The Known, Unknown, and the Unknowable

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I want to talk to you as a scientist, about the unknown and about two boundaries of the unknown: the known, and the unknowable.

The unknowable as a notion does not come easily to the scientifically-minded: science works at the boundary of the known and the unknown, a different place entirely. It is a safe bet that working scientists and most of you today would agree to the notion that there is a lot we don’t know yet, and that the boundary between the known and unknown which science pushes back is the shoreline of a small island floating in a vast sea of the unknown.

Let us say – make the further hypotheses – that the sea of unknown is not the edge of everything, and that the unknown itself is wholly bounded, blurring into an intrinsically inaccessible and immeasurable unknowability. Then science would still be increasing the territory available to the world of the understood. As the length and complexity of the shoreline with the unknown grew in step with every discovery, there would still be no edge to the unknown except the unknowable. The enterprise of science would be assured of a limitless future of successes, none of them ever bringing the unknowable any closer.

Dealing with the unknown in this way is a project full of paradox, requiring that one talk about the inarticulatable and anatomize the unmeasurable. I chose to work at this new boundary nevertheless, because the habits of thought of a scientist made me take note of it. As soon as the notion of the unknowable as distinct from the unknown placed itself before me, the shock changed both my career and the way I see the world.

The unknown was the raw material of my career as a scientist, and the notion that it might be bounded in this way seemed to me deeply subversive of the entire enterprise of science. My first reaction was as a scientist: I kept this idea to myself, and went on about my business as a laboratory director while I thought about how it might be put to a test of some sort. But then, like the spotted Dalmatian who leaps to run after any truck that sounds like a fire engine, my training — begun as a physics major in Columbia College – eventually obliged me to grab onto what was most interesting rather than what was expedient, to try to understand the notion of the unknowable in all its untestability, and to make what I could understand about the unknowable understandable to others in turn.
Science moves into the unknown from the known by the by the testing of hypotheses; this is the so called "Scientific Method." But hypotheses about the unknowable are not likely to be testable, so it is probably not worth a moment of anyone’s time to seek the proof through science of any religious belief. Still, the scientific method itself is beholden to the unknowable.

Ask any scientist what lies at the core of her work, you will learn that it is not the experimental test of the hypothesis – although that is where most of the time and money of science go. It is the hypothesis -- the idea, the mechanism, the insight -- that justifies all the rest of the work of science. The moment of insight that reveals the new idea, where an instant before there was just fog, is the moment when the unknown first retreats before the creativity of the scientist. And it is also the scientist's door into the unknowable.

Where does scientific insight come from? Surely from someplace currently unknown. Let us consider the possibility -- the hypothesis -- that scientific insight, like religious revelation, comes from an intrinsically unknowable place. I can anticipate one response you this notion: to beg the question. The unknowable is not a category that gives itself easily to demonstration of its existence. If it were a mental quirk only, a fantasy not worth worrying about, an idea of something that cannot be, then that would be a sufficient answer: No unknowable, no problem. The problem with that glib answer is, that science itself depends on the periodic emergence of the unknowable for its own progress.

There is no way to think through a good idea in advance; insight is not a phenomenon subject to prior scientific analysis. At every instant of insight, every moment of Aha!, what had not been conceivable, becomes clear. Where was the idea before it was thought? Only afterward, once it was thought, can science begin the determination of the known from the unknown, using the idea as a guide. But before it was thought, there were no tasks, no path, no idea that there was even a question to ask.

The unknowable is worth a scientist’s attention if for no other reason than that it is the source of insight, the irrational part of science that has no chance of being brought under rational control. Moments of insight in science are not reproducible, nor is their occurrence modeled by any hypothesis of its own. As scientific insight cannot be harnessed to the engine of experimental testing, each occurrence may as well be a gift from an unknowable source. Good ideas emerge in the mind of a scientist as gifts of the Unknowable. They are not, as data are, simply trophies of a struggle with the unknown.

The essence of the measurable is reproducibility; insight is by definition not a reproducible thing. Recall how few such ideas have come to any of us in the hundreds of years we have been trying to understand the world and ourselves through science. Yet without moments of insight which emerge from nowhere, science bogs down in mindless repetition of acts that look serious but cannot be in the service of anything except confirmation of what is already known.
Scientific insight is not the only example of such a gift from the unknowable. Other events — also occurring rarely, inexplicably, unpredictably — can give meaning to our lives, just as scientific insights can explain the world outside ourselves. By meaning, in this context, I mean a new understanding drawn from the internal, emotional content of the experience, not the intellectual understanding which may follow as it does when experimentation proves a scientific insight to be useful. Meaning, purpose, teleology, the end of things: these are not notions that we naturally associate with science. Such experiences are commonly called religious.

Yet the central event in science — the sudden insight through which we see clearly to a corner of what had been unknown — is so similar to these religious experiences, that I see only a semantic difference between scientific insight and what is called, in religious terms, revelation. That difference remains small, whether one says that insight or revelation both come from nowhere interesting, or that they come from the unknowable which surrounds all that can be known, or that they come from God.

The differences between science and religion that have crystallized into a wall that separates the two do not lie in the semantic difference between insight and revelation. Whether prepared for or not, prophetic experiences and scientific insights will occur with similar rarity, irrationality and unpredictability. The real differences grow from the different uses made of scientific and revelatory insight.

In both, insight takes the form of a vision of an invisible and hidden mechanism. In science such insights are made into guides for learning how nature works, thereby reducing our ignorance of the world around us. Guiding the formation of religious obligation, revelatory insights are prerequisite to the rituals and observances of a religion, which ease the burden of living by lifting a felt ignorance of the purpose and meaning of our mortal lives.

In all organized religions I am aware of, revelation takes the form of a sense of being overwhelmed by sheer feeling, arising within without reason nor cause. Just as a scientist prepares for insight by deep immersion in the study of what has been dragged out of the unknown by her predecessors, a person adept at religious insight — a holy person, a prophetic person — may prepare by study of earlier revelation and prophesy, and by trying to be alert to the moral or lesson taught through what might be — to an unfeeling observer — just a coincidence.

Though both science and religion presume that the territory of the unknown is vast, most religions are far more comfortable with the notion of a residue of unknowability than are most sciences. Many practicing scientists instead believe — they would say they know — that what is not known today must and will be known tomorrow, or the next day, and that this will go on until everything is known.

The notion that nothing exists except what is knowable is wholly unprovable. Holding on to this belief in the absence of any way to test it through experimentation, and
Despite the counter-evidence of scientific insight itself, puts science at the risk of trapping itself in dogma. Like the worst of religious dogmas, the insistence that everything is knowable, is an unprovable position taken in the face of the evidence of the natural world. In this case, the evidence includes the fact of uncontrollable insight as the wellspring of scientific discovery.

Scientists will argue that the reproducibility of scientific experiments assures that science as an enterprise can always be brought to internal consistency, while religions, free to call upon individual revelation and unreproducible, miraculous events, necessarily fall into contradiction with one another and thereby cancel any reason for a sensible person to take any of them as seriously. In a negative template of this position, many people of faith will argue that science is a fragmented enterprise unable to paint a coherent picture of the natural world, limited by conflicting and inconsistent models and the finite limits of a mortal mind.

This makes speaking about religious feelings in an academic setting particularly tricky. Scientists and others who use their powers of repression to avoid accepting the reality of religious feeling or even its origin the natural world, tend to have great difficulty accounting for such feelings even in themselves. Not just moments of insight and revelation but other feelings as well – emotional states that overtake one, unbidden and unplanned by conscious rational anticipation – seem to be a different order of phenomena that those easily studied under reproducible conditions; it is extremely difficult to do a controlled experiment on feelings.

In terms of the expected behavior of scientists, strong feelings as such are also in bad taste. Data have to be examined in terms of the model they test, and models as well as data have to be able to stand on their own in the eyes of other scientists. This situation too has its mirror image in organized religion, where a spontaneous feeling of disbelief or doubt in the face of incomprehensible evil or simple bad luck may not be easily squared with the presumption that we are moral beings in a moral universe. Nor can all of the unwanted strong feelings associated with love, aggression, nor of course death, be fitted into most religious frameworks of expected right conduct.

Too much doubt is as much in bad taste from a religious person as is too much enthusiasm from an overeager experimenter. Free of the dogmas of both science and religion, any curious and self-aware person should also be able to know clearly the facts of nature through science, and to feel clearly the meanings and purposes of those facts through religion.

For me, this has not been so easy. I find it particularly difficult, for instance, to connect my place in the universe and my reason for being here with certain facts uncovered by my scientific colleagues. The molecular biology of evolution, in particular, has uncovered facts about me and the rest of us through the experimental testing of
scientific insights which fit badly if at all into my religion’s revelation of meaning. The problem lies in DNA.

DNA, assembled in long, informationally rich threads called chromosomes, forms the genome of a species. A genome carries all the information necessary for the construction of each organism in a species; organisms in a species vary from one to the next because their genomes vary. Each of us carries our version of the human genome in each of our million billion cells. Each of us — and each individual in every species — becomes slightly different from the others because the copying of a DNA genome from generation to generation is never error-free.

When error generates new sequences of DNA that happen to encode enhanced survivability in a species’ offspring, a new fertile population may emerge from an existing species. In time it may become a new species, replacing its parent; species themselves are thus no different from the individuals that make them up: like individuals, species are born, live, and die. That is why either replacement or simple disappearance is the certain fate of all species, including our own. These facts from science tell us, in other words, that our species — with all our appreciation of ourselves as unique individuals — is not the creation of design, but the result of accumulated errors.

The scientific confidence in these facts about our own origins and our own eventual fate is buttressed by other, equally well-documented facts about DNA-based life on Earth. In earlier times there were no humans, and even earlier times there were no mammals, nor vertebrates, nor any organism bigger than a single cell.

From those earliest times until now, all that we might want to think of as progress has been simply the selection of one subset of DNA sequences or another from a constantly refreshing pool of copying errors. We can be fairly certain that replacement or death will be the fate of all humanity as a species, just as death is the certain fate of every person.

The methods and strategies of science have thus brilliantly succeeded in explaining how we got here and where we are going next, and the explanation seems to leave absolutely no room for meaning, nor for purpose. A mutation just happens to land in the sperm or egg that will make one individual and not another; no design to its occurrence is either necessary nor even demonstrable. This most successfully defended null hypothesis of science has been so amply confirmed that there is no longer any reason to doubt it.

The living world, ourselves included, is intrinsically imperfect and intrinsically unperfectable. It changes, but even the changes that make each of us individually unique and interesting to each other are meaningless differences in DNA, creating the differences among us toward no purpose beyond the possible improvement in survival of one or another particular version of DNA over time. Even that imputation of purpose to the data may be unjustifiably teleological.
I am not exaggerating the seriousness of this problem: scientific insight into the meaninglessness of DNA-based life is not simply missing meaning. It is the demonstration that a satisfactory, even elegant explanation of the workings of this aspect of nature actually conflicts with the assumption of purpose and meaning. There is neither the need, nor any sign, of an unknowable designer in these data, nor any sign that greater meaning and purpose will one day be drawn from these data.

Honest scientists know their limits. Newton excused himself from the task of finding meaning in his discovery of the laws that govern the movement of stars and planets by saying “I have not been able to deduce from phenomena the reason of these properties and I do not feign hypotheses.” Unless we force science to do just what Newton did not deign to do, and simply articulate our wishes as if they were in the data though they are not, we must accept the meaninglessness and purposelessness of our presence on Earth as the verdict of testable science.

Yet you may, as I do, find it impossible to understand your place in the universe on these facts alone, and find yourselves asserting with me the irrational certainty that there must be meaning and purpose to one’s life despite these data. With those assertions, we can begin to take down that wall, by asserting as well that this irrational certainty that there is meaning – based not on data but on emotional necessity — is itself a data point about the living world that can and must also be understood.