What the Hell does Thomas Kuhn Have to do with Conspiracy Theories?

Thomas Kuhn is a giant of modern philosophy of science, and also a bit of a gateway philosopher for physicists. A giant of mid-century philosophy, Kuhn popularized the idea of a paradigm shift[1], that is an abrupt and not logically determined shift in popularity from one scientific theory to a replacement theory. Kuhn also introduced a broader description of how scientific communities self-organize and settle on consistent theories. For decades, basically everyone in philosophy who wants to talk about how scientists actually practice science have had to content with his ghost. In my personal opinion, a tempered interpretation of his theory is still a very good description of how physics works and what motivates physicists. For better or worse, paradigm shifts are now integrated into the language and mythology of physics research and history, and have found broader descriptions in social sciences, including history.

In fact, a history class was where I was first introduced to the terminology, to explain Kuhn's famous example of the Copernican revolution. They're usually taught as a radically strange experience, something that the average person can't imagine. To me this was rather strange, because, sixteen and as intellectually cocky as you can get, I already had a couple under my belt.

Kuhn intellectually "grew up" in the heyday of messy quantum field theory descriptions and the emergence of condensed matter as a practical output of quantum mechanics, a theory whose philosophical weirdness was becoming less of an interesting outstanding question and more of an embarrassingly stubborn problem. So, the unspoken background questions to his work include "hey, what happens when your theory is really useful, but we don't have a consistent interpretation?" "Can we still use it?" "What happens if we have competing alternate descriptions of the same physical phenomena[2], is there some value to having both?"

[1] Kuhn used 'paradigm' in at least two distinct ways in the structure of scientific revolutions. What I mean by 'paradigm' would be a 'disciplinary matrix' in later Kuhn

[2] "phenomena/phenomenon" is a word I'm going to use to avoid being precise about whether scientists study real objects, or observe the behavior of some object. We do this is because sometimes we like to define things in science without being sure they exist. A Phenomenon can be a thing we think really exists, like a giraffe, or it can be a behavior/pattern we describe in the world, like a giraffe decapitating a lion. For example, an electric current is a phenomena. Now we're sure it comes from electromagnetic field interactions, and we describe it as a flow of charged particles. However, we thought about electric current before we were sure that charged particles existed, and way before we could manipulate them in laboratories.

The other really big question that matters here is "is science actually objective if there are competing explanations for a phenomenon?"1 The formal word for this in philosophy is the problem of underdeterminism, but it can be stated quite simply. Sometimes in science, we have two or more possible explanations for why something works the way it does. For example, the miasma ("bad air/bad vapors") theory of disease versus germ theory. There were decades where which theory you believed could be a matter of who trained you and what your personal preferences were.

Kuhn's points are essentially: (1) scientists don't throw away good theories because of one or two small problems, instead whenever problems or points of confusion emerge in a theory, people try to work our solutions from within the theory. (2) Theories are embedded in a scientific community, important classic problems, and some underlying assumptions. New researchers are trained up in this "paradigm"2 and will by default continue to use it. (3) Iif you study a theory enough, eventually more serious problems emerge, "anomalies" that just really don't make sense. Eventually a competing theory will emerge to explain it, and if the new theory can explain both the anomalies and explain why the old paradigm was useful, then eventually it will overthrow the old theory, in a "paradigm shift". Bonus points if this yet unknown theory solves some outstanding puzzles within the field.[3]

Time for an example. If you're a physicist in the 1910's, then Einstein's special relativity is a nice theory with some useful features but doesn't have very strong evidence. And Newtonian gravity has worked for hundreds of years, why throw away a successful theory on what is basically just a mathematically nice guess? However, Einstein's theory has some novel predictions. Both Newtonian physics and General relativity predict that light will bend around a massive object. But the amount that starlight will deflect is different in each theory, and in 1919, a solar eclipse allowed Arther Eddington and collogues to measure light deflection around the sun. Einstein's theory could better explain the experimental evidence, boosting the theory's popularity. Equally importantly, all of Newtonian physics is a special case of special relativity, so special relativity allows us to keep using all the useful Newtonian physics, while explaining new ideas.

There's a lot to like here. Kuhn explains why scientists think so differently about the same phenomena, like why electrons in quantum field theory have such a different explanation than in experimental electromagnetism. He explains why we might use a theory, even if we know it has some outstanding problems. "Quantum gravity" is the holy grail of modern theoretical physics,

[3]Somewhat relatedly, particle physicists actually want the current paradigm, the standard model, to be overthrown, but so far it has been stubbornly consistent.

and at its simplest, it's the paradigm which explains how two dominant theories, general relativity and quantum field theory, fit together. But no one is going to stop using GPS systems which rely on general relativity, or MRI machines, which rely on QFT, just because of a few anomalies.

To twentieth century rationalists trying to justify why the rapidly expanding system of science produced trustworthy knowledge, "which theory you decide is the most reasonable one to study is a matter of taste" is not a particularly comforting message. Kuhn figured out a way to make this palatable to historians and philosophers of science, by arguing that even if individual scientists chose between competing theories with a combination of training, personal biases, and scientific community consensus, scientific communities could still be objective.

However, Kuhn has always been a bit controversial. Philosophers find his writing hyperbolic and frustrating, not to mention overfocused on natural sciences. He's been accused of being too focused on the individual researcher, and a narrowly defined and optimistically "pure knowledge" focused researcher at that. Even worse, he's prone to sloppy definitions and grand emotional language. Paradigm shifts are in Kuhn's understanding, emotionally wrought and sometimes impossible intellectual transitions. They are drastic and often swift change which comes not from rational reflection, but a choice to see the world differently. They are a choice to prioritize different evidence, different definitions of phenomena, to (maybe literally) "see the world differently". Directly, "the transition between competing paradigms cannot be made a step at a time, forced by logic and neutral experience...it must occur all at once (though not necessarily in an instant) or not at all." (Kuhn 1962)

And all that sounds, well, rather like a religious conversion. Which is why it's a popular way to talk about the Copernican revolution. And why, if you happen to need to explain how you got out of religious (or non-religious) pseudoscience, Kuhn comes in handy.

First, Kuhn doesn't draw a sharp distinction between the rational processes governing the development of scientific and non-scientific beliefs, instead saying "If these out-of-date beliefs are to be called myths, then myths can be produced by the same sorts of methods and held for the same sorts of reasons that now lead to scientific knowledge" (Kuhn 1962). Second, when one has poured years of belief and effort into a pseudoscientific belief, then one has a lot of re-arranging to do. Kuhn gets this: "Within the new paradigm, old terms, concepts, and experiments fall into new relationships one with the other. The inevitable result is what we must call, though the term is not quite right, a misunderstanding between the two competing schools." (Kuhn 1962)

Within Kuhn (irrespective of whether Thomas Kuhn would himself like to be read this way), there is room for compassion for the rationality of pseudoscientific reasoning, and the difficulty of leaving it, while embracing the superior social and epistemic benefits of mainstream science.

It's easy, from the outside to shake one's head at something like young earth creationism, which contorts geological observations and nitpicks at small anomalies or unresolved questions in evolutionary biology to claim that the earth is 6000 years old. It's harder to do that at age seven, when all the trusted adults in your life tell you that Genesis is a chronologically accurate history of the world, or age ten, when evolution is a cool conspiracy theory that God wants you to fight at every turn. Or at 14, when your biology textbook has a chapter on why evolution isn't true that you read, with the vague sense of unease that perhaps this is all too much work. But vague unease only gets you so far - I didn't give up young earth creationism as a teenager because I was a biology prodigy. Instead, the theological and philosophical commitments of young earth creationism all got to be too much.

Young-earth creationism was part and package of a hyperliterally evangelical paradigm that asked too much of me. To buy into young earth creationism, I had to believe a hyper literal reading of Genesis, which meant that I was ontologically lessor than any male Christian and eventually would have to allow my will and choices, even over my own body, to be subsumed by a husband's. I also had to believe that the entire scientific establishment was either incompetent or involved in an organized conspiracy and well, I like vaccines and modern medicine too much for that. Whereas dropping young earth creationism opened me up to the whole of scientific exploration – to understand why biology isn't perfectly designed, to revel in just how massive the time and energy scales of the universe are and eventually led me to the beatifically quirky statistics of quantum mechanics.

The messiness of paradigm shifting – the drama, emotionality, subjectivity, are precisely why a 20th century philosopher of science has something useful to say about conspiracy theories. Kuhn's paradigms explain all of it – why I left without strictly rational reasons for doing so, and why I have so much intellectual joy from leaving. I left an emotionally taxing and intellectually costly paradigm for one which gave me room to understand the world better. Not because I couldn't think, as a conservative teenager, but because I wanted to see the world differently.

This gets at something missing from science communication aimed at "debunking" conspiracies. Systems of belief govern people's acceptance of science, and systems of belief are not simply a collection of debatable facts. Sometimes, people are drawn, or born, into a complex web of religious and cultural presuppositions which make accepting vaccines, evolution, or a round

earth unpalatable. Facts alone do not draw someone into pseudoscience, and facts alone can usually not shake them out of it again.

We can and should push back against science conspiracies, but science communication which plays whack-a-mole debate with conspiratorial arguments is ineffective. Science, when at its best, has a wonderful ability to enrich the lives of everyone, not just everyone who knows the science on the level of a practitioner. We should not dismiss the epistemic merit of anyone who falls into a pseudoscientific belief. Instead, we can strive to offer an accessible, expansive view of science so that anyone caught in those webs can look up and decide that the grass is greener beneath a sky full of ancient stars.

References

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