is a damning indictment of the theory. And if you believe that the corpus of mainstream physics is fundamentally correct, and that science is progressing closer and closer to truth, you will be highly skeptical of any major departure from standard theories.

A second, related aspect of the asymmetry is the cursory treatment of the dissenting views. The debunkers only go one level deep - they critique the dissenting claims but do not address the responses to their critiques. Why not? If you believe, again, in the institutional soundness of science, it must be because such a conversation is a waste of time for the serious physicist, who would have no time for teaching or research if he or she bothered to rebut every half-baked alternative theory invented by people imagining themselves to be the next Einstein. The risk, though, is that legitimate unorthodox theories are tarred with the same wide brush.

Another disturbing aspect of the debate that has resonance with other issues that pit a powerful orthodoxy against a marginalized heterodoxy is the liberal use of scare quotes and derisive epithets like "pseudo-science" to exercise psychological pressure on the reader, who does not want to be thought a dupe or a fool. These tactics invoke in-group/out-group social dynamics, leading one to suspect that the same dynamics might prevail within the scientific establishment to enforce groupthink and discourage dissent. But again, perhaps the unorthodox theories really are bunkum and deserve the derision directed at them. We the laypeople cannot know. It comes down again to our trust in authority.

Cosmology is relatively inconsequential to human wellbeing (or maybe not, but let's leave that aside), but the same dynamics apply to matters of life and death for people and the biosphere, especially in the areas of medicine and agronomy (e.g. the GMO debate). Can we trust scientific consensus? Can we trust the integrity of our scientific institutions?

Perhaps not. Over the last few years, a growing chorus of insider critics have been exposing serious flaws in the ways that scientific research is funded and published, leading some to go so far as to say, "[Science is broken](#)."

The dysfunctions they describe include:

- [Deliberate, unconscious, and systemic fraud](#)
- [Irreproducibility](#) of results and lack of incentive to attempt replication
- [Misuse of statistics](#), such as "P-hacking" - the mining of research data to extract a post-hoc "hypothesis" for publication
- Severe flaws in the system of peer review (see [here](#) and [here](#)), for example, its propensity to enforce existing paradigms, to be hostile to anything that challenges the views of the reviewers whose careers are invested in those views.
- Difficulty in [obtaining funding](#) for creative and unorthodox research hypotheses
- [Publication bias](#) that also favors positive results over negative results, and suppresses research that won't benefit a researcher's career

The system encourages the endless elaboration of existing theories about which there is consensus, but if one of these is wrong, there are nearly insuperable barriers to it ever being overturned. It exemplifies the classic Kuhnian resistance to paradigm shift. Former NIH Director and Nobel laureate Harold Varmus [describes it this way](#):

The system now favors those who can guarantee results rather than those with potentially path-breaking ideas that, by definition, cannot promise success. Young investigators are discouraged from departing too far from their postdoctoral work, when they should instead be posing new questions and inventing new approaches. Seasoned investigators are inclined to stick to their tried-and-true formulas for success rather than explore new fields.

Another Nobel Laureate, Sydney Brenner, [addresses the same problem](#):

The [financial] supporters now, the bureaucrats of science, do not wish to take any risks. So in order to get it supported, they want to know from the start that it will work. This means you have to have preliminary information, which means that you are bound to follow the straight and narrow. There's no exploration any more except in a very few places.

And regarding the much-vaunted system of peer review, which is supposed to maintain high standards of research, he comments:

I think peer review is hindering science. In fact, I think it has become a completely corrupt system. It's corrupted in many ways, in that scientists and academics have handed over to the editors of these journals the ability to make judgment on science and scientists. There are universities in America, and I've heard from many committees, that we won't consider people's publications in low impact factor journals.... it puts the judgment in the hands of people who really have no reason to exercise judgment at all. And that's all been done in the aid of commerce, because they are now giant organizations making money out of it.

Therefore, he says, echoing a growing sentiment, people like Peter Higgs, Fred Sanger, and Francis Crick "wouldn't have survived" in today's academic climate. The canonical paradigms of science have enjoyed a long tenure. Is that due to their correctness - or is it due to the exclusion of the innovators, the risk-takers, and the mavericks who don't receive the support that scientists of an earlier generation received?

If the growing legion of critics is right, if science is increasingly dominated by bureaucratic inertia, financial interests, and ideological resistance to new thinking, what can we do about it? Two issues need to be addressed: publication, and funding. Neither is sufficient without the other. Today there is a robust movement toward online publishing and crowd-sourced peer review that is freeing research from the stranglehold of the established top journals. These journals still have tremendous power - university hiring, promotions, and funding give them extraordinary weight - but at least alternative avenues for the propagation of knowledge are available. These could form the infrastructure of a new culture of science that, like many other systems, departs from the old centralized, hierarchical model.

As for funding, a new initiative is underway to channel support to researchers who are tackling unfashionable questions, pursuing unorthodox hypotheses, and developing theories and technologies that conflict with established financial and ideological interests. It is called the [Institute for Venture Science](#). It is not a fringe operation. Two Nobel laureates, the director of the National Science Board, and several university rectors and presidents serve on its advisory board. The initiative is spearheaded by Gerald Pollack (whose [book on water](#) I reviewed here), a professor of bioengineering at the University of Washington, and endorsed by over seventy professors, deans, and other establishment figures. A launch symposium for potential funders will be held in Seattle on September 25th.

Of course, the defenders of orthodoxy can assert that these illustrious Nobel laureates and professors (many of them retired) have gone batty in their old age. But regardless of the success of this Institute, the mere fact of its endorsement by so many in the scientific establishment bespeaks a gathering sea-change in science, a shift of gravity away from old centralized institutions that is part of a parallel shift far beyond science. As in politics, the economy, and the ecosystem, what once seemed incontestably true is coming under question. And the questioning is now infiltrating the mainstream.