Review of The Structure of Scientific Revolutions
By Thomas Kuhn
University of Chicago Press, 1962

1. To establish the credibility and ethos that Kuhn has for the area of knowledge that he is interested in, Thomas Kuhn studied physics at Harvard, and then later on studied theoretical physics. It was while he was working towards his doctorate and teaching a class, he had to dig into scientific history; this so undermined his views of the nature of science that he moved into the field of the history and philosophy of science. This just shows that he has a very important idea to express to the world.

2. Back then, Karl Popper's Falsification idea expressed in his work The Logic of Scientific Discovery was dominant, whereby he stressed the distinction between real science and pseudoscience being the first tries to proves its theories false while the other strives to prove its theories right; this Popper argues is the main reason why science is so successful in that it is rigorous and effective in creating useful knowledge. Popper is arguing that scientists and science are always critical, and critical here means not taking things for granted for two very important reasons: to avoid making mistakes as well to make progress. Most are in agreement with this idea, but not Kuhn.

3. Kuhn thinks that if science is indeed always critical, then why do scientists take so many things for granted? For example, as a chemist, the chemist takes the accumulated knowledge of chemistry for granted such as the periodic table, without questioning its legitimacy, which is what a critical profession should be doing; A chemistry student is taught to just to memorise some chemical compounds. The ability to just take things for granted reflects the reliability and trust that the knowledge accumulated is robust, which Kuhn argues that it's not a bad thing, as this enables scientists to make further progress and focus only on the research question at hand. But this also goes to show that our claim of science being critical (as how Popper portrayed) is skewed and should be abandoned.

4. Kuhn was concerned with the convention that science (and subsequently knowledge) is a linear accumulation of facts. But rather in his own observation, he realises that this is quite the contrary of how major advancements are actually being made in science. Most of the advancements made in science Kuhn posited, is through revolutions in what he notably terms as a "Paradigm shift". He argues that new science can be seen as the replacement of one worldview with another. For example, Aristotle's Laws of Physics penned down during the Ancient Greece's time shouldn't be viewed as simply "bad Newton". Newton's Laws of Physics entirely replace the worldview of knowledge particularly science, rather than an outcome of a hypothetical linear progression of what Aristotle established. Hence, a Paradigm shift.

5. Kuhn went into further detail by demarcating four phases of science: The pre-paradigmatic phase that only happens once before every scientific revolution, The Normal Science phase, The Crisis phase and lastly the Scientific Revolution

phase. According to Kuhn, Normal Science is defined as the existence of a paradigm whereby theories, concepts, methods and so on are being taken for granted by the scientific discipline. This is the science that students study, and scientists trust this paradigm, and the main scientific activity can be seen as solving scientific puzzles within this paradigm.

6. The pre-paradigmatic phase is the phase before there is a paradigm. Every scientific discipline starts out without any shared concepts, theories or methods. The first historian didn't have any common way of writing history. Due to this absence of a commonly-shared body of knowledge (eg. terms, technical vocabulary, perspectives), there is no way for knowledge to be created in a unified way, thus we can deduce that in the pre-paradigmatic phase, every individual scientist or historian started off individually and there was almost no way of communicating the ideas similarly. When they do convene, they try to argue for their case while putting others down, which is the opposite of falsification. Pre-paradigmatic phase doesn't look anything like the normal science and everyone's starting from scratch, as there's no common assumptions or unified standards. They can't build upon one another's results, hence why Kuhn thinks it's a good thing for the scientific discipline to have knowledge to built upon, or in other words things to take for granted.

7. When scientists fall in line with one idea, then we can move on from the pre-paradigmatic phase into a paradigm, which is normal science. For example, Newtonian Mechanics sparked a paradigm for all scientists to fall in line and have something to commonly agree on and no longer to be critical about to solve detailed problems. The important thing to note is that paradigms don't last forever, and things don't always exist as normal science. Hence Kuhn introduced the concept of an "Anomaly": A problem within the paradigm that scientists are at present unable to solve. So long as the confidence of scientists on the paradigm is still strong, the phase will remain at normal science. But once there are many anomalies, scientists would begin to lose confidence in the paradigm when they fail to solve many puzzles within the normal science.

8. Scientists would begin to doubt if they can ever solve these problems within the current paradigm. When that happens, we begin to enter the phase of Crisis. Crisis is when scientists start doubting their current paradigm. They wonder if it should be changed, and become interested in radical new ideas and theories. They begin to become critical and start "thinking out of the box" and the more radical the new ideas are being taken seriously. The longer a crisis last, the more critical scientists become.

9. There are two possibilities to end a crisis: 1) Most of the puzzles are solved within the paradigm, then things revert back to normal science. 2) The scientific community begins to embrace a new paradigm and abandons the old paradigm, then we've reached the fourth phase of science: Scientific Revolution.

10. Scientific revolutions are when the second more radical possibility takes it course. Historically, the Darwinian revolution in Biology, the Copernican Revolution in

Astronomy, The Chomskian revolution in Linguistics. These are the most noticeable moments that defines a discipline for decades or even for centuries to come. Because of that, people often think that science consists of revolutions, which is a very critical activity. But in fact, Kuhn posits that scientific revolutions are exceptions to the rule, not the rule. The rule is normal science itself, where scientists are not critical about things to make progress. Most of the real detailed solving of problems is done by normal scientists during normal science. Until normal science gets stuck, then only the paradigm is revised again.

References

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