The Benefits of Knowledge and Ignorance

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As science advances, there is an ever-widening crisis of public confidence in scientists. They are becoming increasingly specialized, whereas lowly laymen are understanding less and less and growing increasingly afraid.

There are many biases surrounding the "correctness" of scientific views, which stem mainly from the notion – held by many – that science strives for the truth and indeed actually manages to attain it. Failing to realize that "the truth" is just our current state of knowledge, rather than some indisputable set of entrenched dogmas.

The process of arriving at successive truths is well-illustrated by the evolution of scientific views on the nature of heredity. Gregor Johan Mendel showed back in 1865 that the mechanism by which biological traits are inherited has a chemical basis. The molecules responsible took more than 80 years to discover, and in the meantime hypotheses were devised based on the mistaken assumption that proteins were most crucial to the mechanisms of inheritance. It was not until 1944 that the record of inherited traits was shown to be inscribed in DNA. Soon thereafter, in 1953, its double-helical structure was worked out and was hypothesized to be universal among all living organisms. However, by the end of the 1980s biologists had demonstrated that although genes are made of DNA, their structure within the genome is different in bacteria than in other living organisms.

The more than 100 years that have passed since Mendel's work have not brought us to the point where we can actually read the DNA language. We have deciphered the structure of the writing (the chemical "letters"), but we are still unable to interpret its sense. Even worse, until recently we were still reading the sequence of letters at an arduous pace. This picked up only in the early twenty-first century, when machines capable of sequencing billions of letters quickly and accurately were built and efficient computer techniques for analyzing these lengthy phrases were devised. So we can now read the genome well, but we still do not understand most of what we are reading. It is said that we understand just 27% of the genome of "higher" beings including humans. So what do the other 73% of the letters mean?

This example shows how as discoveries, data, and hypotheses are accumulated, the truth about heredity is evolving. No one sensible will claim we already know "everything." And what we still don't know about genetics gives rise to numerous misunderstandings in everyday life, for which science gets blamed. Butter or margarine? Tomatoes healthy or carcinogenic? GMOs harmful or beneficial? Wheat with its terrible gluten as the great poison of the western world? Sugar and salt are bad for you? Stem cells have healing power? Should children be vaccinated? Should trees invested by woodworm be culled? Should we bring mammoths, dinosaurs back to life? Rescue the gibbons? Allow in vitro fertilization? Treat people for homosexuality? Use genetic therapies? Modify the genomes of people, animals, plants? Are genetic diseases a "scourge" or did they play some positive role in evolution?

Some people treat glossy magazines, the Internet, and gossip from the waiting rooms of doctor's offices as reliable information sources. Answers no less elaborate can be provided by physicists, chemists, computer specialists. But science does not provide clear-cut, decisive answers. Even worse, its answers change over time! So where lies the truth?

In fact, it appears at every stage of the search for it. And one of the reasons why it seems to change is because research methods and technologies proliferate quickly. In scientific research, every hypothesis should be verified experimentally or mentally, in various ways. And if at least one result clashes with the hypothesis, so much the worse for the hypothesis. Science has worked out rules for doing experiments, so that they are repeatable. Following these rules, researchers posit theories that remain in effect as long as no contradicting fact is ascertained. Such a fact demands attention. Perhaps a new hypothesis needs to be made, the theory modified. If we look this way at the benefits of knowledge and ignorance, both of these traits contribute to the further development of science.

But as science advances, there is an ever-widening crisis of public confidence in scientists. They are becoming increasingly specialized, whereas lowly laymen are understanding less and less and growing increasingly afraid. It is easy to tell a nonspecialist: "no, just because." Specialists justify their "yes" answer with thousands of experiments, hundreds of hours of discussion. But it is the "no, just because" answer that will spread like a meme. Even the retraction of fraudulently published data alleging that "vaccination causes autism" will not help. The meme continues to thrive in women's magazines and social media.

Should we throw up our hands in dismay? That is not an easy question. I think the only proper stance is to insist that the benefits of knowledge are nevertheless greater than those of ignorance – although attaining knowledge requires a certain investment of effort. And of money. ■