The Barrier View: Rejecting Part of Kuhn's Work to Further It[1]

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[2] how science and scientists operate. In the book[3], Kuhn states that a paradigm is a base of shared theoretical and methodological belief systems facilitating future scientific work in selection, evaluation[4] and criticism (Kuhn 16-17). Kuhn explains that new paradigms can replace old ones when scientists logically realize a new truth.[5] However, this realization can be delayed for a long period of time, upwards of several hundred years, due to a logical gap[6] between the paradigms. Howard Margolis, in his book *Paradigms and Barriers*, rejects this part of Kuhn's argument. Margolis states that habits of the mind define paradigms and while logical gaps may exist between new and old paradigms, the real obstacle to paradigm shift is the barrier caused 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*, and for that reason, Margolis' ideas reject some of Kuhn's but only to modify and further build on Kuhn's ideas.[7]

Thomas Kuhn's main argument in his famous work is the existence of paradigms to describe the working of science[8] in history and in the future. Prior to the publication, paradigm was not a word used to describe science[9]; Kuhn coined the term himself. He describes a paradigm as an "implicit body of intertwined theoretical and methodological belief that permits selection, evaluation and criticism" (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.[10] Without this base of assumed knowledge, scientists would be forced to waste much time[11] laying the groundwork before they could even get to research that would progress the field[12].

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 in normal science overwhelmingly contradicts the current paradigm, this sets the stage for the famous "paradigm shifts" and the scientific revolutions 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.[13] The shift from the theory of spontaneous generation to that of biogenesis is an example of a scientific revolution.[14] Kuhn makes it clear that scientists do not attempt to discover revolutions and only do when they *accidentally* observe data that contradicts the paradigm. [15]

Once this view[16] is accepted 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 occurs between the observation of data clearly contradicting the established paradigm, and the realization 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. In this case, the paradigm shift may be delayed significantly and may take hundreds of years to be overcome. [17]

Margolis' views on paradigms are significantly different.[18] While Kuhn states that paradigms are a shared base of theoretical and methodological belief systems, Margolis

argues 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[19], 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[20].

Margolis also differs in his reason for why scientists do not often discover scientific revolutions.[21] Kuhn believed that scientists worked within the parameters of a paradigm naturally[22] 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 paradigm prevent scientists from discovering a new one.[23] All[24] 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[24] scientists conduct their normal science activities in this mindset, they are naturally not prone to discovering data that would contradict the established paradigm. Then how do scientific revolutions occur?[25] 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 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?[26] 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 Kuhnian revolution occur and a new paradigm will arise.[27]

Margolis makes his most significant argument in regards to Kuhn's final assertion: that[28] paradigm shifts may be delayed due to a logical gap[29] 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.[30] Instead, Margolis lays out a new theory to describe this phenomenon: " the barrier theory." Going along with his previous arguments,[31] the barrier theory states that habits of the mind create a barrier to scientists that prevent them from discovering new paradigms. Like previously, the barrier is often notoriously hard to overcome due to it being difficult to notice ones habits when there is no one else to compare to.[32] 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[33] 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 mind barrier is broken. [34]

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. Copernicus was a sixteenth-century astronomer who proposed the heliocentric theory that the sun was the center of the solar

system.[35] 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 claim[36] 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.[37]

Another example Margolis uses to support his barrier theory is the origin of probability.[38] Today, probability seems logical to nearly everyone[39]; if you role a die enough times, the occurrence of each number is will be approximately the same, giving you a one in six chance of rolling a given number each roll. Before probability was developed however, habits of the mind prevented great mathematicians from being able to understand it. The great mathematician Fermat, who eventually helped develop the theory,[40] could not even verbalize it to another mathematician for some time as he started to overcome the barrier. Margolis points out that the basis for probability was established 2,000 years previously[41] and it took until then for the simple logic to be realized. Surely the[42] tiny gap in logic did not cause mathematicians to be stumped for 2,000 years! Again,[43] Margolis points to this as a clear cut example of a habit of the mind that was exceedingly difficult to discard of and caused an extremely long period to come before a new paradigm was finally realized[44].

While it may seem that Margolis' *Paradigms and Barriers* is a complete rejection of Kuhn's famed work, it is in most cases simply a modification or even an

interpretation.[45] 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.[46] 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 proven or accepted as fact, yet it is doubtful that in the task of categorizing scientific developments, facts will ever emerge. Taken as that, 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.[47]

1. "Rejecting part of Kuhn's work to further it" could be worded more clearly?
2. "that describe"—change to ",describing"
3. Change "in the book" to something less vague
4. Comma needed
5. Good, but maybe a direct quote from Kuhn would be useful?
6. Define what the "logical gap" is to make your ideas more clear
7. Overall, very good strong opening paragraph. Perhaps including an overview of how Margolis's theory is more logically sound than Kuhn's and stating how it builds on Kuhn's work.
8. "the working of science"? use more formal language
9. Its unnecessary to say that paradigm wasn't used to describe science if you state that Kuhn coined the term himself
10. Good quote and explanation of quote
11. Is laying the groundwork a waste of time? Maybe pick a different phrase…
12. "Progress the field" doesn't make sense... reword
13. Good defining terms/setting up the stage for the rest of the essay in this paragraph
14. Maybe start this sentence with a transitional phrase to make it flow better
15. It seems random to go from the sentence about biogenesis to this one. Perhaps include it earlier in the paragraph or put some sort of transitional sentence betwixt them.
16. Which view are you referring back to?

17. You don't discuss why this gap occurs… so far you haven't discussed much of your thesis or interpreted Kuhn's work, you've simply been summarizing and providing background information…although this is good, it may be too much.
18. This paragraph needs a more specific topic sentence
19. Maybe put the actual quote here?
20. Rephrase; the second half of this sentence does not make sense
21. How did Margolis differ in his reason for why scientists do not often discover scientific revolutions?
22. Needs a comma
23. There are way too many "that"s in and around this sentence
24. All?
25. Don't use rhetorical questions
26. Good example, use more
27. Don't switch verb tense in the middle of the sentence
28. You don't need the "that" here if you are using a colon
29. Explain this logical gap, to make your argument stronger
30. On what basis does he reject Kuhn's hypothesis?
31. Unnecessary clause
32. This sentence is generally awkwardly worded, get rid of the "like previously"
33. TO get past that barrier?
34. Good point, but you still need to fully define this "logical gap"
35. You could make this sentence into a subordinate clause of the last one to make it flow better
36. Comma
37. This last sentence is rather repetitive. Good examples in this paragraph though.
38. Consider varying your sentence structure in your introductory sentences to paragraphs
39. Generalizations like this make your argument seem weaker
40. Unnecessary comma
41. Needs a comma
42. Change "the" to "a" or "this"
43. "Again" is too informal, as is "clear cut"
44. Rephrase the second part of this sentence, doesn't make sense, but besides that…good examples of Margolis's theory in this paragraph and the one before it
45. Be sure that you are stating the same idea in your conclusion that you are in your thesis
46. Superior in what way? That it proves Kuhn's wrong
47. Good concluding paragraph, consider changing the last phrase to make it stronger, overall good analytical essay.