

# 18 Non-experimental Science

“Science Which Is Not a Science . . .”

Because of the success of science, there is, I think, a kind of pseudoscience. Social science is an example of a science which is not a science; they don't do [things] scientifically, they follow the forms—or you gather data, you do so-and-so and so forth but they don't get any laws, they haven't found out anything. They haven't got anywhere yet—maybe someday they will, but it's not very well developed, but what happens is on an even more mundane level. We get experts on everything that sound like they're sort of scientific experts. They're not scientific, they sit at a typewriter and they make up something like, oh, food grown with, er, fertilizer that's organic is better for you than food grown with fertilizer that's inorganic—may be true, may not be true, but it hasn't been demonstrated one way or the other. But they'll sit there on the typewriter and make up all this stuff as if it's science and then become an expert on foods, organic foods and so on. There's all kinds of myths and pseudoscience all over the place. I may be quite wrong, maybe they do know all these things, but I don't think I'm wrong. You see, I have the advantage of having found out how hard it is to get to really know something, how careful you have to be about checking the experiments, how easy it is to make mistakes and fool yourself. I know what it means to know something, and therefore I see how they get their information and I can't believe that they know it, they haven't done the work necessary, haven't done the checks necessary, haven't done the care necessary. I have a great suspicion that they don't know, that this stuff is [wrong] and they're intimidating people. I think so. I don't know the world very well but that's what I think.

Richard Feynmann, *The Pleasure of Finding Things Out*, **1999**, Basic Books

It's always a pleasure to find someone who can think. It's an even greater pleasure to discover those who can think about science. I don't care if they are a Kuhnian, a Popperian, a historian, or even an anarchic scientist, as long as they can think about what an experiment is, or what a theory is, and how much weight a theory can hold, I'm for it and love reading it.

Many modern books on the history of science miss this fundamental aspect of doing science. Many think that what Copernicus did was different from what Ptolemy did. Most put Copernicus's astronomical heliocentric theory as clearly superior to Ptolemy's work in 100 A.D. But a comparison of the predictions produced by the two astronomical theories found Ptolemy winning. And Ptolemy had circular orbits around the earth with circular eccentrics to explain the planetary motion, and Copernicus had the planets, including the Earth, circling the sun. This conundrum, a better theory

with no better predictions, gave rise to Bernard Goldstein asking, "What was the question for which heliocentrism was the answer?"<sup>1</sup> Goldstein concludes that Copernicus was trying to find a consistent distance/period relationship between the planets, and came to heliocentrism in the derivation. In other words, Copernicus wasn't dissatisfied with the geocentric model and went looking for options; he happened across a different, possibly easier-to-use model in the course of calculating orbital numbers. But Copernicus' orbits were still circular, so he really didn't abandon the fundamentals of Ptolemy's model, he just eliminated some epicycles.

So was Copernicus a scientist? Most say he was, because he was more correct (heliocentric) than Ptolemy (geocentric). But really, what experiment did he do to confirm or to challenge his own heliocentric idea that Ptolemy hadn't already done and done better? In my mind, Copernicus wasn't a scientist, at all. Eventually being right doesn't make one a scientist.

The same applies to Rachel Carson, author of *Silent Spring*. She began in marine science, but quickly moved to anti-pesticide activism when a friend of hers published a description of birds found dead on her land after *DDT* had been oversprayed, making the claim (it turns out erroneously) that the *DDT* killed them. Carson began collecting "evidence" (all anecdotal) of the dangers and harm of pesticides. The industry was celebrating maximal crop yields by eradicating pests, claiming (truthfully) that hundreds of millions were being fed because pests were not killing and eating a portion of the crops (that number is now in the billions of people today).

About the only part of what she said that proved to be correct was that *DDT* was having an effect on certain birds: *DDT*, when attached to dirt and transported by river to a deep bay, could be converted slowly into *DDE* by bacteria, bioaccumulated, and prey birds would eat the fish. The *DDE* interfered with the egg-shell deposition mechanism, resulting in egg shells so thin the parents would crush the shells. So based on the scary stories, the U.S. government banned *DDT* use in the U.S. Had there been more time, alternatives could have been found (they have been found now, but it's a bit late to control the fire ants when they first entered the US) in pesticides like bifenthrin. And there is talk now about using *DDT* again, this time in a more controlled way (which is what should have happened back in the 1970s).



The herbicide *2,4-D* suffered a similar fate, but some quick work by chemists showed that the "toxic" aspects of *2,4-D* mixtures was the presence of a contaminant *2,4,5-T* when *2,4-D* was poorly synthesized. But that's another story.

No matter, for Rachel Carson the damage had been done, and the pesticide and herbicide industries had a lot of work getting back into the field and into the store. But the organic movement was created from this book, and the expenses. What the book really accomplished was to make the food more expensive for those who couldn't measure risk well.

The funny thing is that *Discover* magazine named it one of the top 25 science books, and it had no science in it!

Also see my blog post on the [Return of Natural Philosophy](#).

<sup>1</sup>Bernard Goldstein, "Copernicus and the Origins of the Heliocentric System," *Journal for the History of Astronomy*, **2002**, 33:219–235. As Goldstein notes (p. 221), this motivation is consistent with Noel Swerdlow's classic mathematical account of Copernicus's derivation of the heliocentric model from the eccentric model of the second anomaly for the inferior planets found in book 12 of Regiomontanus's *Epitome of the Almagest*.

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Revision #2

Created 3 October 2023 13:26:46 by bruce

Updated 3 October 2023 13:35:54 by bruce