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OP-ED CONTRIBUTOR

## Taking Science on Faith

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SCIENCE, we are repeatedly told, is the most reliable form of knowledge about the world because it is based on testable hypotheses. Religion, by contrast, is based on faith. The term “doubting Thomas” well illustrates the difference. In science, a healthy skepticism is a professional necessity, whereas in religion, having belief without evidence is regarded as a virtue.

The problem with this neat separation into “non-overlapping magisteria,” as Stephen Jay Gould described science and religion, is that science has its own faith-based belief system. All science proceeds on the assumption that nature is ordered in a rational and intelligible way. You couldn’t be a scientist if you thought the universe was a meaningless jumble of odds and ends haphazardly juxtaposed. When physicists probe to a deeper level of subatomic structure, or astronomers extend the reach of their instruments, they expect to encounter additional elegant mathematical order. And so far this faith has been justified.

The most refined expression of the rational intelligibility of the cosmos is found in the laws of physics, the fundamental rules on which nature runs. The laws of gravitation and electromagnetism, the laws that regulate the world within the atom, the laws of motion — all are expressed as tidy mathematical relationships. But where do these laws come from? And why do they have the form that they do?

When I was a student, the laws of physics were regarded as completely off limits. The job of the scientist, we were told, is to discover the laws and apply them, not inquire into their provenance. The laws were treated as “given” — imprinted on the universe like a maker’s mark at the moment of cosmic birth — and fixed forevermore. Therefore, to be a scientist, you had to have faith that the universe is governed by dependable, immutable, absolute, universal, mathematical laws of an unspecified origin. You’ve got to believe that these laws won’t fail, that we won’t wake up tomorrow to find heat flowing from cold to hot, or the speed of light changing by the hour.

Over the years I have often asked my physicist colleagues why the laws of physics are what they are. The answers vary from “that’s not a scientific question” to “nobody knows.” The favorite reply is, “There is no reason they are what they are — they just are.” The idea that the laws exist reasonlessly is deeply anti-rational. After all, the very essence of a scientific explanation of some phenomenon is that the world is ordered logically and that there are reasons things are as they are. If one traces these reasons all the way down to the bedrock of reality — the laws of physics — only to find that reason then deserts us, it makes a mockery of science.

Can the mighty edifice of physical order we perceive in the world about us ultimately be rooted in reasonless absurdity? If so, then nature is a fiendishly clever bit of trickery: meaninglessness and absurdity somehow masquerading as ingenious order and rationality.

Although scientists have long had an inclination to shrug aside such questions concerning the source of the laws of physics, the mood has now shifted considerably. Part of the reason is the growing acceptance that the emergence of life in the universe, and hence the existence of observers like ourselves, depends rather sensitively on the form of the laws. If the laws of physics were just any old ragbag of rules, life would almost certainly not exist.

A second reason that the laws of physics have now been brought within the scope of scientific inquiry is the realization that what we long regarded as absolute and universal laws might not be truly fundamental at all, but more like local bylaws. They could vary from place to place on a mega-cosmic scale. A God's-eye view might reveal a vast patchwork quilt of universes, each with its own distinctive set of bylaws. In this "multiverse," life will arise only in those patches with bio-friendly bylaws, so it is no surprise that we find ourselves in a Goldilocks universe — one that is just right for life. We have selected it by our very existence.

The multiverse theory is increasingly popular, but it doesn't so much explain the laws of physics as dodge the whole issue. There has to be a physical mechanism to make all those universes and bestow bylaws on them. This process will require its own laws, or meta-laws. Where do they come from? The problem has simply been shifted up a level from the laws of the universe to the meta-laws of the multiverse.

Clearly, then, both religion and science are founded on faith — namely, on belief in the existence of something outside the universe, like an unexplained God or an unexplained set of physical laws, maybe even a huge ensemble of unseen universes, too. For that reason, both monotheistic religion and orthodox science fail to provide a complete account of physical existence.

This shared failing is no surprise, because the very notion of physical law is a theological one in the first place, a fact that makes many scientists squirm. Isaac Newton first got the idea of absolute, universal, perfect, immutable laws from the Christian doctrine that God created the world and ordered it in a rational way. Christians envisage God as upholding the natural order from beyond the universe, while physicists think of their laws as inhabiting an abstract transcendent realm of perfect mathematical relationships.

And just as Christians claim that the world depends utterly on God for its existence, while the converse is not the case, so physicists declare a similar asymmetry: the universe is governed by eternal laws (or meta-laws), but the laws are completely impervious to what happens in the universe.

It seems to me there is no hope of ever explaining why the physical universe is as it is so long as we are fixated on immutable laws or meta-laws that exist reasonlessly or are imposed by divine providence. The alternative is to regard the laws of physics and the universe they govern as part and parcel of a unitary system, and to be incorporated together within a common explanatory scheme.

In other words, the laws should have an explanation from within the universe and not involve appealing to an external agency. The specifics of that explanation are a matter for future research. But until science comes up with a testable theory of the laws of the universe, its claim to be free of faith is manifestly bogus.

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