

The Barrier View: Rejecting Part of Kuhn's Work to Further It

Thomas S. Kuhn's *The Structure of Scientific Revolutions*, published in 1962, spawned decades of debate regarding its assertions about the nature of scientific paradigms that describe how science and scientists operate.¹ In the book, Kuhn states that a paradigm is a base of shared theoretical and methodological belief systems facilitating future scientific work in selection, evaluation and criticism² (Kuhn 16-17).³ Kuhn explains that new paradigms can replace old ones when scientists logically realize a new truth.⁴ However, this realization can be delayed for a long period of time, upwards of several hundred years, due to a logical gap between the paradigms.⁵ Howard Margolis, in his book *Paradigms and Barriers*, rejects this part of Kuhn's argument. Margolis states that⁶ habits of the mind define paradigms⁷ and while logical gaps may exist between new and old paradigms, the real obstacle to⁸ paradigm shift is the barrier caused⁹ by those habits of the mind. Margolis provides several examples in support of his theory that Kuhn's theory could not adequately address. While Thomas Kuhn's theory of the nature of scientific revolutions was revolutionary itself, certain parts of it are not as logically sound as the theories Howard Margolis presents in *Paradigms and Barriers*, and¹⁰ for that

¹ This sentence is a little wordy at the end. I'd write "...assertions about how science and scientists operate" and then introduce paradigms in the next sentence.

² Okay, but what does all that mean? What are "theoretical and methodological beliefs"? "Selection, evaluation, and criticism" of what?

³ You should use footnotes, not parenthetical citations, and have a bibliography.

⁴ What do you mean by "logically realize"? You mean "discover"? What sort of "new truth"? Is it that they acquire some new evidence that contradicts the current paradigm?

⁵ What do you mean by a "logical gap between the paradigms"? I have no idea what this is supposed to mean. Do you mean merely that the paradigms are different ways of thinking about things? That's true by definition.

⁶ I'd insert "certain" for clarity.

⁷ Comma needed.

⁸ "a paradigm shift" or "paradigm shifts"

⁹ "created" would be a more appropriate word here.

¹⁰ This is a very long sentence. I'd separate it here (i.e. "...*Paradigms and Barriers*. For that reason,...").

Regardless of what they taught you in high school, your thesis statement need not be a single sentence if making it so is too awkward.

reason, Margolis' ideas reject some of Kuhn's¹¹ but only to modify and further build on Kuhn's ideas.¹²

Thomas Kuhn's main argument in his famous work is the existence¹³ of paradigms to describe the working of science in history and in the future. Prior to the¹⁴ publication, paradigm¹⁵ was not a word used to describe science; Kuhn coined the term himself.¹⁶ He describes a paradigm as an "implicit body of intertwined theoretical and methodological belief that permits selection, evaluation and criticism"¹⁷ (Kuhn 16-17). Paradigms are generally accepted belief systems by which scientists operate and study a particular field in order to achieve progress in that field.¹⁸ Without this base of assumed knowledge, scientists would be forced to waste much time laying the groundwork before they could even get to research that would progress¹⁹ the field.

Once a paradigm is established, scientists are free to use "normal science," the exploration of the details of a paradigm, to further understand a branch of science. However, when observed data gathered in²⁰ normal science overwhelmingly contradicts²¹ the current

¹¹ Comma needed.

¹² Your thesis statement ought to be more substantive regarding what Margolis' objection to Kuhn actually is. Your thesis should not merely state *that* Margolis' theory is in some ways better than Kuhn's, but rather what about his argument is better. What are these "certain parts" of Kuhn that are logically flawed and to which Margolis presents better alternatives. Generally, your introduction needs work; by the end of it I have only a vague idea of what your thesis is.

¹³ "...main argument...is the existence": ungrammatical. One argues *for* the existence of something.

¹⁴ "its"

¹⁵ When referring to a word itself in writing, the word should be in quotes: "Prior to its publication, [the word] 'paradigm' was not...."

¹⁶ He did not. The term had been around previously, mainly in linguistics. He merely appropriated it to refer to these "broad theories" in his theory of science.

¹⁷ You paraphrase this very closely in your introduction, so closely that it is bad form not to just quote him directly. I would leave the paraphrasing of this quote out of the introduction, replacing it with a more straightforward definition like the one you give in the next sentence (see note). This quote is arguably not helpful here either, but you can leave it as long as you provide clarification, as you do in the next sentence.

¹⁸ Good, *now* I know as a reader what a paradigm is. Put this, or something like it, in your introduction.

¹⁹ Please, please do not use "progress" as a transitive verb when you could just as easily say "advance their field."

²⁰ "through"

²¹ "data" is a plural noun. Therefore, "data...contradict"

paradigm, this sets the stage for the famous “paradigm shifts” and the scientific revolutions²² upon which Kuhn bases his book. A scientific revolution is a change in accepted ideas about a part of science when a new paradigm replaces an old one.²³ The shift from the theory of spontaneous generation to that of biogenesis is an example of a scientific revolution.²⁴ Kuhn makes it clear that scientists do not attempt to discover²⁵ revolutions and only do when they *accidentally*²⁶ observe data that contradicts the paradigm.

Once this view is accepted²⁷ one may wonder: why does it sometimes take so long for the revolution to take place once the data is available? In many cases, there is a time gap that occurs²⁸ between the observation of data clearly contradicting the established paradigm,²⁹ and the realization³⁰ and acceptance of the new one. To this, Kuhn argues that there is a certain logical gap that prevents the realization of a new paradigm.³¹ In this case, the paradigm shift may be delayed significantly and may take hundreds of years to be overcome.³²

Margolis’ views on paradigms are significantly different. While Kuhn states that paradigms are a shared base of theoretical and methodological belief systems,³³ Margolis argues

²² Redundant: a paradigm shift *is* a scientific revolution.

²³ Awkward sentence.

²⁴ This is a totally unhelpful example: I have no idea what the “theory of spontaneous generation” or the “theory of biogenesis” refer to.

²⁵ Revolutions are not “discovered.” They occur as the result of a discovery.

²⁶ I wouldn’t so much say “accidentally” as “incidentally,” that is, when they simply happen to observe such data. There’s a fine distinction.

²⁷ Comma needed between a dependent and an independent clause.

²⁸ “there is a time gap that occurs”: wordy and confusing.

²⁹ No comma.

³⁰ You use this word frequently and not always correctly. In particular, if when you say “realization of a new paradigm” you mean realization in its less common sense of “the fulfillment or coming into being,” as in “to realize one’s dream,” then the use of this word might be legitimate (though somewhat awkward). If, however, you mean “realization” in the more common sense (as you clearly do elsewhere) of “becoming aware of,” then this is the wrong word, grammatically and in terms of content. Paradigms aren’t things that independently exist and can be “realized” in the sense of “discovered.” They are theories, and theories are ideas that are “developed” or “created,” not “discovered.”

³¹ I still don’t know what you mean by a “logical gap.”

³² Wrong antecedent: here it seems what is “overcome” is the paradigm shift, but what you mean is that it may take hundreds of years for the *barrier* to the paradigm shift to be overcome.

³³ This is still merely a string of big words you have yet to clearly explain.

that paradigms are instead shared habits of the mind: “To put the point in the most extreme way: shared habits of mind are the only *essential* constituents tying together a community in the way that makes talk of sharing a paradigm fruitful” (Margolis 23). He states that habits constitute paradigms, and that it is nonsense to talk of a paradigm without shared habits of mind, as it would similarly be nonsense to “talk of a square without a perimeter” (Margolis 23). Margolis does not refute the importance of shared methodological and theoretical beliefs; instead he sees them as significant in describing many paradigms, yet not as what constitutes and defines them.³⁴

Margolis also differs in his reason for why scientists do not often discover scientific revolutions. Kuhn believed³⁵ that scientists worked within the parameters of a paradigm naturally and that it was essentially not in their nature to look for scientific revolutions. Margolis counters this, arguing that it is the same habits of mind that define a paradigm³⁶ prevent scientists from discovering a new one. All scientists in a field under a paradigm share similar habits of mind, and this influences the way they propose and conduct experiments and gather data. Since all scientists conduct their normal science activities in this mindset, they are naturally not prone to discovering data that would contradict the established paradigm.³⁷ Then how do scientific revolutions occur? Margolis asserts that paradigm shifts only occur when scientists realize a habit of mind that they have been operating on. Since all scientists share the same habits of mind in normal science, it is nearly impossible to be aware of them. Margolis

³⁴ I'm not following you in this paragraph. What exactly does Margolis mean by “habits of the mind” and how do they constitute paradigms? How are these “habits of the mind” distinct from Kuhn’s “theoretical and methodological beliefs”? Aren’t “theoretical and methodological beliefs”—what my basic assumptions are and how I go about thinking and working within them—the same thing as “habits of the mind.” Can you give an example of what Margolis means?

³⁵ Stick to the literary present tense: “argues that scientists work...”

³⁶ Word missing: “that prevent...”

³⁷ Again, I don’t see exactly how this is distinct from Kuhn’s view; this seems like just another way of saying almost the same thing—that scientists end up all operating under the same basic assumptions that circumscribe their methods and acceptable solutions.

compares this to a person's manner of speaking or gait; if not compared to others different from the person, how would the person ever realize the habit?³⁸ Occasionally, scientists do realize their error, and out of these newly realized habits of mind come new ideas that conflict with the old habit. Only then can ³⁹Kuhnian revolution occur and a new paradigm will⁴⁰ arise.

Margolis makes his most significant argument in regards to Kuhn's final assertion: that paradigm shifts may be delayed due to a logical gap that may take hundreds of years to overcome. Margolis, calling this argument of Kuhn's the "gap theory," rejects the argument that a logical gap prevents paradigm shifts from being realized. Instead, Margolis lays out a new theory to describe this phenomenon: "the barrier theory." Going along with his previous arguments, the barrier theory states that habits of the mind create a barrier to scientists that prevent⁴¹ them from discovering new paradigms.⁴² Like previously, the barrier is often notoriously hard to overcome due to it being difficult to notice ones⁴³ habits when there is no one else to compare to. This was especially true in some not-so recent history, in which there were often very few scientists in a given field. Without more scientists, it often took a very long time for any of them to discover the habit of the mind they were operating under, and even longer get past that barrier. Margolis asserts that scientists often had evidence right in front of them that could lead to a scientific revolution, but the barrier prevented the scientists from accepting the new idea. Kuhn's concept of a logical gap is not completely nullified however; it is just not the reason for the length of time before realization of a new paradigm. Logical gaps can and do exist in many situations, but in many instances, the gaps are insignificant once the

³⁸ Avoid rhetorical questions.

³⁹ Article missing: "a Kuhnian revolution"

⁴⁰ Ungrammatical: remove "will."

⁴¹ Subject-verb agreement: "barrier...prevents"

⁴² As I mentioned above, paradigms aren't so much "discovered" as "developed." Facts are discovered, theories are developed. In general, be careful about what verbs you're using.

⁴³ "one's"

mind barrier is broken.⁴⁴

In order to provide evidence for his barrier theory, Margolis looks to a few notable examples in history in which there was a long delay in the realization of a new paradigm. The most prominent example is Copernicus.⁴⁵ Copernicus was a sixteenth-century astronomer who proposed the heliocentric theory that the sun was the center of the solar system. In coming to this conclusion, which was revolutionary at the time, Copernicus used information that had been around for fourteen hundred years! Logically, the data clearly illustrates the claim⁴⁶ and it is shocking that no astronomer came to the conclusion earlier. Margolis proposes that the delay was not caused by a logical gap, but by a barrier from a habit of the mind that prevented the realization of heliocentrism. The same barrier affected the readers of Copernicus's book as well. It took another forty years before even Copernicus's peers were able to see the logic behind it. According to Margolis, this is another indicator of a cognitive barrier caused by the mind.

Another example Margolis uses to support his barrier theory is the origin of probability. Today, probability seems logical to nearly everyone; if you role a die enough times, the occurrence of each number is⁴⁷ will be approximately the same, giving you a one in six chance of rolling a given number each roll. Before probability was developed⁴⁸ however, habits of the mind prevented great mathematicians from being able to understand it. The great mathematician Fermat, who eventually helped develop the theory, could not even verbalize it to another mathematician for some time as he started to overcome the barrier. Margolis points out that the

⁴⁴ Again, since I don't know what you mean by a "logical gap," I don't follow you in this paragraph. How exactly is Margolis' view different from Kuhn's?

⁴⁵ "Copernicus" is not an example. The Copernican Revolution could be an example.

⁴⁶ Comma needed between two independent clauses.

⁴⁷ Remove "is."

⁴⁸ Comma needed.

basis for probability was established 2,000⁴⁹ years previously and it took until then for the simple logic to be realized. Surely the tiny gap in logic⁵⁰ did not cause mathematicians to be stumped⁵¹ for 2,000 years! Again, Margolis points to this as a clear cut example of a habit of the mind that was exceedingly difficult to discard of⁵² and caused an extremely long period to come before a new paradigm was finally realized.

While it may seem that Margolis' *Paradigms and Barriers* is a complete rejection of Kuhn's famed work,⁵³ it is in most cases simply a modification or even an interpretation. On what defines a paradigm Margolis even points out: "it is now almost thirty years since publication of Kuhn's *Structure of Scientific Revolutions*, yet debate is as unsettled as ever on the nature of paradigms, which suggests that some new way of thinking about the issue is worth trying" (23). That being said, it seems Margolis' modification of Kuhn's arguments is certainly superior. Through logical arguments and historical examples, Margolis' statements seem to point out and correct the flaws in Kuhn's thinking. It is important to note that the ideas in *Paradigms and Barriers* are far from being proven⁵⁴ or accepted as fact, yet it is doubtful that in the task of categorizing scientific developments, facts will ever emerge. Taken as that,⁵⁵

⁴⁹ Be consistent in your use of words vs. numerals to express numbers ("fourteen hundred years" vs. "2000 years").

⁵⁰ I would hardly call the difficulty of truly wrapping one's head around the notion of probability "tiny."

⁵¹ Wordy: just say "did not stump mathematicians..."

⁵² Remove "of." One does not "discard of" something; one "discards" it.

⁵³ It doesn't seem like that at all; indeed, as I said, it barely seems to differ at all.

⁵⁴ Proof only exists in mathematics!! Scientific theories, historical theories, etc. are never "proven."

⁵⁵ What is this phrase supposed to mean? It seems colloquial; remove it.

As I have made abundantly clear in my above notes, you have not at all clarified what exactly you mean when you discuss a "logical gap" between theories, what exactly these "habits of the mind" that Margolis discusses are, and what distinguishes the two. Since this distinction is at the heart of your argument, you fail to illustrate the exact difference between Kuhn's view of the difficulty of developing new paradigms and Margolis' view. Your examples are not helpful in this regard: you simply assert that there was not a "logical gap" between two paradigms, but rather that certain established "habits of the mind" were the barriers to progress, but since you neither clearly define these terms at the outset nor clarify what exactly they mean in your example cases (what exactly were the pre-probability "habits of mind"? What would it mean for there to be a "logical gap" between geocentrism and heliocentrism, if there had been one?), such assertions are uninformative. I also have my doubts about whether Kuhn's view of the difficulty of developing new paradigms can fairly be characterized as dealing with some "logical gap" between paradigms, though, since I don't know what exactly you mean by "logical gap," I really can't be sure.

Margolis presents a fascinating supplement to *The Structure of Scientific Revolutions* and leaves the door open for further expansion and correction, just like any paradigm would.