

The Foundational Principles of Science

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What is “Science?”

In the 1964 United States Supreme Court case *Jacobellis v. Ohio*, Justice Potter Stewart wrote a short, concurring opinion in which he grappled with the difficulty of defining “obscenity.” In what have become famously quoted words within the legal community he wrote, “I shall not today attempt further to define the kinds of material I understand to be embraced within that shorthand description, and perhaps I could never succeed in intelligibly doing so. But I know it when I see it, and the motion picture involved in this case is not that.”¹

Needless to say the “I know it when I see it” standard did not prove to be particularly helpful in legal circles when determining what ran afoul of obscenity laws. Nonetheless, the difficulty in taking something that many people intuitively recognize and boil it down to a strictly worded definition may tempt us all to resort to Justice Potter’s solution. To some extent, arriving at a definition of “science” is just such a case.

Del Ratzsch acknowledges that there is no “standard, accepted definition” of “science.”² For one thing, there are an enormously wide number of disciplines that have been, at least to some extent, referred to as “sciences.” Colin McGinn asks, “Aren’t anthropology, sociology, social psychology, and economics precisely sciences of human culture in a broad sense?”³ Ratzsch however is primarily concerned with “natural science,” which deals specifically with the study of the natural world.

¹ *Jacobellis v. Ohio*, 378 U.S. 184, 197 (1964).

² Del Ratzsch, *Science & Its Limits: The Natural Sciences in Christian Perspective* (Downers Grove, IL: Intervarsity Press, 2000), 11.

³ Colin McGinn, "The Science of Philosophy," *Metaphilosophy* 46, no. 1 (January 2015): 89.

In attempting a definition of natural science, Ratzsch identifies three characteristics upon which such a definition must be based: the empirical, the objective and the rational. Utilizing these three concepts which he argues are integral to science, Ratzsch proposes the following definition:

A natural science is a theoretical explanatory discipline that objectively addresses natural phenomena within the general constraints that (1) its theories must be rationally connectable to generally specifiable empirical phenomena and that (2) it normally does not leave the natural realm for the concepts employed in its explanations.⁴

The Necessary Presuppositions of Science

However, even these three defining characteristics are inadequate, in and of themselves, to fully explain “natural science.” After all, any such science must also be built upon certain presuppositions before it can even begin. Scientists, for example, must assume that nature is intelligible, that it is uniform (i.e., what we observe on a limited scale can be extrapolated to a larger one), and that we can discern facts about unobserved entities (whether due to their scale or the fact that they occurred in the past) based upon those things we are capable of observing.⁵ For the naturalist these presuppositions must be taken simply as “brute facts” since they are fundamental presuppositions of nature and naturalism does not accept anything beyond nature by which to justify them. However, on a Christian worldview these presuppositions can be grounded in the nature of God and His creative act.

⁴ Ratzsch, *Science & Its Limits*, 13.

⁵ *Ibid.*, 14-15.

For example, why should nature be intelligible at all? If all of nature is the result of unintelligent causes, then why does it exhibit patterns, regularity and uniformity?⁶ If we come across a series of coins which are all neatly divided based upon their denominations (i.e., pennies, nickels, dimes and quarters) and stacked in columns of ten each, will we assume they became that way through an intelligent or an unintelligent cause? Order can be philosophically grounded in intelligence, and the operation of the universe exhibits order. Thus, if God exists, and if He created this universe, we should expect to find it to be orderly because it was created by an orderly mind.

If God is not just a deistic entity who created the universe then left it alone, but rather one who cares for us and wants us to be able to learn about Him, then the principle of uniformity may also be grounded. Scientists assume that the data we receive from our small corner of the universe can inform us about the operation of those corners we cannot see. But why should this be so? If this universe is the creation of a loving God, it is reasonable to conclude that He would not deceive us. He would not set up our observable environment in such a way as to point us toward false conclusions about the universe as a whole. If He truly wants to foster our learning, He would reasonably be expected to create a universe in which the principle of uniformity applies.

Thus, the Christian theist does not need to stop at these presuppositions as merely brute facts, but can dig even deeper and ground them in the nature of God.

Positivism and the Traditional View of Science

⁶ Ibid., 15.

By the “traditional conception of science,” Ratzsch is referring to view that was “dominant from the seventeenth century until the mid-twentieth century.”⁷ Finding its origin in the thought of Francis Bacon (1561-1626), the traditional view held that objectivity was ensured by collecting and organizing data in a manner free from all prejudices, empiricity was preserved by relying solely upon the empirical data, and rationality was protected through the dependence solely on the logical process of induction.⁸ Positivism, however, took these aspects of the traditional view to the extreme, especially in the realm of empiricity.

For example, Ratzsch explains that the positivist movement amounted to “an attempt to reduce all knowledge to scientific knowledge, all truths to empirical, scientific truths and all methods of knowing to empirical, scientific methods.”⁹ It adopted the “verifiability criterion of meaning,” which stated that “no statement is even meaningful unless either it is in principle possible to empirically verify it (or at least to test it) or else it is ‘analytic.’”¹⁰ In the area of rationality, positivists expended significant effort in the realm of probability theory, attempting to evaluate the probability of a particular theory being true given the available evidence.¹¹

Unfortunately for the positivists, the foundation upon which their philosophy was based (the verifiability criterion of meaning) was unsupportable. First, it is self-defeating. The criterion itself is not capable of being empirically verified nor is it analytic. If we were to adopt the verifiability criterion of meaning, we would be forced to conclude that the criterion itself is

⁷ Ibid., 17.

⁸ Ibid., 18.

⁹ Ibid., 28.

¹⁰ Ibid.

¹¹ Ibid., 29.

meaningless. Second, the necessary presuppositions of science discussed above also cannot be empirically verified, nor are they analytic. Yet without them the practice of science cannot take place. Thus, the criterion would undermine the very thing it is seeking to rely upon for knowledge.

Karl Popper, the Demarcation Question & Falsificationism

Karl Popper (1902-1994) rejected the verifiability criterion of meaning. However, if statements outside of those included in that criterion could be meaningful, it raised a significant “demarcation question.” As explained by Ratzsch, “exactly what constituted the criterion for distinguishing what was genuinely scientific from what was not?”¹²

For Popper, the answer to this question lay in the alleged impossibility of induction. The positivists had held that if a theory carried with it certain implications, and those implications were empirically verified, then this provided some degree of confirmation of the theory. Popper, however, observed that this committed the logical fallacy of affirming the consequent. Furthermore, merely confirming some of the logical implications of a theory would not be enough. After all, later discoveries could show that other necessary implications were false, and it is a practical impossibility to test every possible implication. Therefore, Popper rejected the notion that any scientific theory could ever be proven true.¹³

While he rejected the possibility of proving theories true, Popper did believe that theories could be shown to be false. If the empirical data failed to support a necessary implication of a theory, then that theory, according to Popper, could not stand. This, then, is how he answered

¹² Ibid., 33.

¹³ Ibid., 33-34.

the demarcation question. Popper's view, according to Ratzsch, was that a "theory, hypothesis or other claim might be meaningful and important, but it was genuinely *scientific* only if it was empirically falsifiable or testable – that is, only if data could at least in principle contradict it and show it to be false."¹⁴ But this extends beyond mere theories. If falsification is indeed the line of demarcation for something to be truly "scientific," then in order for empirical data to be truly scientific, they too must be capable of being falsified. But on what basis can scientists accept or reject data? Popper explained that there was an inevitable element of human choice present in the scientific endeavor. The process of testing a theory is dependent upon certain "statements," and those statements in turn are accepted or rejected based upon human decisions.¹⁵

While Ratzsch will go on to argue that Popper's falsificationism as a whole fails (because it is impossible to ever truly show a theory to be definitively false), Popper's observation that the scientific enterprise includes an element of human choice is a significant consideration in the evaluation of theories, including the study of creation science and intelligent design. As Ratzsch suggested in his proposed definition, natural science "normally does not leave the natural realm."¹⁶ But if a scientist comes to the table with a naturalistic worldview, the definition changes from something that "normally" does not leave the natural realm to a discipline that may "never" do so. This is a human choice, and one that will shape what data is collected, the manner in which it is organized, and the types of interpretations that are drawn therefrom.

As such, as much as possible it is essential to take a researcher's worldview-related presuppositions into account when evaluating his or her conclusions. Someone who allows an

¹⁴ Ibid., 35 (emphasis in original).

¹⁵ Ibid.

¹⁶ Ibid., 13.

open door to the possibility of theism, for example, will be open to different interpretations than one who does not. The data themselves, in isolation, do not require a naturalistic interpretation. Rather, choices on presuppositions that are brought to the scientific inquiry in advance dictate such interpretations, even when they otherwise would not appear to be the best explanation for the evidence.