Edge

To arrive at the edge of the world's knowledge, seek out the most complex and sophisticated minds, put them in a room together, and have them ask each other the questions they are asking themselves.

https://www.edge.org/response-detail/25332
Printed On Wed January 11th 2023

2014 : WHAT SCIENTIFIC IDEA IS READY FOR RETIREMENT?

Hugo Mercier

Cognitive Scientist, French National Center for Scientific Research; Author, Not Born Yesterday

Planck's Cynical View Of Scientific Change

This year's question was inspired by Max Planck's bleak view of scientific change: "A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it." Certainly, Planck's assessment struck a chord with the general public. Its reception among the more educated public was likely eased when Thomas Kuhn's pointed out that well established scientists would have an incentive to resist novel theories instead of jettisoning their life's work.

If even scientists, with their freedom of discourse and exacting standards of evidence, cannot change their mind when they should, what hope is there for the rest of us? Why bother trying to convince anyone, ever?

Fortunately, Planck was wrong.

Detailed accounts of major scientific changes reveal, time after time, how quickly scientists adopt novel theories—provided they are well supported.

One can hardly blame, for instance, sixteenth century scholars for rejecting Copernicus' heliocentric model: it didn't account for the data much better than the alternatives, it was laden with inelegant post-hoc fixes, and it had no answer to such basic question as, If the Earth is moving, then why can't we feel it? As these issues got resolved—Kepler introducing elliptical orbits, Galileo understanding the principles of motion—the heliocentric model promptly gained supporters.

Other theories that also required dramatic conceptual change were much more quickly accepted, as they rested from the start on better arguments.

When Newton first advanced a new theory of light, one that upset centuries-old beliefs, he did so in a short article that offered little experimental evidence for many of his claims. Yet the cogency of his theory already proved persuasive to many (this was not a case of argument from authority, since Newton had very little then). When, 30 years later, Newton published his Opticks, with a much better presentation of the same theory and a plethora

of well described experiments, he took natural philosophers by storm; a few years and a few replications later, most were sold on his ideas.

By taking his belief in the existence of the phlogiston to the grave, Joseph Priestley became a favorite example of the pigheadedness of even brilliant scientists. But Priestley was very much an exception. When Lavoisier started publicizing his discoveries and criticizing the concept of phlogiston, he was met with resistance but also with acceptance —resistance to new theories that were half-baked even in Lavoisier's own mind, acceptance for his solid methods and results. Once the French chemist formulated a theory that could properly account for the main phenomena of interest, it was accepted in a matter of years.

Examples could be multiplied—the heart of Darwin's ideas was accepted by his colleagues shortly after publication of the Origin, plate tectonics went from speculation to textbook example in a dozen years—all showing that when the arguments are good, the vast majority of scientists change their mind accordingly. As the historian of science Bernard Cohen noted, even Planck—whose ideas were no less revolutionary than the other examples mentioned here—managed to convince most of his peers, not only the new generation.

Evidently, not every science reaches a consensus equally quickly—a natural phenomenon, given that political scientists, say, do not have the benefit of data quite as precise as that gathered by particle physicists. Still, it is important to give science, as a whole, its due—not only because such efficient belief change is no mean feat, but also because a pessimistic, cynical view of the power of argumentation can have pernicious effects.

If people who disagree with us are never going to change their mind, then why even talk to them? If we do not engage people who disagree with us in discussion, we will never learn of the—often perfectly good—reasons why they disagree with us. If we cannot address these reasons, then our arguments are likely to prove unconvincing. Our failures to convince will only reinforce the belief that we face pigheadedness rather than rational disagreement. A belief in the inefficiency of argumentation can be a destructive self-fulfilling prophecy. We should give scientists, and argumentation more generally, more credit: it is well deserved. Let's retire Planck's cynical view of scientific change.

Return to Table of Contents