Words or Worlds: The Metaphysics within Kuhn’s Picture of Science

By

Justin Price

A Thesis presented to The University of Guelph

In partial fulfilment of requirements for the degree of Master of Arts in Philosophy

Guelph, Ontario, Canada

© Justin Price, May, 2013
ABSTRACT

Words or Worlds: The Metaphysics within Kuhn’s Picture of Science

Justin Price
Advisor:
University of Guelph, 2013

This thesis project establishes that there is a metaphysical theory underlying Kuhn’s work, and that it plays an important role in justifying his arguments regarding scientific theory change. Chapter 1 explains how this metaphysical theory has led to what I will call the ‘world problem’ within *The Structure of Scientific Revolutions*. It stems from the ambiguous use of the word ‘world’ and the problem is how one can account for either of its uses within *Structure*. In some cases it is used to refer to a single non-changing world and in other cases it is used to refer to a world that changes with a change in paradigms. In Chapter 2 it is argued that this problem has led to a dissonance between the critic responding to Kuhn’s work and the work itself, resulting in the critics’ arguments ‘talking past’ what is presented in *Structure*. This emphasizes the need for an adequate account of Kuhn’s metaphysical theory. Chapter 3 establishes that for Kuhn a metaphysical theory was vital to his continued work (especially regarding his response to the critics examined within Chapter 2) and how a robust account was lacking. Chapter 4 investigates what a more robust account would be by considering an inadequate solution and an adequate one.
Acknowledgements

Without the following people this thesis project would not be nearly at the quality it is now, if it would even be possible to begin with. Thank you Andrew Wayne, Peter Loptson, Stefan Linquist and Guelph’s wonderful philosophy department.
# Table of Contents

**Chapter 1: The Worlds Problem**

- The Metaphysical Issue  
  2
- The Fundamentals  
  5
- After Structures: Postscript  
  13
- ‘What are Scientific Revolutions?’  
  21
- Conclusion  
  24

**Chapter 2: Kuhn’s Critics**

- On the Very Idea of a Paradigm  
  27
- Kordig and Comparison  
  36
- Reason, Truth and Reality  
  45
- Conclusion  
  50

**Chapter 3: The Metaphysics of Incommensurability**

- Commensurability, Compatibility, Communicability  
  52
- The Road Since Structure  
  68

**Chapter 4: Solutions**

- The Hacking Solution  
  74
- Reconstructing the Worlds Problem  
  82
- Conclusion  
  90

**Bibliography**  
  95
Chapter 1: The Worlds Problem

The goal of the first chapter of my thesis is to provide a summary of Thomas Kuhn’s conception of science within his earlier work and the metaphysical problem that is apparent within it (Kuhn 1962/1970, 1981, 1983). Towards this goal, this chapter will include three parts. First, in order to provide a robust history of Kuhn’s thought I will provide a short explication of his views as found within the original Structure of Scientific Revolutions. I will be focusing chiefly on his thesis of incommensurability as that is the point where an analysis of the metaphysical implications of his work is most fruitful. Secondly, I will sketch how his thought has changed from Structure to the Postscript in the second edition and then in two later papers titled “What Are Scientific Revolutions” and “Metaphor in Science”. Kuhn’s change in thought is what can be called a ‘linguistic turn’, where in his later works he is more focused on the linguistic and semantic elements of paradigms. An important change to note is regarding his thesis of tacit knowledge within the practice of normal science, and what is implied by it. Kuhn provides a more robust account of this in his later work. In short, the tacit knowledge one learns when becoming a member of a paradigm amounts to learning the various likeness relations between the entities of that field. Lastly, during these explications, I will interpret what Kuhn seems to think regarding the metaphysics of his picture of science. A more robust claim coming from my own views, as well as others, will be the project of my fourth and final chapter.
The Metaphysical Issue

Within this section I will provide a short summary of the ‘different worlds’ problem which was mentioned. The problem originates in *Structure* and it can be summed up in several quotes:

> In so far as their only recourse to [the world of their research] is through what they see and do, we may want to say that after a revolution scientists are responding to a different world (Kuhn 1970, p.111).

> Though the world does not change with a change of paradigm, the scientist afterward works in a different world (Kuhn 1970, p.121).

> Even more important, during revolutions scientists see new and different things when looking with familiar instruments in places they have looked before. It is rather as if the professional community had been suddenly transported to another planet where familiar objects are seen in a different light and are joined by unfamiliar ones too (Kuhn 1970, p.111).

This description of scientific revolutions as something which affects the scientist so pervasively that it is ‘as if’ they exist in a different world is primarily contained in the tenth chapter in *Structure*. The goal of my thesis is to make sense of these remarks, because as they stand they are vague and metaphorical. Kuhn himself admits later on in *Structure* that the sense of the word ‘world’ needs further explication, and that it is an important part of his theory of paradigm change and incommensurability: “...the third and most fundamental aspect of the incommensurability of competing paradigms. In a sense that I am unable to explicate further, the proponents of competing paradigms practice their trades in different worlds” (Kuhn 1970, p.150). The problem in short is that the word ‘world’ is used to both describe something independent of the scientists and their paradigm, and also something which is dependent on the paradigm. His usage of the second sense is illustrated by the quotations before this; earlier in *Structure* more examples of Kuhn using the first sense of ‘world’ can be found. “The scientist must, for
example, be concerned to understand the world and to extend the precision and scope with which it has been ordered" (Kuhn 1970, p. 42). This sense of the word ‘world’ suggests something that is common to all, scientists and non-scientists, and it suggests something which has been ordered in a particular way. For example, for both the scientist and the non-scientist the moon regularly takes its place in the night sky and the preponderance of everyday objects furnishes the activities of everyday living. The other sense suggests that the world is affected by the paradigm scientific research operates within and includes the objects of scientific research. This sense of the world is the one within which the scientist works. There are a couple of examples Kuhn gives for this type of world, one of them involves Galileo and his experience of pendulums being very different from the experience of Aristotelian scholars regarding pendulums. “Nevertheless, the immediate content of Galileo’s experience with falling stones was not what Aristotle’s had been” (Kuhn 1970, p.125). This, and other such examples regarding the immediate experience of scientist, is what leads Kuhn to use the second sense of ‘world’. Its use is to refer to something populated by Galilean pendulums and other objects whose composition is somehow affected by the paradigm.

The first sense is used as a singular (e.g. ‘the world’) while the second sense can be used as a plural. This puzzling and ambiguous use of the word ‘world’ leads to what I will call the ‘different worlds problem’, and within the solution I will be answering questions such as: How can there be an unchanging world and multiple, changeable worlds? Simply using different words to refer to the different usage of the word ‘world’ is not going to solve this question because underlying their usage is an ontological posit. One posits the existence of an external unchanging world while the other posits a world
internal to a certain practice of science and is changeable. It is at least mildly confusing in how he uses both senses. What makes them both what we would call a ‘world’? It could be that they are both groupings of different kinds of objects (e.g. The objects of experience and the objects that our experience is caused by). Perhaps the paradigm-affected world is something privileged to science and the revolutionary nature of science is one that lends itself to a flux regarding its objects. But then where would that sort of world ‘end’ and the world of the everyday person, the common unchanging world, begin? For example, at what point does the difference between the objects of the scientific paradigms result in a difference in the ordinary objects of the everyday person. Science is not completely separate from the lives of the non-scientist; their research does affect how many go about their lives, through technology and also through what becomes common knowledge. For example, it is now common knowledge that the earth is not the center of the solar system. Does the Copernican paradigm now affect the objects of everyone’s world? Is the sun we now experience different from the sun the common person experience during the time of Ptolemy? The solution is important because it is intricately related to the Kuhn’s thesis of incommensurability. As Kuhn himself says in *Structure*, incommensurability is foremost a result of scientists working within different worlds. An elaboration of this problem and a proposed solution will lead to insights regarding the variety of ways that scientists can be said to work in paradigms.

Throughout this dissertation I will be referring to the first sense of world, the singular unchanging world, as world₁. The second sense of the world, the changeable world, will be referred to as world₂.
The Fundamentals

In order to illustrate the importance of the metaphysical problem, and pave a path towards a solution, I will first need to explicate some of the fundamental features of Kuhn’s picture of science. First is his characterization of the cumulative aspect of science, typically what he calls ‘normal science’, and what it means to become a practitioner of normal science. Normal science is the part of scientific work that is most like what philosophers of science previous to Kuhn pictured science. It is more or less a cumulative fact-gathering enterprise. Kuhn characterizes the work of normal science as puzzle solving and the goal is mostly to solve three classes of problems: “The three classes of problems – determination of significant fact, matching facts with theory, and articulation of theory - exhaust, I think, the literature of normal science, both empirical and theoretical” (Kuhn 1970, p.34). The most important aspect of this puzzle solving enterprise is that the aim is almost never to discover major novelties. The puzzle solving of normal science is governed by a set of rules contained within the paradigm the scientist is working within, such that the success of puzzle solving is different from one paradigm to another. There is also a sense in Kuhn’s work that the product of the puzzle solving is partly determined by the paradigm. It is the qualities of rule following and the tendency to reject puzzles that would lead to novelties that separates normal science from revolutionary science.

In order for one to be a practitioner of science one must learn to take part in this activity of normal science. It is a type of learning that Kuhn says cannot be entirely descriptive. No one can learn to do science from just a textbook for instance. Kuhn’s normal science is partly inspired by Wittgenstein’s idea of language-games when it
comes to the rules involved in practicing science. Much like how Wittgenstein says we cannot provide a full and complete list of the rules by which we apply concepts like ‘tree’ and ‘game’, Kuhn says we cannot apply a full and complete list of rules by which the scientist does his research. This assertion is motivated by two points for Kuhn.

The first, which has already been discussed quite fully, is the severe difficulty of discovering the rules that have guided normal-scientific traditions (Kuhn 1970, p.46).

The second... Scientists, it should already be clear, never learns concepts, laws, and theories in the abstract and by themselves (Kuhn 1970, p.46).

These two quotes illustrate the idea of holism when it comes to learning a paradigm, that nothing can be learnt in the abstract. It also illustrates the motivation for saying that there is tacit knowledge involved in the first place regarding the practice of normal science. He is basing it on his historical work on science, that the historian studying scientific tradition would find it very difficult to pin point a robust a descriptive set of rules that being within that tradition involve. It is partly this that leads Kuhn to his incommensurability thesis later on.

With regards to the second point, the laws, theories and concepts are learned in conjunction with their application. The student of science must at the same time as they read about these theories learn to apply them through problem solving. It is not by rules which these problems are linked but by some sort of ‘family resemblance’. This is how paradigms fundamentally guide normal research, through a sort of resemblance of the current puzzle solving to successful ones in the past. So, in learning to do scientific research, the student must become acquainted with this resemblance, and since it is not of descriptive nature, the student must learn by actually practicing science.
An important point to bring up at this time is that Kuhn does not seem to consider science something that can be done outside of a community. The belonging to a scientific community is essentially the sharing of a paradigm and it is suggested normal science cannot be done outside a paradigm. Although it does not seem necessary in a logical sense that science must be done within a community, I think Kuhn would probably say that whatever is done outside the community would not resemble science very much at all. It would not have the structure that a community working within a paradigm would provide; it would most likely be a rather spurious sort of science. The tacit rules which govern normal science are informed by the paradigm, to the extent that doing science according to these rules is an important part of being a member of a science’s community; at the same time, a sort of descriptive type of knowing these rules may not be as vital. By ‘descriptive knowing’ I mean a sort of knowledge that is analyzable to an extent and communicable. Kuhn makes a comment regarding this that pertains to future discussion. “[Some philosophers of language say] we must, that is, grasp some set of attributes that all games and only games have in common. Wittgenstein, however, concluded that, given the way we use language and the sort of world to which we apply it, there need be no such characteristics” (Kuhn 1970, p.45). My interpretation of this is that Kuhn believes that philosophy of language is informed by the ‘sort of world’ we use language in. The world in the sense that I’m suggesting he is using here is world\textsubscript{2}, the world that Kuhn thinks changes during a scientific revolution. Kuhn suggests here that given that sort of metaphysical theory, a certain theory of language is the result. Later in this thesis I will be discussing this relationship more in depth. The pervasive nature of the community is a quality of
Structure, and its role in the enterprise which these communities participate in has important roots in some sort of metaphysical theory.

This characterization of normal science as a community activity and the rule following that is important for its success indicate the pervasive and holistic nature of Kuhn’s paradigms. The common theme in the book is that the practice of science is holistic. This is especially true of the activity of normal science. It is essentially a self-contained enterprise and the learning of it must involve learning multiple things at once. For example, the learning of the descriptive content of theories must include learning how they apply. It is these aspects that lend themselves to a holistic understanding of what paradigms are for Kuhn. In order to preserve Kuhn’s idea of normal science within a metaphysical elaboration of his work, it is important to preserve this sense that paradigms are an interconnected web of theories, applications and rules where parts cannot be abstracted from the whole without some sort of loss (perhaps of meaning). Considering the essential interconnectedness within paradigms, one can begin to see how it might motivate him to describe their change as a change of worlds.

While Kuhn's picture of the cumulative aspect of science is relatively uncontroversial, his picture of scientific revolutions has led to a lot of controversy and has been the focus of most of the criticisms towards his work. I will now outline some of the central thesis with regard to his work on the revolutionary aspect of science in Structure and explain the importance a metaphysical elaboration has with regards to these theses. These theses can be summed up as the incommensurability of paradigms, the rationality behind paradigm choice and paradigm change as change of 'world-view'.

In regard to the incommensurability of paradigms in *Structure*, Kuhn claims that paradigms pose a barrier to communication and understanding such that in an important way one cannot wholly understand the language used in a different paradigm nor can they completely know 'what it is like' to be part of that paradigm after a revolution. These two reasons seem to be related, and in later literature Kuhn goes into more detail how they are related. As it is presented in *Structure*, the incommensurability between paradigms is a very deep notion of incommensurability. This is partly due to the interconnectedness of the elements that compose a paradigm. Since none of the aspects of a paradigm can be learned without the whole, neither can one talk meaningfully about parts of a paradigm in abstract. When a revolution occurs and a new paradigm is founded, the debate between the new and the old is essentially going to lead to communities talking past each other. Even though they may use similar terms, they are connected to each other in different ways. “Within the new paradigm, old terms, concepts, and experiments fall into new relationships with each other. The inevitable result is what we must call, though the terms are not quite right, a misunderstanding between the two competing schools” (Kuhn 1970, p.149). My understanding of Kuhn’s point here is that there is a part of the discussion between two competing schools that is not going to be completely understandable. For example, the sense of understandable here seems to be in the same sense that a paradigm’s tacit rules are not completely describable. One must be a member of the scientific community working within a paradigm to understand the rules involved, and continuing with the holistic theme of paradigms, also talk completely meaningfully with members of that community. Implied by his idea that the terms cannot be learned in abstract, the meaning of those terms
must rely on other elements of the paradigm. Since one must belong to the community of scientists researching under a paradigm in order to be a part of the paradigm, the community must also at least partly determine the meaning of terms. This of course leads him concluding that most of the time community members inhabiting different paradigms talk at cross-purposes and that, although it can be fruitful in some respect, debates regarding whether one paradigm is going to be successful or not will be inconclusive. Thus, this leads to the linguistic incommensurability of paradigms. Here, the word incommensurability means a sort of untranslatability, where an important part of the meaning of terms used within a practice of science cannot be communicated to those outside the paradigm.

In his infamous chapter ten of *Structure* Kuhn argues that scientific revolutions are not just a process of mere theory change but rather that most elements of the paradigm change in some fashion. The elements that compose paradigms up to this point have been described as things such as theories, laws, procedures, instruments, rules, terms, and concepts. Added to the list within the tenth chapter is experience. Not only are the meanings of terms different from one paradigm to the next, but the incommensurability between paradigms is so pervasive that the scientist's very experience is different. They are essentially talking about different phenomena when trying to use the same words. So, it is not only an incommensurability of language but also an incommensurability of experience. This seems to be one of the motivating factors when Kuhn uses the phrase 'world change' to describe paradigm shifts and why he would characterize scientific revolutions as changes of world-view. To illustrate his view of paradigm shifts he uses analogies to vision flipping goggles and gestalt switches
(it is an analogy he later rejects). The point he seems to want to convey through these analogies is the holistic nature of paradigms, that not even experience is separate from the myriad of paradigm-influenced elements in Kuhn’s picture. Unlike those examples, for the scientists within a paradigm, there is no neutral ground to step back to. Paradigms for Kuhn must partly determine experience, because if there were some neutral ground to be found within experience science would most likely be cumulative upon that foundation. Since science does not appear cumulative to Kuhn between paradigms, even experience cannot lend itself as a neutral ground. In his later works Kuhn goes on to distinguish certain parts of the experience of scientists which may be neutral (i.e. not paradigm dependent), but as far as Structure goes, paradigms determine the whole of a scientist’s work, from the apparatus to what they see in the apparatus.

From this determination come his controversial conclusions regarding the rationality of science. First of all, the choice between paradigms is not one that can be made in logical steps or from some neutral point of observation. The values of the scientists (at least in Structure) are primarily determined by the paradigm, so any recourse of rationality towards these values is not going to help one during the choice of paradigm. The point Kuhn wishes to make here is that there is no single one principle that will determine if the new paradigm is going to be more successful. Where it concerns entering a new paradigm from an old, the scientist might face a multitude of arguments that may convince him, but there is no ultimately calculable way to make the decision. “And even those arguments, when they come, are not individually decisive. Because scientists are reasonable men, one or another argument will ultimate persuade
many of them. But there is no single argument that can or should persuade them all" (Kuhn 1970, p.158). Kuhn is further motivating the holistic nature of paradigms. If there were one sort of rationality, or 'argument', for the success of a new paradigm then it would imply that there is a sort of paradigm-neutral grounds for evaluating them. This would lend itself towards a more cumulative picture of scientific activity, something which Kuhn is opposed to. The motivation for the scientist to embrace a new paradigm is mostly drawn from the problems of the old one; the anomalies which have lead the community to crisis. So, the rationality behind adopting a new paradigm is away from the problems of the old one and not towards a greater cumulative enterprise of fact gathering. Given Kuhn's commitments regarding neutral grounds, it makes sense that within his work that scientific rationality is something that proceeds first from the problems of the old paradigm. If it were any other way, it would suggest that science would be a cumulative activity. Thus the rationality of paradigm choice cannot contain some rigid sort of process guided by a few principles; instead, it is composed of a wide variety of motivating factors.

After considering what I have called the thesis of Kuhn's picture of revolutionary science, there is a central theme I wish to focus upon considering the metaphysical issue at hand. That theme is the 'resistance to neutral, rationality within the scientist's practice. Kuhn's incommensurability of meaning retains its depth because he purports there to be no theory-free language from which to derive our meanings. Terms are necessarily interconnected within the scientist's disciplinary matrix when it comes to their meaning. Also, there is no neutral ground to be found in experience to act as direct referents to our terms. The rationality of paradigm changes thus cannot be a calculated
decision because there is no principle from which the scientist can base their reasoning. Much of what we normally think of as composing the world (objects, kinds etc.) is determined for the scientist by the paradigm they work within, such that there is no recourse for the grounding of meaning, experience and rationality outside of it. But, at the same time, world, stays the same. So, for a metaphysical program that stays true to Kuhn's vision of science, there must be some aspects of what we commonly think as independent of human activity in the world actually dependent on it. Accordingly, Kuhn is not a complete anti-realist (as is more illustrated in his later works). He admits that something external to the objects of scientific study ‘resist’ what we may think about them. Further argument for this interpretation of Kuhn’s work is in the 3\textsuperscript{rd} and 4\textsuperscript{th} chapter.

Ian Hacking has suggested, in the book \textit{World Changes}, that this seems to indicate that Kuhn may be a nominalist. Roughly, Hacking places the two different uses of the word ‘world’ into a dichotomy between the world in which we work within and the world within which we exist. The nominalist position is that the world we exist in contains property-less individual entities. These are independent of human minds. The world is furnished by the structure of properties and the kinds associated with them. These are mind dependent. For Hacking the world we work in contains the kinds and properties which allow us to interact with, and study, nature. The world we work within is human constructed, and the kinds and abstract entities are determined by what Kuhn has so far called a paradigm. As we shall see in chapter 4, although this sort of view would suggest that Kuhn is a nominalist, there are aspects of nominalism that fit Kuhn’s metaphysical theory poorly. Kuhn provides a greater elaboration of his own views
regarding what is meant by the two senses of world within the Postscript to the second edition. Although, ultimately he does not provide a completely robust delineation of his metaphysical claim, it does provide important clues regarding how it can be interpreted.

**After Structure: Postscript**

The postscript to the second edition of *Structure* contains many important elaborations on his picture of science and some changes to his theory. Among those, the most fundamental is a distinction between two senses of paradigm. The first sense is paradigm as a constellation of beliefs, techniques and values which all the members of a scientific community share. The second sense is a specific area of the constellation of beliefs regarding puzzle-solving. The first sense is what allows scientists to unanimously agree and provides a starting point for their investigations. The assumption here of course is that a starting point is needed by something like a paradigm. It is only when a community possesses a paradigm mature enough to include constellation of beliefs regarding puzzle-solving that normal science can take place. “Communities of this sort are the units that this book has presented as the producers and validators of scientific knowledge” (Kuhn 1970, 178). Kuhn calls the set of beliefs pertaining to group commitments that allow for normal science the disciplinary matrix. This is in order to avoid the vagueness of the use of paradigm in the original text (he notes within the Postscript that the word paradigm is used in almost 21 different ways).

The second part of this disciplinary matrix he refers to as the ‘metaphysical part of paradigms’. It is the beliefs within the constellation concerning identity statements primarily. They are informed by beliefs regarding what he calls ontological models,
models that tell the scientists the permissible ways in which they can use analogies and metaphors, for example. The third part of the disciplinary matrix is the shared values of the scientists practicing normal science. The fourth and most important part of the disciplinary matrix concerns exemplars. Exemplars are the concrete puzzle-solutions that the students of science learn at first and then, in becoming part of the scientific community, learn to extrapolate from and use resemblance to future situations to do further puzzle solving. The exemplars are how the student learns the laws and theories of science, and how to become a member of the community. To make his point, Kuhn says when it comes to Newton's law (f=ma):

The sociologist, say, or the linguist who discovers that the corresponding expression is unproblematically uttered and received by the members of a given community will not, without much additional investigation, have learned a great deal about what either the expression or the terms in it mean, about how the scientists of the community attach the expression to nature (Kuhn 1970, 188).

What the sociologist or linguist is missing is what makes it possible for the student to relate the various instances to which the expression of Newton’s law applies. It is a relation of similarity; it is in applying the exemplar to different situations that the student learns the science. Here we see a further elaboration of Kuhn’s Wittgensteinian roots.

According to Kuhn, the reason for his insistence on the type of know-how involved in applying exemplars is based on his ideas regarding perception. He thinks perception involves a system. Although he does not provide a robust idea of what this system is, he characterizes it as “..the attempt… to analyze perception as an interpretive process, as an unconscious version of what we do after we perceived” (Kuhn 1970, p. 195). Although it is unclear, I think the point Kuhn is trying to make is
that previous philosophers have thought that perception is just another kind of interpretation. That is to say, to perceive something is in a sense 'open' to determination by the perceiver. We cannot simply choose to perceive anything at all. It is partly determined by the success of past experience given certain stimuli (i.e. successful puzzle solving).

To give a better idea of how the concept of tacit rules helps to resist this system, Kuhn describes in greater detail how the tacit knowledge contained in the disciplinary matrix affects our experience of the world. Herein is a very important distinction which lends a significant amount of clarity to the different worlds problem. It is the distinction between stimulus and sensation. Kuhn says that if two viewers are standing in the same spot we must conclude "under pain of solipsism" that they are receiving the same stimulus. "But people do not see stimuli; our knowledge of them is highly theoretical and abstract. Instead they have sensation, and we are under no compulsion to suppose that the sensations of our two viewers are the same" (Kuhn 1970, 192). Kuhn is suggesting here that the outside world is in a certain respect epistemologically inaccessible, and that our knowledge is primarily furnished by the realm of sensation. It is in the realm of sensation that objects of scientific study exist, along with most of the mundane objects we interact with. With regards to the relationship between stimulus and sensation, there are three things we know for sure: “that very different stimuli can produce the same sensations; that the same stimulus can produce very different sensations; and, finally that the route from stimulus to sensation is in part conditioned by education" (Kuhn 1970, 193). This allows Kuhn to explain how: community members can talk about and relate to similar experience; scientists can be said in a sense to live in different worlds.
(the world of sensation); and how paradigms partly determine the scientist’s experience. The existence of the external world, the world where we receive stimulus, is a posit in order explain our sensations and also to avoid solipsism. Kuhn states that we share the good majority of our sensation with the community; this is also implied by the stimulus-sensation bridge being affected by education. This education is primarily a learning of the tacit rules governing how we group certain sensations under concepts. This is exactly the same education scientists receive under Kuhn’s picture of normal science and the same tacit rules are involved in determining the likeness of the exemplars of science. Regarding these exemplars: “...recognition of similarity must be as fully systematic as the beating of our hearts” (Kuhn 1970, 194). For Kuhn, in this postscript, sensation is primary. We can deliberate upon this process after the fact, but there is an important notion that there is no recourse to stimulus during the actual sensation. It is fully determined by the neural process that bridges stimulus and sensation. This neural process has three characteristics: “it has been transmitted through education; it has, by trial, been found more effective than its historical competitors in a group’s current environment; and, finally, it is subject to change both through further education and through discovery of misfits with the environment” (Kuhn 1970, p.196). He goes on to describe this as a type of knowledge we do not have direct access to and also that we have no rules or generalizations to express this knowledge.

The last bit of the postscript briefly discusses incommensurability and rationality. Kuhn revises the notion that there are no values or recourse beyond the paradigm for scientists to discuss paradigm change. It is a regular occurrence that members of different scientific paradigms communicate about their work, and it often happens
through a type of translation. The scientists can isolate the troublesome terms and meet on a common ground of everyday language. A scientist can for instance, discuss whether a theory is simpler than one of a previous paradigm or whether it is more coherent relative to the work they are currently participating in. Certain values are shared by scientists and non-scientists that they can relate to and understand each other by reference to them. These are values such as simplicity, breadth of coverage, intuitiveness etc. The important thesis of incommensurability remains though, the scientist do not share the same (or similar) neural process learned by becoming a member of that specific exemplar-using community. To this extent there is still no common ground sufficient enough to know what the members of the other community mean by their terms, because this knowledge is at least partly the know-how related to exemplars and their interconnectedness with sensation. “To translate a theory or world-view into one’s own language is not to make it one’s own [for this] one must go native...” (Kuhn 1970, 204). This of course means that the central thesis of scientific rationality remains for Kuhn, that there is no single rational principle or process from which we can evaluate and determine scientific progress. Science remains non-cumulative across paradigms. Although, one can supposedly ‘go native’ and involve themselves to such a degree that they are participating members of a paradigm, it does not seem to be a problem for Kuhn’s picture of science. Kuhn does not say that it would be impossible to practice science within multiple paradigms. Despite this, even if one were practicing in two competing paradigms, there would still be no neutral ground to ultimately base a rational judgement on regarding paradigm change, the type of judgement that is necessary to ultimately say one paradigm is ‘more true’.
The dichotomy regarding stimulus and sensation is relevant to the metaphysical issue regarding the multiple worlds problem. It allows Kuhn to demonstrate some of the metaphysical stipulations, as well as stipulations regarding philosophy of mind, that are important for his picture of science. At a glance it would seem that Kuhn is fully supporting a nominalist view of nature. The structure of the world is determined by human efforts, it is divided into kinds primarily by the education we receive. With a change of paradigms, scientist carve the world up differently than before, thus the structure must be mutable. Kuhn also posits some sort of external world, going along with the nominalist intuition. The objects of our experience are determined by our neural process, education and the stimulus we receive. The only thing Kuhn identifies as existing external to us is this stimulus, and perhaps other minds. This distinction between stimulus and sensation, and the route from stimulus to sensation also opens many more questions. These are questions such as: Are the psychological terms like neural process the most appropriate way to describe what seems like a necessary process? In this postscript Kuhn’s metaphysics seem very Kantian, with the world of stimulus at first glance similar to Kant’s noumenal realm and the world of sensation similar to the phenomenal realm.

Looking back at the brief description of Hacking’s interpretation of Kuhn’s work as nominalist, it still does not seem at this point, with the stimulus/sensation schema, that it is an entirely convincing interpretation. As was already mentioned, the world of stimulus does not necessarily entail the classical nominalist position that the outside worlds is composed of a multitude of entities which properties then adhere to. Neither does it entail that the determining factors that make up our sensations are necessarily
unreal, or non-existent. For example, it leaves Kuhn open to perhaps believing in real abstract concepts that are mutable to human interests. Just because they change according to human interest does not entail that they cannot have some sort of existence, even an existence outside of human minds. Although, at this point of time, I do not have a positive and robust theory of what exactly Kuhn posits for the metaphysical basis of his picture of science, I can say so far that it does not necessarily have to be nominalism, either classical or Hacking's interpretation. A further examination of this metaphysical theory in relation to Kuhn's work will be made in chapter 2, where it will concern certain points of contention between Kuhn and the critics of his incommensurability thesis.

‘What are Scientific Revolutions?’

In this last section within this chapter I will briefly examine two papers written roughly a decade after the Postscript was written. In the first, “What are Scientific Revolutions?” Kuhn retraces his original idea of scientific revolutions with an emphasis on the non-cumulative nature of science. I will focus mostly on how he presents his idea of incommensurability, language and what insights can be gained on the different world problem. Within this paper Kuhn seems to shift the locus of incommensurability from sensation, as suggested in the postscript, to language. He emphasises three characteristics that seem true to scientific revolutions at this stage of his work. First, they are holistic, keeping this line of thought from Structure, in that they cannot be done piecemeal. The inclusion of a new generalization must include sweeping changes to the other generalizations within the scientist's language. Secondly, a revolution includes
change in how the terms attach to nature, how their referents are determined. It is notable that Kuhn now uses the language of reference to talk about the meaning of terms. The reference of terms is modified by a revolution by a change of the actual objects that the terms refer to. Thirdly, a scientific revolution changes the taxonomic categories prerequisite to scientific descriptions and generalizations. These three characterizations in a sense demonstrate the holistic activity Kuhn pictures science as. This idea is still alive from *Structure*, it just seems that the locus has shifted to language.

One major change with regards to tacit knowledge is regarding Kuhn's idea of exemplars, the idea that he initially provided in the Postscript. It seems the exemplar problems of science are no longer what are being related to when the scientist uncovers a new problem. Kuhn describes what has previously been called tacit knowledge of how a problem relates to an exemplar, instead is now a juxtaposition of situations or objects. The juxtaposition is an understanding of what is similar between the situations and problems which the scientists encounter. This juxtaposition is what informs the scientist of the taxonomic structure of their discipline. It also seems like it involves some sort of tacit knowledge, as it is based on a similarity relation that is not quite explicit. What is most interesting in this turn of thought is Kuhn's characterization of language as a two-sided coin.

Language is a coinage with two faces, one looking outward to the world, the other inward to the world’s reflection in the referential structure of language (Kuhn 1981, p.30).

In much of language learning these two sorts of knowledge --- knowledge of words and knowledge of nature --- are acquired together, not really two sorts of knowledge at all, but two faces of the single coinage that language provides (Kuhn 1981, p.31).
Within this paper it is this two-sided nature of language that provides the conceptual incommensurability of incompatible paradigms. One cannot alter one’s knowledge of the world without altering the meaning of language and vice versa. Although mentioned briefly, this has to do somehow with the objects which the terms of language refer to changing with the change of scientific paradigms (I guess in this paper it is more appropriate to say linguistic paradigms). A more robust examination of Kuhn’s philosophy of language will follow in chapter 3, as it will be necessary in order to explicate his later metaphysical views.

To finish this chapter, the paper *Metaphor in Science* will be mentioned briefly and more extensively in the later chapters where it can be properly juxtaposed with the philosophy of language to which Kuhn is addressing. All I want to include right now from this paper is a rather lengthy quote located right at the end which sums up the Kuhn’s later thoughts regarding the worlds problem. In this quote Kuhn is responding to Boyd, a scientific realist. Boyd argues that scientific theory accommodates to the world in that it gets its epistemological status from successfully representing or picking out aspects of nature.

What is the world, I ask, if it does not include most of the sorts of things to which actual language spoken at a given time refers? Was the earth really a planet in the world of pre-Copernican astronomers who spoke language in which the features salient to the referent of the term ‘planet’ excluded its attachment to the earth? Does it obviously make better sense to speak of accommodating language to the world than of accommodating the world to language? Or is the way of talking which creates that distinction itself illusory? Is what we refer to as ‘the world’ perhaps a product of mutual accommodation between experience and language? I shall close with a metaphor of my own. Boyd’s world with its joints seems to me, like Kant’s ‘things in themselves,’ in principle unknowable. The view toward which I grope would also be Kantian, but without ‘things in themselves’ and with categories of the mind which could change with time as the
accommodation of language and experience proceeded. A view of that sort need not, I think, make the world less real (Kuhn 1983, p.206).

Proceeding from this it is obvious that the more contemporary of Kuhn’s work is focused on philosophy of language. The metaphysical problem has become a problem partly to do with language. In order to solve the problems Kuhn’s work poses I must examine how it is that language can inform what we know, and what we experience, as well as be partly determined by those things. The epistemic barrier he purports to exist requires a more nuanced look at the philosophy of language he is responding to.

Conclusion

Through his early work and on to his later work there have been a few revisions to Kuhn’s theory of paradigm shifts, but several important elements remain the same. These elements are especially emphasized in his later work with the shift of focus from discussing the nature of paradigms to a more focused elaboration on his thesis of incommensurability. The important elements that remain are: the idea that science not cumulative across paradigms; the corollary of this, that there are no theory-neutral rational principles with which to base judgments of paradigms upon; the practice of science is entirely holistic with regards to the concepts involved, the theories, puzzle-solving and experience of the objects of science (whatever revisions made to what the elements are the idea remains that they cannot ‘be’ without the whole); and, the
education involved in practicing science. The metaphysical underpinnings of this sort of picture of science are, as I have suggested, related to the worlds-problem. It seems that if we agree with Kuhn’s picture of science we must in some sense agree that the world is mutable with respect to the paradigm and also that there must be, in another sense, a singular world. The first sense of the world is the one, as Hacking suggests, is where the scientists work within, where the second sense is the kind of world we exist within. It is the kind of world that is common to all.

For instance, if the world of the scientists work were not changeable relative to the paradigm, they would not be in some respect incommensurable. To elaborate on how the relationship holds between the sort of incommensurability found in Structure and beyond, and the metaphysical theory tacit in Kuhn’s work, it is going to be fruitful to articulate the points of contention between Kuhn and his critics. Specifically, the points of contention regarding his thesis of incommensurability as found in his later work. Much of this issue, I seek to demonstrate in this next chapter, can be boiled down to the metaphysical commitments Kuhn makes. Considering this, I also wish to argue that some of these points of contentions can be analyzed as points where Kuhn and his commentators are miscommunicating with each other. Much like the scientists engaging in cross-paradigm debate, there is an important presupposition that is being made by both parties that is not entirely explicit. This presupposition is going to involve the metaphysical posits previously mentioned and what has been termed the ‘different worlds problem’.
Chapter 2: Kuhn’s Critics

Introduction

Within this chapter I will be examining three responses to Kuhn’s work. These responses are all critical to some degree of Kuhn’s concept of incommensurability and approach the issue in different ways. In general I will argue that to some extent all three have misconstrued some element of Kuhn’s work and this is partly the result of proceeding from differing theories regarding metaphysics. This in turn leads to a ‘divide’ between each critique and the works of Kuhn. That is to say, there is a point in argumentation within each of the works discussed that does not quite fit the theory being criticized. These works are Davidson’s “On the Very Idea of a Conceptual Scheme” (1973), Kordig’s “The Comparability of Scientific Theory” (1973), and a section of Putnam’s book “Reason, Truth and History” (1975). The primary issue with regard to Davidson is a misconstrued relation between what calls a ‘conceptual scheme’ and what Kuhn calls a paradigm. This results from certain assumptions regarding the concept of conceptual scheme, and the metaphysical components regarding it. Kordig’s work on the other hand does not attempt to characterize Kuhn’s concept of paradigm, but instead debates the depth of incommensurability. Ultimately it is his suggestions for comparison, built upon an incompatible framework, that creates the distance between his work and Kuhn’s. Putnam’s criticism is similar to Davidson’s but instead of an incorrect characterization of Kuhn’s theory as a conceptual scheme it is Putnam’s idea of translatability that makes for the divide. Incommensurability results from certain
theories in Kuhn’s work whereas for Putnam those theories are a result of translatability. These are theories regarding meaning, extension and reference. It is in a sense an antagonism created by a difference in the direction of argument.

A chief concern in this chapter is going to be analyzing whether or not a part of the following works is some sort of metaphysical commitment. My criteria is going to be along the lines of ‘if X results in a significant way from some statement, theory or idea regarding the nature of what exists and those are in some way unjustified or not entirely explicit then it is a metaphysical commitment’. This analysis is not the only concern of this chapter. I will also be using these works to forward my discussion on Kuhn’s theory as it relates to the worlds problem and otherwise.

**On the Very Idea of a Paradigm**

In this section I will be examining Davidson’s critique of Kuhn’s idea of incommensurability. Within the paper *On the Very Idea of a Conceptual Scheme* Davidson is arguing against the existence and usefulness of what he calls ‘conceptual schemes’. Kuhn’s paradigms are one type of conceptual scheme. Within this paper Davidson addresses a multitude of philosophers and theories. This section will chiefly be focused on what pertains to Kuhn’s incommensurability. It will conclude that Davidson misses several important elements concerning Kuhn’s work in his critique. This is a result of what appears to be misinterpretation and ultimately a misunderstanding of the metaphysical principles underlying Kuhn’s work. The misinterpretation ultimately results from Davidson assuming different principles
regarding language’s relation to Kuhn’s idea of world, relating back to the ‘worlds’
problem discussed in the previous chapter.

To begin with I will be addressing a remark that some philosophers seem to
make regarding Kuhn’s work. “Kuhn is brilliant at saying what things were like before
the revolution - using what else? - our post-revolutionary idiom” (Davidson 1972, p.4). At
first this seems like a major problem for Kuhn. How is it possible that these paradigms
are incommensurable to the depth that he purports them to be if he can so easily
discuss the paradigms of the past? The brief answer here is that it is a matter of
interpretation being partial. There is going to be an important part to the interpretation
missing. For Kuhn, the important part is being a member of the scientific community
working within a paradigm. One cannot learn to be a practicing scientist purely from
textbooks for this very reason. There is more to the science than just the language or a
dictionary-like relation of terms and descriptions. There is no determined list of elements
one must learn to become a scientist. Some of these elements include the tacit rules
involved with participating within the community and some indeed are learning the
language. The language is an important element regarding becoming a scientist but it is
not wholly separate from other elements, and in Kuhn’s later work it is dependent on
what he calls tacit rules in Structures. Paradigms are holistic and all the elements are
related to one and another in such a fashion that prevents the meaning of the linguistic
terms from being completely derived separate from the other elements. Kuhn’s project is
not contradictory or conflicting in the way the previous quote suggests precisely
because the idea of incommensurability depends on the holistic nature of paradigms, so
it is not purely semantic. Incommensurability in this sense does not suggest an inability
to interpret or understand to an extent; it can just mean that whatever is involved in the whole of a paradigm is not carried across by anything linguistic. There is a lot to be understood about the previous paradigm simply by reading a textbook, but there are also many things missing from that understanding. These are things such as the tacit rules involved with being a member, the acceptance of certain principles, the beliefs regarding the objects of study and even the perceptions of the scientist working under the paradigm. Statements like the one quoted, if understood in light of the holistic nature of Kuhnian paradigms, are neither contradictory nor are they conflicting. This will be further highlighted upon examination of the rest of Davison’s critique.

Davidson’s critique is aimed at two main theories regarding the relationship between concepts and language that he thinks are misconstrued. He starts by painting a picture of the typical conceptual scheme theory. Although theories may emphasize these elements differently, generally conceptual schemes are: ways to organize experience, categories that give form to sensation, and/or points of view which cultures adopt in relation to the world. Depending on which literature of Kuhn you read, all three of these seem to apply to his picture of science at some point. Next Davidson states that the only way to make sense of the idea of a conceptual scheme is if it is associated with language. Thus the criterion for differing conceptual schemes ought to be failure of translation. He says that this can either be complete failure or partial failure of translation. With regards to conceptual scheme theories which seem to invoke the criteria of complete failure he lumps Kuhn into that group. This characterization is more correct regarding Kuhn’s idea of incommensurability as found within Structures.
After this particular piece was written by Davidson, Kuhn revised his notion of incommensurability to be more akin to Davidson’s criteria of partial untranslatability. For the purpose of this section I will chiefly be juxtaposing Davidson’s essay to the elements of Kuhn’s work he is directly responding to (Structure). Although I am certain Kuhn would hesitate to use the term ‘complete untranslatability’, it is a criteria worth examining with regard to his theory.

Near the beginning of the paper Davidson makes another distinction between two different types of conceptual scheme theories. This first type, which Kuhn is part of, is the type where the theory describes concepts as somehow organizing experience. The second type is where the concepts determine ways in which language fits experience. Where it concerns type-1 conceptual scheme theories the dominant metaphor is viewing the world from differing perspectives. According to Kuhn, scientists operating in different scientific traditions (within different paradigms) ‘live in different worlds’. "… Since there is at most one world, these pluralities are metaphorical or merely imagined… Kuhn wants us to think of different observers of the same world who come to it with incommensurable systems of concepts” (Davidson 1974, p.9). Here may be the crux of the problem when it comes to Davidson’s paper as a critique of Kuhn’s incommensurability. As Kuhn's work has been understood so far within this thesis, this is an incorrect interpretation of his work. It has been partly the goal of this thesis to analyze the worlds problem and whether or not Kuhn means it metaphorically (I have suggested that he does not). This will be defended in the next two chapters. From what I have considered in the previous chapter, it seems Davidson is incorrect in assuming that Kuhn means ‘different worlds’ purely as a metaphor for different perspectives. For
Kuhn, from the beginning, incommensurability is fundamentally a result of scientists practicing their trade in different worlds. “…the third and most fundamental aspect of the incommensurability of competing paradigms. In a sense that I am unable to explicate further, the proponents of competing paradigms practice their trades in different worlds.” (Kuhn 1970, p.150). Considering this, the criteria Davidson uses to determine that conceptual schemes cannot be completely untranslatable are going to be developed on grounds that do not coincide with Kuhn’s work. The metaphysical part of whatever groundwork Davidson himself is proceeding from is going to be different from Kuhn’s. For instance, if the meaning of a term is determined by the object the term refers to then translation will fail for Kuhn (because of the difference in worlds) where Davidson might see a successful one (because it is merely a difference in perspective). Davidson is not directly addressing Kuhn within *On the Very Idea of Conceptual Schemes*. The primary goal of the essay appears to be a critique of what he calls the third dogma of empiricism, the dualism between conceptual content and empirical content in language. Kuhnian paradigms are not exactly the type of conceptual scheme theory he is chiefly addressing in the broader critique, but where it concerns the type-1 conceptual scheme theory Davidson may be wrong about translatability based chiefly on his metaphysical presuppositions. Namely, that there can be in some sense different groups of people working within different worlds.

Continuing with Davidson’s characterization of type-1-scheme theories he describes the process of developing a new scheme as switching the truth values of a set of sentences. These are usually the sentences which are more or less fundamental to the scheme. He also proposes this as the way to assess the feasibility of complete
untranslatability concerning schemes. If it is indeed a different untranslatable scheme, certain sentences must be false where they were true before. This is something which seems true of Kuhn’s paradigms to an extent. “We may now seem to have a formula for generating distinct conceptual schemes. We get a new out of an old scheme when the speakers of a language come to accept as true an important range of sentences they previously took to be false (and, of course, vice versa)” (Davidson 1974, p.10).

While it may be one of the results of a new paradigm, truth value assignment is not entirely the process by which scientists enter a new paradigm. This is another problematic point of Davidson’s critique of type-1 conceptual schemes where it applies to Kuhn. He continues:

What is clear is that retention of some or all of the old vocabulary in itself provides no basis for judging the new scheme to be the same as, or different from, the old. So what sounded at first like a thrilling discovery - that truth is relative to a conceptual scheme - has not so far been shown to be anything more than the pedestrian and familiar fact that the truth of a sentence is relative to (among other things) the language to which it belongs. Instead of living in different worlds, Kuhn's scientists may, like those who need Webster's dictionary, be only words apart. (Davidson 1974, p.11)

Concerning the last two quotes from Davidson, Kuhn’s scientists are not merely words apart because that would imply that all there is to a paradigm are the linguistic elements. Incommensurability can neither be simply about the truth value of propositions nor relations of sentences to language. It is made more clearly in Kuhn’s Postscript: perceptions, behaviors, experimental methods, and the determination of how theory fits exemplars are also part of the package. The vocabulary of a paradigm plays a part into what may make a difference, but the language of the paradigm is not what determines the other elements. The holistic nature of paradigm’s for Kuhn makes it so
that the language plays an important roles and may determine some elements (or all elements in some way), but it cannot be purely the measure of paradigm difference. Kuhn cites things such as values which may have some linguistic basis but are nevertheless not purely linguistic elements that can make a paradigm incommensurable. Also, there is the perceptual element to what changes with a change in paradigms that cannot be evaluated on linguistic terms. These elements seems to make up the sense in which a change of paradigm is a change in worlds, and it is in this sense that incommensurability is in principle an aspect of different paradigms.

Considering Davidson’s philosophy of language, meaning is the determination of how various linguistic elements (sentences etc.) fit into a language; it seems this incomplete characterization of Kuhnian paradigms may be a result of both Kuhn and Davidson coming from different frameworks. Davidson’s picture of conceptual schemes considers it adequate to say one is different based purely on linguistic elements (and thereby untranslatable based purely on them) whereas for Kuhn the paradigm involves more than just a language or scheme of concepts. A more robust examination of those frameworks would take up a much larger part of this chapter than I can dedicate, for now my goal is to demonstrate that those differences exist. These differences seem to result in Davidson characterizing Kuhn’s paradigms as something which they are not, thereby making his paper’s criticism similar in a way to that of a scientist’s criticism of another paradigm might be.

One final element of Davidson’s paper I wish to consider is the problem he poses for type-1 conceptual scheme theories. It is the idea that language organizes or determines experience in some way. This is an idea which is relevant for Kuhn’s work
and partly what makes paradigms incommensurable. Davidson says that type-1 theories typically describe this in two ways: either conceptual schemes organize experience or they organize reality (the preponderance of objects). He then points out the obvious problems of using the word ‘organize’ to describe the interaction between conceptual scheme and the outside world. Organizing only applies to pluralities, so it could not just be ‘the world’ you are organizing but the objects within it.

How about the other kind of object, experience? Can we think of a language organizing it? Much the same difficulties recur. The notion of organization applies only to pluralities. But whatever plurality we take experience to consist in -events like losing a button or stubbing a toe, having a sensation of warmth or hearing an oboe -we will have to individuate according to familiar principles. A language that organizes such entities must be a language very like our own.

Experience (and its classmates like surface irritations, sensations and sense data) also makes another and more obvious trouble for the organizing idea. For how could something count as a language that organized only experiences, sensations, surface irritations or sense data? Surely knives and forks, railroads and mountains, cabbages and kingdoms also need organizing (Davidson 1974, p. 14-15).

Davidson, in the quoted passages, is saying we cannot make sense of conceptual schemes organizing reality/experience because it is not clear how the plurality is determined. The things to be organized would need to be determined in the first place. If that determination was straightforward it would involve language as well and then you would have in principle some way in which you could translate from one scheme to the next. Whatever linguistic elements determined this plurality would be the common measure for comparison and interpretation.

There are several difficulties when it comes to this description of conceptual scheme theory as a description of Kuhn’s theory. The first is using the term ‘organize’ to
describe a paradigm’s relation with ‘reality’. It does not seem like the right term to use in relationship between paradigm and world. I have suggested in the last chapter that a better term would be ‘determines’, that would suggest a role that is more direct, substantial and pervasive to what constitutes the world for scientists. The second is the juxtaposition of paradigm (conceptual scheme) and experience/reality, as if the one is some sort of agent acting on the other. The problem of this assumption goes back to the worlds problem. Although Kuhn says he believes there to be one world outside of us, what might be called world (the changeable sense of world) suggests a more holistic description than a straightforward dichotomy between organizing scheme and something to be organized. This is something that will need to be addressed moving forward in the later chapters. From Kuhn’s literature as analyzed so far, it is definitely not so straightforward. The third is the inclusion is of the notion of plurality as something which ‘things’ come to us from the outside as. That is to say, it is not necessary that whatever exists outside of our minds be a plurality. Davidson is assuming that what reality gives us is like a freshly done hamper of laundry and just needs sorting into socks, shirts and pants. This is not necessarily the case and historically there have been metaphysical theories that argue reality is indeed some sort of unity. Regardless, where it applies to Kuhn, this is not only an assumption that distances the critique from Kuhn’s work but instead closes off certain interpretations of his theory. Although it is not clear, it may very well be the case that the best fit for Kuhn’s metaphysical view is the outside world as some sort of Spinoza-like unity or Kant’s dichotomy between noumenal and phenomenal realm. Kuhn has said that his metaphysical view is similar to Kant’s,
which would go further to suggest a reading of Kuhn where this metaphysical assumption by Davidson is ill-fitting.

While Davidson’s critique primarily concerns the possibility of untranslatable conceptual schemes, there are several areas where he misconstrues Kuhn’s work. My goal has been to demonstrate how these misunderstandings are partly brought about by Davidson developing his critique on uncommon metaphysical ground. Although in some areas a more robust description of the metaphysical elements of Kuhn’s work is called for, that will be addressed that in the next two chapters. Primarily, the problem for Davidson’s essay is he is arguing from the notion that all there is to a conceptual scheme is a language. When you consider his principle of charity when it comes to understanding a language, it is then implied that all language must be translatable in principle. For Kuhn, paradigms don’t quite fit this assessment of conceptual schemes because there is more involved in a paradigm than just language. There are the elements Davidson addresses, such as beliefs and truth-values, but there are also experiences, methodology, the community etc. The point is that there is more involved in a Kuhnian paradigm than there is in Davidson’s conceptual scheme. Some of that is the result of differing metaphysical theories.

Kordig and Comparison

In his paper The Comparability of Scientific Theories, Kordig attempts to lay some groundwork for the rational comparison of scientific theory. He delineates two different levels in which scientific theories may be said to be invariant and from that invariance concludes that we may be able to employ a theory-neutral analysis to evaluating different theories. The two levels are observational invariance (observations
which stay the same through theory change) and invariance within regulative standards (scientific values which stay the same through theory change). This paper works as critique of Kuhn’s *Structures* in the regard that it purports that the incommensurability between scientific theories is not as complete as Kuhn first suggests. In short, observational invariance allows us to create some standards that we can (and have) use(d) to evaluate theories ‘outside’ the paradigm. Kordig says that these standards are not only descriptive of past science but can also be used to create a robust normative system by which to evaluate future science, thus allowing for a positive notion of progress. In this section I am going to evaluate the fit of Kordig’s system onto Kuhnian paradigms, and, much like with Davidson’s critique, there are some areas where theory of language and metaphysics becomes relevant. Kordig makes important metaphysical assumptions towards his goal of demonstrating observation invariance which allow him to propose the previously mentioned standards. Specifically he commits himself to the idea that world2 stays the same through theory change. This presupposition is central to justifying his criticism of Kuhn’s work, and it is contrary to Kuhn’s metaphysical theory (that world2 does seem to change). The metaphysical presuppositions play an important role in that they justify both philosophers’ claims about theory change. In order to be a successful criticism Kordig ought to engage with this presupposition in Kuhn’s work, but he does not. This is where his criticism is inadequate.

Kordig begins the paper by listing the two features of scientific theories which allow for evaluation. The first is invariance in observation. There are at least some observations which do not change with change of theory, and this invariance allows for extension between the words used to stay the same. If extensions are the same then an
important part of the meaning of the terms used stays the same and we can draw upon that to explain how scientific theory is at least somewhat meaning invariant. Kordig allows for the theory ladenness of observation, but he finds sufficient evidence in our every-day language and the activities of logic and mathematics to infer that there must be some observations which stay the same. With regard to observations in the every-day world, this is something which I think Kuhn would allow even from the standpoint of *Structures*, for at least some observations. For Kordig’s purposes it must be that invariance is typical between scientific theories. In order to evaluate observational invariance Kordig suggests that we would have to develop some sort of observational metalanguage. This is to avoid the vicious circularity in trying to found observation invariance based on an analysis between two theories based on assuming meaning invariance in the first place.

This leads Kordig to two important questions which, he spends a significant part of his paper in answering: has there been such a language historically, and do we currently possess such a language to discuss the relevant difference and similarity in ontology between the two theories? For Kordig, the first question can be answered in the negative while the second question in the positive to allow for an evaluation of the cumulative aspect of science. What Kordig is suggesting is that we have the tools now that we may not have had for neutral evaluation of observation. His reasons for believing this to be possible are based on our current developments in logic, mathematics and the meta-analysis of physical theories. One development he points to in particular is the Lowenheim-Skolem Theorem.
It expresses the fact that the property of having a denumerable model is invariant with respect to every consistent first-order theory (Kordig 1971, p.472).

In other words all first-order theories have a countable substructure and this substructure is also a model of the same theory. Kordig uses this as a motivation towards believing that there is a sort of structural invariance through theory change. L-S theorem seems like it has to hold true to all theory.

This is an example of how a theory may have very important invariant features from another, and was expressible with our current development in logic. Where it concerns scientific theory and observational invariance Kordig uses the example of this statement borrowed from Hanson:

*Our sense observation shows only that in the morning the distance between horizon and sun is increasing*, but it does not tell us whether the sun is ascending or the horizon is descending... (Kordig 1971, p.471).

The italicised portion is what Kordig regards as a neutral description of observation. The context here is that Hanson found this to be sufficient evidence against neutral description of observations found in both Tycho and Kepler’s theory, a matter of observational invariance. Kordig argues that the italicized fragment is something which has stayed the same.

A question I found important at this stage of Kordig’s development is ‘what exactly counts as neutral?’ The most concise answers I could within this paper are contained within the next two quotes:

This fragment of ordinary language is neutral to these two theories; it commits us to neither theory (Kordig 1971, p.471)
And in describing the invariant observational state of affairs we have used theory-neutral language: neutral, that is, between Tycho’s and Kepler’s respective physical theories. (Kordig 1971, p.472)

Kordig thought that we can build, or construct, a neutral framework for evaluating invariance by using language which commits us to neither theory. In other words it is neutral so long as we do not need to understand the theory to understand what is being said.

This idea of neutrality develops into the divide between Kuhn and Kordig’s works. It seems to at least assume meaning invariance between common language and language found in scientific theory to ground observational invariance. In allowing that scientific theories may be observationally invariant to a certain extent it does not seem correct to make the move in assuming that that would not apply between scientific theory and certain aspects of common language. Even if fragments of common language presupposes a certain neutrality between theories (with regards to commitment), there seems to be a problem that fragments such as the previous one lose a significant portion of what they mean in the abstraction from scientific theory. To illustrate further where this leads Kordig, consider this quote wherein Kordig argues for observational invariance between Galilean physics and Newtonian physics:

Using Feyerabend’s own words, we can describe the neutral observational objects in terms which are neutral to T1 and T2: Both T1 and T2 refer to material objects such as falling stones, pendulum, balls on inclined planes, etc., each of which are near the surface of the earth. None of the terms used in this description (‘falling stones’, ‘balls on inclined planes’, etc.) are peculiar to only T1 and T2. Nor does the description presuppose meaning invariance between T1 and T2. We have not presupposed that any of the terms occurring in our description occurs with the same meaning in both T1 and T2; we have assumed only the ordinary English language meaning of these terms—whether or not they have the same meaning as their typographical counterparts, if any, in either T1 or T2. The terms in the
description occur in our (and Feyerabend's) metalanguage in which we talk about T1 and T2. Thus, in order to establish whether our description is correct and whether there exists observational invariance between T1 and T2, one need not presuppose meaning invariance between T1 and T2. And our description, indeed, is correct as every historian of science would recognize. Therefore, there is observational invariance between T1 and T2. And hence, there is also (extensional) meaning invariance between Galilean and Newtonian physics. Galilean ideas of mass, acceleration, and force were applicable to all bodies located near the surface of the earth. The Newtonian idea of gravitational force included these bodies within its range and, of course, added celestial bodies as well. This overlap between the ontologies of Galilean and Newtonian physics is nontrivial. The class of all terrestrial objects is not a trivial or an insignificant class. And this class comprises the overlap of the common objects dealt with by both of these physical theories. 'Terrestrial objects' is, in each theory, a correct answer to the question 'What moves?' A term that illustrates nontrivial meaning invariance in both theories is, therefore, 'inertia.' In both theories it is correct to say that terrestrial objects "have inertia." There are other terms which illustrate nontrivial meaning invariance. In both theories terrestrial objects "undergo displacement." Similarly, in each theory terrestrial objects "have mass," "undergo acceleration," and "undergo velocity." There is therefore also some nontrivial meaning invariance with respect to these phrases (Kordig 1971, p.473).

Considering this quote, it does not seem obvious to me to suppose that because terms themselves are the same that the meanings are also invariant from theory to metalanguage. Meaning is fairly context dependant. A falling stone is a terrestrial object, as Kordig says, but the description under theory regarding that object change fairly dramatically from T1 to T2. T1 would include a description that includes 'impetus' and that word is not exactly replaceable by gravity. This will be discussed further in chapter 3. As it pertains to this chapter Kordig indicates in this quote that part of the reason for believing meaning invariance is that both theories contain a lexicon of terrestrial objects that is more or less shared, and that those objects exist from T1 to T2. He describes it as an overlap of ontologies. This is an important presupposition because he uses it to
Kordig seems to think the current historical framework he is operating within is somehow neutral from Kepler’s theory. The developments from that period of time are what allow us to juxtapose the fragments with other statements (such as ‘the sun in this fragment refers to a celestial object which appears to move but mostly its movement is relative to the movement of the earth’), and the only way this juxtaposition makes sense seems to stem from historical developments in science. What I am implying here is that what Kuhn has demonstrated, that the activity of science operates relative to certain historical developments in the field, cannot be fully divorced from the language-use activity of the layman. Our lay understandings must be affected in similar ways as theory change if what Kuhn says of paradigm change is true. Coming from a Kuhnian perspective then, the theory of language and metaphysics which underwrite his works cannot be completely divorced from extra-scientific work. To assume otherwise would indicate a divide between the critic of Kuhn and Kuhn’s work, which much like the scientists of competing paradigms, lead to a ‘talking past’ one and another.

Of course, considering what Kordig is appealing to, it does seem obviously true that scientists must observe mostly the same preponderance of objects we do. Kuhn appeals to this notion as the possibility for both the activities of speech and science in the first place within the Postscript. The problem so far as observational invariance is concerned when it comes to Kordig is when he uses it as a foundation for some of the normative claims regarding the progress of science he makes later in the work. To make my point perhaps more clear, it is not unlikely that there is observational
invariance or meaning invariance between paradigms. That seems rather likely, it is the idea that we can analyze to a robust enough extent with a meta-language that we may come up with normative claims about the progress of science that is antagonistic to the work of Kuhn.

Regarding what Kordig calls second-level comparisons, the comparisons concerning the value of a theory, he thinks that these can supply some normative rules to theory construction. Empirical confirmation is, of course, the first way he suggests through which we can evaluate theories. This naturally follows from the fact that theories are observationally invariant for Kordig. If they were not, then there would be no grounds for comparison. As a slightly related tangent, Kordig believes that the preponderance of physical objects are constructs, much like Kuhn seems to think. The key difference is that for Kordig theory-ladenness of observation refers only to the specific theory being tested at that time. Kuhn uses the idea of theory-ladenness as applied to paradigms. It is important to note the distinction between paradigm and theory. While theory is a mostly a linguistic entity, Kuhnian paradigms on the other hand can include non-linguistic elements. This distinction also makes up part of the divide between Kordig and his response to Kuhn.

But these constructs are not always, or even usually, specific only to the particular theory undergoing test at the time; they usually do not presuppose this theory. If we appealed only to the constructs needed to record the observations and experiments, we usually would not be able to predict what occurred. To do this we usually have to make further appeal to the special constructs and hypotheses of the particular theory we are testing. And these are usually neither used nor needed to record the experiments and observations.8 Thus, the particular experiment or observation is not completely laden with, nor does it presuppose, the particular theory being tested (Kordig 1971, p.478).
Kordig notes that there would be problems in experimenting on a theory if the objects themselves presuppose the theory. This leads him to assume that the observations and physical objects must go largely unchanged from theory to theory. Kuhn avoids this difficulty within his explanation of scientific activity as something involving more than just the theory underwriting it. From paradigm to paradigm the ontology may be mostly different and there could still be some sort of framework for the operation of normal science. This is because the paradigm supplies the scientist with rules for successful predictions through what Kuhn introduces as exemplar relations between relevant theories and experiments. For Kuhn observations must presuppose the paradigm to an extent and despite this Kuhn still seems to be able to explain the activity of science. This difference leads Kuhn towards denying that there are any neutral grounds for second-level comparison and Kordig towards trying to construct a positive theory whereby comparison can provide normative standards. Considering this, empirical conformation is not going to work for Kuhn in establishing cross-paradigm values in the way it is suggested by Kordig; this is also the case for the other values which Kordig later suggests.

In conclusion, Kordig's project is partly in response to Kuhn's work and in that capacity it reaches a divide similar to Davidson's critique. Kordig's paper argues for comparison between theories beginning with the framework that observational invariance must be true most of the time between competing theories. This in turn appeals to an analysis through a meta-language which seems possible only if you hold certain aspects to be true between the connection of a meta-language and theory. This involves ontology in some respect. These metaphysical assumptions and in turn
assumptions regarding meaning lead to an antagonism between his work and Kuhn’s which I would suggest becomes problematic if it is to be interpreted as a critical response. It is problematic in that Kordig presupposes ontological sameness through theory change and this presupposition is central to the claims he makes. He does not engage with Kuhn’s metaphysical theory, instead he proceeds from his own metaphysical theory, which plays an important role justifying his criticism. Since both philosophers’ metaphysical theories are important in that they play important roles justifying their characterization of theory change, a critical argument ought to consider these metaphysical theories. This is what is problematic of Kordig’s article as a criticism of Kuhn’s picture of science.

**Reason, Truth and Reality**

In Putnam’s book *Reason, Truth and History* he provides an objection to Kuhn’s idea of incommensurability similar to the one previously discussed by Davidson. In principle the objection has to do with how translatability is necessary for the ability to say something is different in the first place. Paradigms could not be incommensurable to the extent that Kuhn thinks because in order for him to demonstrate that fact he would be demonstrating that scientific paradigms are in fact translatable. Putnam concludes that what he calls ‘scientific anarchism of this type’ is self-refuting in this manner. In this section I will be examining the argument Putnam gives in more detail and also provide some relevant background to his objection. The rest of the book deals with epistemology and philosophy of language. I will be arguing that incommensurability is only self-refuting if Kuhn approaches translatability the same way Putnam does. I will
also be demonstrating that Putnam’s metaphysical theory is important in regards to his philosophy of language and central to justifying his objection to Kuhn.

One of Putnam’s concerns in the book is regarding the problem of reference as it applies to philosophy of language. He reflects how it is that reference is fixed to particular things e.g. how when we use the word ‘water’ it means the substance ‘H2O’. The solution he suggests is that it is the extension of the terms which fix the reference and not what may be inside people’s heads. That is to say, it is not the intension but the extension that fixes what a term refers to. He uses the Twin Earth thought experiment to demonstrate this (Putnam 1981, p. 34). He imagines a different ‘earth’ that is exactly the same in every single way except for the fact that water is not H2O but XYZ. It is composed of completely different molecules. At the same time, there is no distinguishable difference between the two substances at the perceptual level. Whatever the population of twin earth may have in their minds when they imagine water would be the same as what we think of water. Since the molecular structure of a substance we now take to be as more or less an essential property of that substance, the intuition here is that one would want to say they the different earth’s populations have different referents when they use the word water. He concludes that the explanation for this intuition is that no matter what scientists on either earth discover about water, or however their knowledge base grows in regard to it, the meaning and the referent is fixed. “The words water would still refer to different stuff even if the collective mental state in the two communities were the same. What goes on inside people’s heads does not fix the reference of their terms” (Putnam 1981, p.24).

Considering this view of meaning, it would seem that translation and interpretation
would involve some sort of criteria for agreement upon reference and thus extension. Putnam does indeed talk about that later in the book, much of the rest of it is dedicated to examining how it is exactly that terms refer to the extension. What is important to establish so far is that despite questions regarding the apparatus words are in fact fixed in meaning based on the stuff they refer to.

The section where Putnam addresses Kuhn is titled “Anarchism is Self-Refuting” and that is exactly what Putnam goes on to argue. His first example in this regard is one I addressed in the section on Davidson. It is the fact that Kuhn purports that there is some deep level of incommensurability between paradigms based on his discussion of those past paradigms which are supposed to be incommensurable. Following from this Putnam puts forward a question that I think sums up his critique.

Once it is conceded that we can find a translation scheme that ‘works’ in the case of a seventeenth century text, at least in the context fixed by our interests and the use to which the translation will be put, what sense does it have in that context to say that translation does not ‘really’ capture the sense or reference of the original? (Putnam 1981, p.116).

This is a tough question for the Kuhn of Structure to answer so far as the idea of incommensurability at that time goes. If incommensurability is the deep sense of incommensurability that indicates a jarring discontinuity between scientific revolutions, then ones needs some sort of criteria in the first place to establish that fact. Such criteria would indicate some sort of standard for translation practice and if such a standard existed then paradigms could not be incommensurable to such an extent. There would be some sort of ‘common measure’ in order to establish, in Putnam’s terms, that translation does not really capture the sense or reference. Putnam’s idea of
translation is then something which is done for a purpose and that purpose determines the success of translation.

I have suggested in the previous chapter and sections one way to interpret the ‘worlds problem’ is that the root of Kuhn’s incommensurability is the sense in which scientists live in different worlds after a paradigm. In that sense it is not that we have some ideal translation in mind when Kuhn says that paradigm’s are incommensurable. Instead, it is more that paradigms must be incommensurable because of that difference. Kuhn does not go through the various examples of incommensurability in *Structure* and say ‘when scientists use these terms today it really does not mean the same as it did before because it is not a successful translation, a successful translation would adhere to criteria [A], [B], [C]’. Instead, they are used to suggest a divide in meaning which Kuhn identifies to be at a more fundamental level than just semantic content. So in response to Putnam’s question ‘in what sense does translation fail?’, it does not fail but instead cannot be completed in principle, because referents in different worlds are different. The theory underlying Kuhn’s picture of science begins with paradigm changes as world changes and from there it must be the case that incommensurability results. This is the direction I wish to suggest Kuhn’s thesis of incommensurability results from. It is not deduced the other way around, from examples of untranslatability to incommensurability. Therefore, Kuhn can be seen to be not exactly self-refuting in the manner that Putnam suggests because the underlying theory (metaphysical and otherwise) in principle determines that translation in is going to be incomplete. It is not as Putnam suggests: that the examples of incomplete translations then, by themselves, lead to the conclusion that paradigms are incommensurable with respect to each other.
That would lead to the problem he talks about in this text, the need for translation in the first place to establish incommensurability.

What acts as an impasse between Kuhn and Putnam in this regard relates to Putnam’s use of extension to fix reference. It is not this idea in terms of philosophy of language that creates this barrier, but the metaphysical assumption underlying it. Putnam does not appear to be a straight-forward metaphysical realist or ‘materialist’, but at the same time his criticism seems to rest on the fact that for the most part the reference (extension) stays the same between two terms that are determined to be synonymous. For Putnam this is the case because for one term to be translated from another *implies* same reference and extension. “To say that a word (A) can be translated as ‘wheel’, or whatever, is to say that, to the extent that the translation can be relied upon, (A) refers to wheels” (Putnam 1981, p.116). For Kuhn one term may be translated into another but in principle the translation is not going to be complete partly because the extension is not the same, and science is operating in a different world. With Putnam, fixing the reference is partly a product of translation. It is along the same lines as Davidson’s principle of charity, something needed for the possibility of intelligibility of language. For Kuhn, the reference is fixed by the paradigm and the paradigm is what determines the intelligibility of language thus incommensurability follows from a difference of paradigms. Here we can see the importance of ‘what terms refer to’ in both these philosophers and how both develop their ideas along such regard differently. Also, the importance of such metaphysical theories in terms of what constitutes or determines the object of reference comes to play an important role in the critique of Kuhn’s *Structure*. 
Conclusion

In some places in this chapter I have suggested that the authors may have misconstrued some of Kuhn’s work or that they are in fact talking about different things despite using the same terms. Necessary for a full evaluation of this would be to have a correct idea of the theory underlying Kuhn’s work. In the previous chapter, much like this one, I have suggested certain ways Kuhn can be interpreted. In the next two chapters I hope to have a more concrete picture and framework for analyzing Kuhn’s picture of science in terms of metaphysical commitments. One thing I may suggest considering the results of my argumentation in this chapter is that there are benefits to be found in explicating this sort of underlying metaphysical theory. Kuhn hints at it, and as is discussed, it may have led to critiques and debates which do not connect with each other. The hope in the following chapters is to get a better idea of how Kuhn’s world problem can be interpreted into a more explicit metaphysical theory, and upon reflection, see if this can be applied to these debates.

There is an important element to the paradigm and change of paradigms which lends itself to problems when it comes to describing Kuhn’s work. It is also this part which I think results in incommensurability. It is in the idea that the world$_2$ changes for the scientist with a change of paradigms, and all that is implied by such an idea. The discussion going forward is going to address what exactly the elements are that make up world$_2$ and world$_1$ for Kuhn. World$_2$ must include some difference in ontology from world$_1$, and there must be an important ontological difference between differing worlds$_2$. An investigation into what composes either sense of the world ought to bring clarity to
the debates between Kuhn and his contemporaries. In the next chapter I will be focusing on an analysis of Kuhn's later work towards this purpose.
Chapter 3: The Metaphysics of Incommensurability

An important part of understanding what I have called the metaphysical theory underpinning Kuhn’s work is examining the responses Kuhn has made to his critics post *Structure*. The responses mostly regard the alterations Kuhn has made to his concept of incommensurability as that has been the chief focus of his arguments after *Structure*. Interestingly enough, while he made significant changes to what he meant by paradigm, scientific revolution and incommensurability, the essence of his picture of scientific practice and the underlying metaphysical views remain consistent and have only changed in becoming more elaborated and precise. In the previous chapter I examined some of the critics of *Structure* and determined that an important and underlying part of the critiques involved Kuhn’s underlying metaphysical theory. Within Kuhn’s response to those critics he expresses his beliefs about those views more directly. This chapter will be dedicated to examining the remarks made by Kuhn in his later work that pertain to his metaphysical beliefs, determining their relation to the alterations made in other aspects of his theory, and providing an interpretation of their importance to Kuhn’s picture of science. This will be followed by a more in depth analysis of Kuhn’s metaphysical theory in the next chapter.

**Commensurability, Compatibility, Communicability**

The first article this chapter will examine is the essay “Commensurability, Compatibility, Communicability” written by Kuhn in 1982 mostly as a response to Putnam and Davidson (Putnam 1981, Davidson 1973, Kuhn 1982). Within this essay Kuhn sketches two typical arguments his critics have against the idea of
incommensurability. These two arguments represent the positions of Davidson and Putnam examined in the previous chapter. The first is that we cannot have complete untranslatability because for that we would have to have a neutral language by which to judge two theories as incomparable. Since Kuhn says we do not have a neutral language, then according to this argument there is no way we could know whether two theories are incommensurable (Davidson 1973). The second argument is that Kuhn, as well as many historians, successfully talk about past scientific theory, frame it in modern-day terms and are understood by the people they are addressing. This then implies that past scientific theory cannot be incommensurable (Davison 1972, Putnam 1981). Kuhn explains that a demonstration of how the second argument does not apply to incommensurability will also demonstrate how the first does not apply, and focuses most of the paper on the second. His response is to essentially say that what Putnam and Davidson call ‘translation’ is a conflation between translation proper and interpretation. What Kuhn, historians and anthropologists do is interpret, and interpretation has different criteria for success than translation. Interpretation is also a different process. It is within the act of interpretation that incommensurability applies. Kuhn’s elaboration of interpretation in this essay also leads into further elaboration of what he previously meant by becoming a member a scientific paradigm; now it means to practice current science. Within this elaboration Kuhn discusses briefly how interpretation involves a learning that is not completely linguistic. The act of interpretation also involves a fundamental change to the structure of the world. This characterization is vague and will be explained below. This metaphysical side of
interpretation is a key feature when it comes to the difference between it and translation and an important part of Kuhn’s revised incommensurability.

The central point of Kuhn’s paper is a further elaboration idea of incommensurability. One of the features of this revision is the clarification that it is not translation. The other is that incommensurability does not need to be as abrupt of a discontinuity as his critics have interpreted it, and as he presented it in Structure. Instead of incommensurability being something more akin to a complete untranslatability, it is something which partly applies between scientific theories. Localized incommensurability (LI) is the theory that there are a large portion of words or sentences used from a previous paradigm that are more or less unchanged. It is from these stable terms that we can compare, thus providing a response to the first argument. Kuhn reminds the reader of the origins of the term incommensurability. The hypotenuse of an isosceles right triangle is incommensurable with its side or the circumference of a circle with its radius in the sense that there is no unit of length contained without residue an integral number of times in each member of the pair. There is thus no common measure. But lack of common measure does not make comparison impossible (Kuhn 1982, p.35).

The important aspect of this analogy to geometry is the phrase ‘no common measure’. There is no exact manual or gloss to preserve the meaning of old terms. Therefore, there will always be residue (or loss) for at least some of the terms used in the old scientific theory, because we must rely on our current linguistic framework to understand it. Where it concerns LI Kuhn is uncertain about whether or not a theory of meaning can support the idea that a certain set of sentences or words remain unchanged completely from old theory to new. His uncertainty also extends to whether it would be possible to apply this theory of meaning in the hopes of discovering where meaning is
preserved in theory change. Kuhn’s work would suggest that he does not believe this can be done to an exact degree. The central point of LI is not whether or not it is true that a certain set of terms remain completely invariant, or that we can identify exactly which terms are invariant. It is the fact that despite having ‘no common measure,’ comparison is still possible through interpretation. The older theory is indeed untranslatable, but that does not preclude comparison and does not entail an inability to understand the older scientific theory. Incommensurability is still significant in that there cannot be completely theory-neutral or ahistorical values for this comparison. This latter part will be the main line of response to the second criticism and also help to explain what he thinks comparison is in the case of localized incommensurability.

Later in the essay Kuhn further characterizes the position of philosophers like Davidson and Putnam. Essentially what they do within their argument is sketch a process of interpretation and then calls it a successful translation. As we shall see below, interpretation is a process that has a metaphysical component, whereas translation does not. Davidson and Putnam are conflating two different processes when they use translation in their arguments. Translation is a process which involves substituting one term for another by an individual who knows two or more languages, and the goal is to produce a text equivalent in meaning. There are two important features of translation: the language being translated to must exist prior to translation, and the translated text only contains the translated words and phrases, so that glosses and prefaces should not be needed. Interpretation on the other hand usually involves one language and the subject of interpretation is something that is at least partly unintelligible. The thing being interpreted can be speech, gestures, experience or a text,
etc. It is the activity performed by historians and anthropologists. The primary example
Kuhn uses is Quine’s ‘radical translation’.

In learning to recognize Gavigai, the interpreter may have learned to
recognize distinguishing features unknown to English speakers and for
which English supplies no descriptive terminology. Perhaps, that is, the
natives structure the animal world differently from the way English
speakers do, using different discriminations in doing so. Under those
circumstances, ‘Gavigai’ remains an irreducible native term, not
translatable into English. Though English speakers may learn to use the
term, they speak the native language when they do so. Those are the
circumstance for which I reserve the term ‘incommensurability’ (Kuhn

This reference to Quine brings to the forefront two vital distinguishing features of
interpretation. The product of interpretation is always a new language, which is then
usually translated into a language the interpreter commands (e.g. common English).
Secondly, learning this new language also involves a process by which we learn to
recognize different things in the environment. This is what I referred to earlier as a
fundamental change to the structure of the world. It is not simply a process of adopting
a new perspective on the same object. It will be suggested later on by Kuhn that
Gavigai did not exist for the interpreter before encountering the natives. He may have
described something similar with the term ‘rabbit’, but if gavigai is indeed irreducibly
native as Kuhn is suggesting, then the incommensurability is at least partially
determined by the object. Gavigai and rabbits are different things, and the Gavigai did
not exist in the interpreter’s world before he interpreted the native’s speech and gesture.

In juxtaposition to this distinction between translation and interpretation, Kuhn
discusses the solution to incommensurability proposed by Kitcher (Kitcher 1978).
Kitcher thought that ‘reference determination’ was a method of translation whereby
incommensurable scientific theories could be translated. Reference determination
involves the preservation of truth values by identifying the referents of sentences and creating a translated text which refers to the same things. This has obvious problems considering Kuhn’s definition of translation and interpretation. In response, Kuhn discusses why it is problematic when we consider the activity of historians as being ‘reference determination’-type translation. What do you do when you encounter a non-referring term (such as phlogiston)? You can either leave it blank or try to substitute a more or less equivalent word or phrase. The problem with the latter option is that it cannot reflect the original author’s beliefs about phlogiston. The problem is that the translated text will be substituted with terms that do not contain the same sense (i.e. preserve in some way the mental content of the theorist). Phlogiston could be translated as either ‘substance released from burning bodies’ or a ‘metallizing principle’, but those phrases do not reflect the original author’s beliefs about phlogiston. The meaning of phlogiston involved a set of other beliefs about the world as well as a belief that the substance existed. Kuhn’s point is that terms like phlogiston cannot be substituted without difficulty (without loss or residue), and when there are such difficulties it is more appropriate to call the translation interpretation.

Kuhn then considers whether it is correct to assume it is a matter of interpretation in cases such as analyzing 18th century chemistry. What specifically demarcates these cases as a process of interpretation? In answer to this he reiterates his previous position on the holistic nature of scientific disciplines. A failure regarding the reference determination of phlogiston indicates that many of the other terms used in conjunction will not be translatable in a straightforward way. This is to the point where we can
assume there may be a lot of meaning change when we attempt to translate 18th century chemistry.

Only after they have been thus acquired can one recognize 18th century chemistry for what it was, a discipline that differed from its 20th century successor not simply in what it had to say about individual substances and processes, but in the way it structured and parcelled out a large part of the chemical world (Kuhn 1982, p.44).

Kuhn is suggesting it is not only what the terms were used to specifically talk about that is problematic to translation, but also how they are used in relation to each other. ‘Phlogiston is a chemical principle’ does not make sense to the modern day chemist, not just because phlogiston does not exist for him, but also because ‘chemical’ and ‘principle’ do not exactly have the same meaning as they did then. The meaning of these terms is determined to a significant extent by their relation to other linguistic elements within the theory.

Therefore, residue and loss with the meaning of one term implies that there is a ubiquitous problem regarding the translation of these past scientific theories. Going back to his previous point in contention with Kitcher, using other terms to help ‘fix’ reference determination is going to be problematic. To illustrate his point Kuhn reminds us of the example of Newtonian mechanics. Force and mass cannot be learned alone and are only intelligible with respect to each other. This is partly because the learning of a discipline is not only the learning of a language but also learning how to distinguish phenomena in the natural world. This is a sort of continuation of his analogy in Structure, where learning to participate in a paradigm includes learning how to ‘see’ the world. It is this combination of the failure of reference determination and the learning process of becoming a member of a scientific discipline that indicate Davidson and
Putnam-type translation is inadequate when it comes to past scientific disciplines. Regarding Kuhn’s observations on the learning of a discipline, “… the interrelated terms in some local part of the web of language must be learned or relearned together and then *laid down on nature whole*. They cannot simply be rendered individually by translation” (Kuhn 1982, p.44) (Italics added). Here we see the reinforcement of the idea that it is language’s relation to nature from which the failure of translation can be assumed. Specifically it is the holistic character of language within its relation to nature which the failure of translation follows from. It is holistic in the way that meaning is constituted and in the way it is applied to the natural world. For Kuhn, the linguistic framework provides criteria for distinguished objects in nature in such a way that it can only be understood holistically. The individual criteria are established in a significant way based on other linguistic elements and each other. This is why he uses the metaphor of ‘laid down on nature whole’. The importance of this passage is not just that translation of old texts fails if it is done piece-meal; also, it is the fact that that method *must* fail *because* of the relation between the language of the scientific community and the natural world.

Following from this Kuhn then sketches what it is that historians do when interpreting past texts. The audience of the historian is typically composed of people unfamiliar with whatever scientific discipline is being described. Generally it takes the form of a description of the world the scientists of the past believed in and, at the same time, teaches the audience a new language. Kuhn points out that many of the people commentating on examples like phlogiston theory have already learned both of these things and that may be a reason that it appears a matter of translation. They effectively
possess two languages. This is why it may appear to Davidson that in order to understand past scientific theory one just needs to open a dictionary. This reinforces the point that the process is not merely a matter of locating reference. If it were there would not be this distinction between audiences. The unfamiliar audience for example (Kuhn’s example) could not be given a Quinean translation manual and be expected to have a sufficient understanding of the older theory. The Quinean translation manual is a hypothetical manual which would teach a newcomer the native’s language by associating words in their language with those of the native’s language in a direct way (the example illustrates this as lines being drawn from rabbit to gavagai, or multiple lines coming from one word to multiple others). Any case which requires a gloss or explanation of this sort of process is a case which Kuhn would call interpretation, and the need for these additions indicates its inadequacy. In Quine’s case, he thought for the one-to-many type linkages you would need context specifiers to locate which word would be appropriate. Kuhn suggests it is these context specifiers, which among other elements are exactly what is understood within interpretation, and the need for them indicates that the process is one of interpretation. One of the key features of interpretation is preserving, or at least recreating, the intention of the scientists who wrote the older texts. Kuhn thinks that it is this process whereby we come to understand the intention that is one of the key differentiating features of interpretation. At this point it is a bit unclear what he means by intention, but it does not affect the summary of his point, namely that the mental content of the individuals of the past community needs to be considered within a successful interpretation and this is something which is not typical of ‘reference determination’-type translation.
Kuhn goes on to discuss it further, but basically it is the idea that the natural world and language influence each other’s content mutually; content in this case means the meaning of linguistic terms and the properties and objects of the natural world. It is not the case that Phlogiston was proven not to exist by later chemistry or the case that we call the same thing by a different name; instead, a different discipline developed where phlogiston did not exist and we use a different term for something to which phlogiston applied in similar ways. The latter part makes it seem like translation is the method to understanding previous disciplines, but the former part is the crux of why we can assume that the result of translation is going to be inadequate to understanding.

Kuhn says, in regards to the locus of the inadequacy of reference determination:

The difficulty is identical with the one encountered by Kitcher’s translation of phlogiston. By now its source must be obvious: a theory of translation based on extensional semantics and therefore restricted to truth-value preservation or some equivalent as a criteria of adequacy. Like phlogiston, element and so on, both ‘doux’ and ‘esprit’ belong to clusters of interrelated terms, a number of which must be learned together and which, when learned, give a structure to some portion of the world of experience different from the one familiar to contemporary English speakers (Kuhn 1982, p.49; my italics).

It is the former notion that Kuhn believes occupies his idea of translation and the latter interpretation. The quote emphasizes Kuhn’s idea of translation as an activity that has criteria which rely on abstracting individual elements from the text being translated. Determining truth-value implies an activity where each term is examined individually with relation to what it is true of (i.e. reference determination). Interpretation on the other hand involves an activity which first considers the relation of terms to each other, and is then applied to experience. The relation does not seem to be as simple as ‘true of’. Instead, the linguistic terms and experience are co-determined along with whatever beliefs are formed regarding experience and the text being studied.
This is also, most importantly, the first time in Kuhn’s writing that he makes a completely explicit account of what was formerly the off-hand mention: "...the third and most fundamental aspect of the incommensurability of competing paradigms. In a sense that I am unable to explicate further, the proponents of competing paradigms practice their trades in different worlds" (Kuhn 1970, p.150). When applied to the previous quote, considering the modified theory of incommensurability presented in this chapter, ‘Worlds’ is roughly equivalent to what Kuhn calls experience. Within the more elaborate account of the relation between scientific practice, the language of scientific communities and experience expressed within his account of interpretation, Kuhn seems to also be providing an explanation of what he previously meant by ‘practicing their trade in a different world’. If language and experience are co-determined in a significant way, and that language changes through the history of scientific discipline, then that is a way in which to understand world change. Kuhn’s entire paper, in this light, can be seen not just as a defense against criticism, but a clarification of why it is that past scientific disciplines are incommensurable and what the reasons are for believing that to be the case. It is not simply a matter of examining efforts to translate the science of the past and determining that they failed to meet certain criteria, as had been mentioned in the previous chapter. To reiterate, Kuhn is not saying that incommensurability applies to scientific disciplines because translation of their theories fails to meet certain criteria. What he has been saying since Structure is that translation is going to be problematic based on how language and experience co-determine each other. The activity of learning a scientific discipline exemplifies this relation, and the systemic inadequacy of translation methods such as reference determination highlights
the problems this relation poses for translation. This is the basis for believing that
interpretation is the process of understanding previous scientific disciplines, and it is
also the reason why the criticisms of Putnam and Davidson fail to apply.

To summarize thus far, the criticism that we are able to translate (and speak
coherently about) past scientific theory indicates that it is not incommensurable fails for
the following reasons. The first is that it conflates two distinct processes: translation and
interpretation. Translating past scientific theory is actually a matter of interpretation.
Interpretation is by definition not a process which can represent the meaning of older
theory without residue or loss. Incommensurability can therefore be assumed when
interpretation is what is being done. The justification of the assumption that it is
interpretation that is being done is as follows. The inadequacy of ‘reference
determination’-type translation when faced with older theory implies that a different type
of activity must take place. The learning process involved with becoming a member of a
scientific community, and the nature of the relation between language and the world
further support the assumption that the result of translation will be inadequate towards
understanding previous science. It is the co-determination of language and experience
which is central to the other two points and hence central to the justification for
identifying the process as interpretation in those cases. It is also this last point that
encompasses the metaphysical view being discussed in this thesis. This highlights, I
think, the importance of explicating Kuhn’s metaphysical view.

Kuhn sketches one last, but important, defining feature of translation in an
attempt to make the difference between it and interpretation more distinct as well as
elaborate more on what is gained in interpretation. He does this by analyzing what is
preserved in a successful translation. It cannot simply be reference. Reference is an important element, but a successful translation must also preserve the sense or intention of the previous text. It is not clear what exact idea he has of what either of those terms are. The relevant point is that the criteria of a successful translation are a correct representation of the beliefs of the past scientist and that this has to do with the reference of terms. When it is the case that the preservation of the intentional component is not possible, that is where one must interpret, and the correct representation of scientific belief is what is gained in interpretation. Ideally the product is the ability to talk about the same things as the scientists of the past. A successful translation should then produce the ability to correctly refer to the same things, and this is due to having (or understanding) in some way the beliefs of the speaker of a translated language. This is problematic when it comes to past science, as well as many other areas. Determining what other people believe is not a simple activity, and it does not seem like translation as characterized so far is apt for this activity. This suggests the possibility that there can be no completely successful translation. Kuhn describes the shared ability to pick out the same referent as fundamental to both learning a language and being a member of a community. Even though we often have different criteria for picking out the referents of terms, it is the fact that we can successfully do it which is the mark of someone who has learned a language.

A question one can ask given what Kuhn has been saying is, ‘How is it that we regularly pick out the same things as each other despite using different criteria? Surely the 18th century chemist and the modern day layman can point out the moon when asked to.’ Kuhn’s answer to this is: “Their language is adapted from the natural and
social world in which they live, and that world does not present the sorts of objects and situations which would, by exploiting their critical differences, lead them to make different identifications” (Kuhn 1982, p.51). Kuhn does not make this point altogether clear. For instance, when Kuhn says ‘adapted from’ he really means ‘determined by’. ‘Adapted from’ implies some sort of conscious inclusion of elements outside of science, which does not fit his idea of the relation between language and the world so far. I think the phrase is also an inclusion of wording from his metaphor of biology which he uses to describe his idea of the relation between language and the world. This metaphor is examined in more detail at the end of the chapter and with it comes a more detailed elaboration of this relation. My interpretation of this remark as it stands so far is that the shared language of the layman and the chemist (call it common English) has not changed very much regarding the moon. This is because in the framework of that language ‘the moon’ occupies roughly the same significance. It seems at the least implied that the nature of languages that are shared by both experts and non-experts of science is one where the objects referred to present no critically distinguishing features. This obviously allows for the fact that there are multiple languages used by experts in a scientific field and perhaps even frames of reference which play a part in how scientists work in different worlds according to Structure.

The preceding may be stretching the interpretation of this passage though, and the implication for those who currently possess multiple languages might be a little bizarre. If 'worlds' is interpreted as discrete experiences, and a language determines these experiences, then it is hard to imagine what the people who are members of multiple linguistic communities’ experience. Is it a significant change in experience every
time they take part in a familiar community or is it an amalgamation, in that each community they belong to adds to what they experience?

To further explicate his idea of the relation between the world and language Kuhn says:

Members of a language community are members of a common culture, and each may therefore expect to be presented with the same range of objects and situations. If they are to co-refer, each must associate each individual term with a set of criteria sufficient to distinguish its referents from other sorts of objects or situations which the communities’ world actually presents, though not from still other objects which are merely imaginable (Kuhn 1982, p.51).

This quote brings to a light another way in which to understand what was previously called ‘world changes’. Previously Kuhn implied that language and experience were co-determined, now it is also the objects that the people within the community of language users which is also determined. One way to understand ‘world’ is as a preponderance of objects. Within that understanding, this is a reiteration of what he has implied in Structure. The implication is that people within a community (or practicing within a paradigm) generally experience the same range of objects and (an implied ‘and’) those things will likely not be apparent/not exist within another community of language users. Language seems to now occupy the same sense that paradigm used to for Kuhn, and at this point it might have been helpful to keep the term paradigm to avoid confusion. ‘Member of a language community’ is synonymous with ‘member of a common culture,’ and based on this commonality we can assume they experience the same thing as each other. Being a member of this culture/language community entails living in the same world. It is a world that presents the objects which language refers to and at the same time is given structure by language. By structure I mean it in a sort of general but
significant sense. It is a sense that includes cause and effect, the properties of objects, the criteria for what is considered an object and how objects are like each other and at the same time not like each other. The criteria within language for distinguishing these aspects of the world also seem to be what determines these aspects. To juxtapose this idea with Kantian language in a rough way, the categories of relations between objects are prior to our experience of the world and at the same time determine these relations between objects. This is a substantially more robust account than what Kuhn provided in *Structure* regarding what he meant by world, and it has become even more critical to his theory of incommensurability.

In summary, translation is something that can only successfully be done by someone who is a member of two language communities. This is something that is impossible for past disciplines and at least problematic for current ones. It is impossible for past disciplines/paradigms because to become a member of a language community seems to require that there are other practicing members. The learning process of becoming a member, for instance, cannot be done from simply studying a textbook, and this would imply that it cannot be done by reading past scientific theory. The person learning needs to be instructed in ways that are not entirely explicit. The problem arises because the thing which is shared by members of a language/culture community is the framework for picking out referents and also the objects actually being referred to. There is a co-determination that characterizes this relation between world$_2$ and the meaning of terms. When we are presented by the task of making communities, and the works of these communities, intelligible, it is not something which translation can accomplish. It requires interpretation. When Davidson points out that Kuhn talks
coherently about past paradigms, he is not then speaking of Kuhn and other historian's ability to translate, but instead, about their ability to interpret. The criticism, that if there is no neutral language then we cannot judge theories to be incommensurable, is then answered in response to the first. They are incommensurable by the very fact that they were produced by different language/cultural communities. Given Kuhn's picture of language and its relation to the world, it has to be the case that incommensurability applies. Kuhn suggests that incommensurability is likely restricted to a local level but that does not have to be necessarily the case, and it may be impossible to determine the extent of local incommensurability even if local incommensurability did apply. The relation between the metaphysical element and linguistic element of cultural communities plays a central part in his argument against these criticisms. It is also a more elaborate and explicit characterization of what I've previously called the 'worlds problem'. Kuhn’s paper exemplifies how central this metaphysical theory is to Kuhn’s theory of incommensurability.

The Road Since Structure

What may be some key remarks in regard to Kuhn’s metaphysical position, or at least the metaphysical position underlying his current theory of incommensurability, can be found in the book *The Road Since Structure*. It is a section titled ‘The Road Since Structure’ and is the published address Kuhn gave to the Philosophy of Science Association in 1990. It contains what I have found to be the most direct attempt at expressing his metaphysical view and thus makes a good segue into the next chapter, where I will be critically considering some of the solutions posed by other philosophers.
Kuhn begins by saying his view is clearly not what would be called realism, at least Putnam’s realism. “Insofar as the structure of the world can be experienced and the experience communicated, it is constrained by the structure of the lexicon of the community which inhabits it” (Kuhn 1990, p.101). The most notable alteration from the previous paper is that the word lexicon has replaced the role of language in what constrains, or determines, experience. The structure of the lexicon determines both the experience of the structure of the world and also the form by which we communicate it. This is essentially similar to the previous position examined, except that it is a direct and explicit statement of the relation between language, experience and the world. It is also implied that there is a single world and it has a structure but we cannot access it through our experience. He goes on to say that there might be aspects of this lexical structure that are biologically determined but for the most part it is determined by education and socialization. He also remarks that people can be members of multiple communities, that they can have multiple lexical structures, but that they can only be actively participating within one at any given time. Kuhn admits that this sounds as though the world is somehow mind-dependent, or a construct, but to assume that would be misleading.

First, the world is not invented or constructed. The creatures to whom this responsibility is imputed, in fact find the world already in place, its rudiments at their birth and its increasingly full actuality during their educational socialization, a socialization in which examples of the way the world is play an essential part. That world, furthermore, has been experientially given, in part to the new inhabitants directly, and in part, by inheritance, embodying the experience of their forebears. As such, it is entirely solid: not in the least respectful of an observers' wishes or desires; quite capable of providing decisive evidence against invented hypotheses which fail to match its behavior. Creatures born into it must take it as they find it. They can, of course, interact with it, altering both it and themselves in the process, and the populated world thus altered is one that will be
found in place in the generation which follows (Kuhn 1990, p.101).

The world he talks about is world$_2$. Despite its ability to change, the world is immutable to the extent that rigorous normal scientific activity can proceed in examining it. To put it in the words of Structure’s Kuhn, it is the world which the scientist strives to understand and also ‘extend the precision and scope with which it has been ordered’ (Kuhn 1970, p. 42). Instead of the process by which scientists become members of a paradigm being just education, this process includes ‘socialization’ into a culture which has lexical lineage. This lexical structure is passed down by community members and is what determines the experience of those community members. Kuhn explicitly calls what is contained in this experience, the structure and objects, the world. “The view toward which I grope would also be Kantian, but without ‘things in themselves’ and with categories of the mind which could change with time as the accommodation of language and experience proceeded” (Kuhn 1983, p.206). Considering this and his passage in the first chapter from “Metaphor in Science”, it appears he regards his position as closely resembling Kant’s metaphysical view. What can be taken from that quote is that the world is: determined by socialization, experientially given, and changeable, but not on whim. Considering this, one can see how such a view is essential to his theory of incommensurability as presented in both Structure and Commensurability. If the language that a community uses to construct theory is essentially related to what the world is to those community members, and that world changes at critical points of the communities development, then incommensurability must be a result at those critical junctures. It is then important to establish the nature of those critical junctures and to do
that a further elaboration is needed of how it is that both the world and the linguistic structure change in relation to each other.

Kuhn provides a metaphor for a way to think of how this process happens. The metaphor he uses is that of ecology (Kuhn 1991, p.103-107). Communities are biological niches in this metaphor, and adaptation of the niche to the environment is the process by which a community’s linguistic scheme (adaptive mechanism) and their world (environment/niche) change relative to each other. Survival is the driving force of this change. Survival seems to retain its literal meaning in both the metaphor and what is being described. The scientific community survives (continues to live on) so long as it continues to adapt, much the same way a species does within the theory of evolution.

Niches may not seem to be Worlds, but the difference is one of view-point. Niches are where other creatures live. We see them from the outside and thus in physical interaction with their inhabitants. But the inhabitants of the niches see it from the inside and their interaction with it are, to them, intentionally mediated through something like mental representation. Biologically, that is, a niche is the world of the group which inhabits it, thus constituting a niche. Conceptually, the world is our representation of our niche, the residence of the particular human community with whose members we are currently interacting (Kuhn 1991, p.103)

One important point he makes before this quote is that niches can only be recognized in retrospect; you cannot recognize a niche as it is being developed. This is an analogy of sorts to the old idea of the formation of paradigms. This metaphor may seem similar to the description of paradigm shifts as gestalt switches found in Structure, or the slightly incoherent reference to stimulus and sense in the Postscript. The metaphor has a fundamental difference from what he says in the Postscript. The constituent of this metaphor is the community. It is a community of individuals who adapt and interact via linguistic structure with the world. This is in contrast to the idea found in Structure,
where it is the individual scientist’s world that changed with a change in paradigm. This
then leads to a conflation of the individual with the community in terms of what a
paradigm change entailed. Communities did not go through gestalt switches. Now we
see here in the more elaborate detailing of his metaphysical theory a refinement of what
he meant by his use of the word ‘world’ in Structure. The world which changes with a
change in paradigm is the world of the community. It is populated by objects whose
nature and structure are determined by a combination of inherited socialization,
biological constraints and linguistic adaptation. My interpretation of the last line of the
quote by Kuhn, ‘conceptually, the world is our representation of our niche’, is that when
we think or talk about what the world is, we are essentially talking about the objects
presented as ‘interact-able’ by the community. For example, 18th century chemistry
presented phlogiston as something which can be tested and interacted with. Phlogiston
existed in that community’s world. Observations were then made that conflicted with the
understanding of phlogiston. This then informed a re-evaluation of the community’s
linguistic structure (i.e. it ceased to exist in the lexicon) as well as the belief that
phlogiston existed. After that nobody interacted with phlogiston via normal science, and
it ceased to exist as an object of scientific study.

My take on Kuhn and this metaphor is that in the case of ‘an object exists’ and
‘an object exists for a certain purpose’ (to be studied, to be theorized, to be modeled),
the former depends on the latter. The objects which populate the world are determined
by the relevant activities of the community. This is my brief interpretation of these
remarks. The next chapter will provide a framework which I will then use to make sense
of them and explicate the theory in greater detail. To accomplish this I will be contrasting
what was examined in this chapter to the solution Hacking proposes for Kuhn’s theory and juxtaposing it to Hoyningen-Huene and Friedman’s metaphysical thoughts regarding Kuhn.
Chapter 4: Solutions

Introduction

So far in this thesis project it has been established that there is a metaphysical theory underlying Kuhn’s work. This metaphysical theory has led to what has been dubbed the ‘world problem’ within Structure. It stems from the ambiguous use of the word ‘world’ and the problem is how one can account for either of its uses within Structure. In some cases it is used to refer to a single non-changing world and in other cases it is used to refer to a world that changes with a change in paradigms. In Chapter 2 it was argued that this problem has led to a dissonance between the critics responding to Kuhn’s work and the work itself resulting in the critic’s arguments ‘talking past’ what is presented in Structure. Chapter 3 established that for Kuhn a metaphysical theory was vital to his continued work and how a robust account was lacking. This chapter will investigate what a more robust account would be by considering an inadequate solution and an adequate one.

This chapter has two primary sections. The first section will be considering Hacking’s solution to what has previously been called the ‘worlds’ problem. The solution is inadequate and the first section will argue why this is the case. The second section will cover a more adequate solution to the world problem, Hoyningen-Huene’s solution, and argue why that is the case.

The Hacking Solution

Hacking’s solution to Kuhn’s worlds problem as found in Structure is more or less straightforward nominalism (Hacking 1993). It is the metaphysical theory that the only
thing that exists outside of the mind is a collection of bare, property-less entities, a realm of individuals. The world is then furnished with properties by the kinds and categories of human invention. These kinds constitute the properties found in nature. In this way it is roughly parallel to Kuhn’s metaphysical view as discussed in the last chapter, at least in the respect of how language and nature are mutually determined. Within this chapter world\(_2\) will refer to the concept of the changeable world in Kuhn’s work and world\(_1\) will refer to the unchanging, singular world.

Hacking characterizes the world problem as the problem of making sense of how the world can change with a change of paradigm, but at the same time the world also stays the same in some sense. His solution is to then interpret the different uses of the word “world” as encompassing different domains.

The nominalist replies, (a) the world is a world of individuals; the individuals do not change with a change of paradigm. But a nominalist may add, (b) the world in which we work is a world of kinds of things. This is because all action, all doing, all working is under a description (Hacking 1993, p. 277).

This seems like a fairly elegant solution at first. It would imply that with a reinterpretation of *Structure* in order to be most clear Kuhn would declare himself a nominalist and only speak of property and kind changes when talking of paradigm shifts. This is an oversimplification, but the main point is that defining the second sense of the word ‘world’ as a domain populated only by kinds and properties is leaving out important elements of Kuhn’s theory. I will elaborate on that a bit later.

The reason Hacking thinks this is a good definition of the second sort of world is that:

All choices of what to do, what to make, how to interact with the world, how to predict its motions or explain its vagaries is action under
description: all these are choices under descriptions current in the community in which we work and act and speak. Descriptions require classification, the grouping of individuals into kinds. And that is what changes with a change in paradigm: the world of kinds in which, with which, and on which the scientist works (Hacking 1993, p.277).

This quote is somewhat perplexing because Hacking is not using description in the typical sense here. The relationship of action ‘under’ description is confusing given its normal sense. By normal sense I mean the sense in which ‘under’ means description facilitates acts, or is foundation for the ability to act. One may interpret description as him really meaning language, but then his idea that description requires *kinds* would be much more questionable. The point is that it seems that kinds are not singularly fundamental to language. Kinds alone do not explain all the ways in which language functions. For example, kinds cannot function on their own to furnish language with its syntax and the meaning of terms.

Hacking concludes his paper: “a suspiciously easy nominalist resolution to the new world problem has been to hand all along” (Hacking 1993, p.306). He then reiterates his nominalist solution:

The world that does not change is a world of individuals. The world in and with which we work is a world of kinds. The latter changes; the former does not. After a scientific revolution, the scientist works in a world of new kinds. A change in the class of sets of individuals that correspond to scientific kinds of things is not a change in the world at all. But in another sense the world in which scientists work is entirely different, because what we work in is not a world of individuals but of kinds, a world that we must represent using projectable predicates (Hacking 1993, p.306).

This solution is proposed as one which accounts for Kuhn’s newer taxonomic notion of incommensurability. It is not explicit in the article, but my interpretation is that Hacking sees, like Kuhn does, the importance of the metaphysical solution to the worlds problem
where it concerns incommensurability. Within Kuhn’s later work, the taxonomic structure within the scientist’s language is a structure of kinds and the idea is that they are part of what is incommensurable between scientific disciplines. The emphasis in the previous sentence is on ‘part of’. This is the locus of what makes Hacking’s solution to the world’s problem ill-fitting to Kuhn’s theory, with regards to both his metaphysical theory and his concept of incommensurability.

The issue with this as a solution for Kuhn’s worlds problem is that it oversimplifies an important relation between language and phenomena, their co-determination. Hacking’s solution is ill fitting if it is taken to mean that properties and kinds are the fundamental characteristics of world2, the basic units of what populates that world. To elaborate on this consider this quote from the previously discussed essay from Kuhn in the last chapter:

Members of a language community are members of a common culture, and each may therefore expect to be presented with the same range of objects and situations. If they are to co-refer, each must associate each individual term with a set of criteria sufficient to distinguish its referents from other sorts of objects or situations which the communities’ world actually presents, though not from still other objects which are merely imaginable (Kuhn 1982, p.51).

It has previously been established that it is important for Kuhn’s theory of incommensurability that language not only, in some way, determines the objects that are presented to the scientist, but also contains the criteria to determine what is the same between objects (kinds) and what is different. This is a very important characterization of Kuhn’s metaphysical scheme. Language determines the objects that are presented to a cultural group to such an extent that it is ‘expected’ that objects are presented to that cultural group within a certain limit based on its shared language. The problem with
Hacking’s solution can then be summed up considering this. It provides an account that cannot fit Kuhn’s picture of science, it is not sufficient because it does not explain the influence which language has on what exists. It fits in the sense that it is coherent with Kuhn’s picture of science that world₁ is more-or-less the world of ‘bare individuals’ and that world₂ is populated by kinds and properties. The problem as a solution is that it does not have a sophisticated enough account of either world₂ or world₁.

Considering the previous quote, Hacking’s solution so far also does a poor job of distinguishing between what Kuhn calls ‘what the world actually presents’ and ‘objects that are merely imaginable’). Despite what may seem like an ‘anti-realist’ sentiment, he still thinks that in the changeable world objects are presented to us as not malleable to what we think about them, or fleeting. For example, it is still possible for us to distinguish between what is imagination and what is not within his metaphysical theory. World₂ may be mind-dependent, in straightforward sense, but it is not affected by our personal whims. On Kuhn’s account world₂ is malleable in that it can change but also concrete in the previously mentioned sense. This is one of the complexities that Hacking’s solution fails to be sufficient in accounting for. The solution he presents only says what sort of things exist within world₂, it does not explain how world₂ is changeable and in what respect.

The summary of the problem with this solution is that with what Hacking provides he really does not need to use the language of different worlds. His account deflates the worlds problem into a dichotomy that does not fit Kuhn’s theory. The description of both world₁ and world₂, and how they relate does not sufficiently account for the co-determination found in Kuhn’s theory. This is especially true with the clarifications Kuhn
has made more recently regarding the importance of the community and how it relates to interpretation, language and objects. This relation, the co-determination, underwrites and explains incommensurability.

To elaborate more on the importance of accounting for co-determination I will examine Kuhn’s response to Hacking. He begins by saying that although *kinds* are an important way of explicating incommensurability, they do not “solve the full range of problems that incommensurability poses.” This is because “the kind concepts I require range far beyond anything to which the phrase *kinds* has ordinarily referred.” It is not entirely clear what those would be, but considering what has been determined so far, it includes more than the common idea of *kinds* as a grouping of kinds of things. This seems implicit in *Structure* and is explicit in the works examined last chapter. In order to make sense of incommensurability Kuhn needs an explanation of the relation between language and the world that goes beyond what is normally thought of as kind terms or descriptions. Kuhn thinks that what he needs, which ‘ranges beyond’ these kind terms, is a characteristic of kind terms and kinds in general. He suggests that this characteristic:

…can be traced to, and on from, the evolution of a neural mechanisms for reidentifying what Aristotle called ‘substances’: things that, between their origin and demise, trace a lifetime through space over time. […] In what follows I shall refer to it frequently as the lexicon, the module in which members of the speech community store the community’s kind-terms (Kuhn 1993, p.315).

Taking the traditional meaning of lexicon it seems that it would go without saying that it would contain a language-using community’s kind-terms. In one sense he means he is looking for a more substantial account for what is incommensurable between scientific communities. In the more direct sense, that he means exactly what he says, he
considers the lexicon in some way analogous to Aristotle’s use of substance. It used, in a general sense, to refer to beings, and the most obvious examples of substances, according to Aristotle, are perceptible ones. (Cohen 2000, Stanford Encyclopedia)

Although Kuhn does not quite come out and say it at this point, the most apt interpretation is that he considers the lexicon as something which is, in an important sense, a being. There are of course much more specific interpretations; this is the most general sense of substance. The relevance is that considering the more general sense of substance, it implies a sense in which the lexical structure is influential to determining substance, where it means beings. Within this interpretation it is another way in which Kuhn reiterates the importance of the lexical structure determining what exists.

This is compatible with what Kuhn later says: “I need a notion of 'kinds', including social kinds that will populate the world as well as divide up the preexisting population” (Kuhn 1993, p.316). What I can discern at this point is that Kuhn is dissatisfied with Hacking’s solution because natural/scientific kinds do not encompass enough of what he considers important to incommensurability. It is the aspect of his theory wherein the depth of incommensurability is explained by the change in language affecting what exists. The importance of world change to incommensurability is covered in Chapter 3.

What is at issue is not exactly the interpretation of world$_1$ being a world of bare individuals. It is Hacking’s solution of the world$_2$ as a world of kinds and properties. Although it is not clear what exactly Kuhn wants with an account of the second world, it is clear that it must be robust. His response to Hacking so far indicates that he wants to shift the importance more-so onto how incommensurability is due to a change in world$_2$. Instead of it being a just a matter of dividing up what we typically think of the world into
two domains (individuals and properties), it is a matter of accounting for either sense of ‘world’ in such a way as to explain how the components interact.

Another, perhaps simpler way, of rephrasing the problem with Hacking’s solution is that both senses of Hacking’s ‘world’ are important for what Kuhn means by world2. For Kuhn’s picture of science the second sense of world contains properties and determines the objects of scientific study. It is the world which scientists both work and also live within. It presents itself as the natural world to be studied. As we have seen in the previous chapter, even though it may seem to be an ‘idealistic’ sort of theory, world2 still presents itself to us as objective and concrete. In the next section I will be presenting a way to think of this distinction through Hoyningen-Huene’s work. As it stands, the first sense of Kuhn’s world has less to be said about it than Hacking suggests and with the second sense much more. To emphasize this point consider this quote from the same section where Kuhn comments on what part of the goal of his project is:

I aim to deny all meaning to claims that successive scientific beliefs become more and more probable or better and better approximations to the truth and simultaneously to suggest that the subject of truth claims cannot be a putatively mind-independent or ‘external’ world (Kuhn 1993, p.330).

The Hacking solution to the worlds problem would be problematic considering this central point in Kuhn’s project. It does not provide an account of Kuhn’s argument against understanding science as converging on a true representation of nature. Scientific belief is not simply about properties or action and representing them through linguistic elements such as kinds. It is a sort of metaphysically bare explanation that does not account for what Kuhn is trying to replace with ‘the subject of truth claims cannot be a putatively mind-independent or external world’. Since truth claims are not
just about properties, the second sense of the word world must account for all things which scientists have beliefs about (objects, laws, models etc.). For this sort of account I find Hoyningen-Huene’s solution satisfies this requirement and also lends more insight into the relation between the two senses of world.

**Reconstructing the Worlds Problem**

In this section I am going to examine Hoyningen-Huene’s characterization of Kuhn’s metaphysical theory. I will determine that it is a faithful characterization of Kuhn’s project and also provides a solution to the worlds problem. I will also highlight the differences between this solution and the Hacking solution in order to emphasize the importance of certain elements to Kuhn’s picture of science. For the first part I will consider Hoyningen-Huene’s interpretation of *Structure* and then later the metaphysical theory he provides as being what underwrites Kuhn’s theory. Hoyningen-Huene’s characterization succeeds in the following ways. It is faithful to Kuhn’s project in the sense that it interprets his metaphysical theory without dissolving the importance of various aspects central to his picture of science, one of them being non-convergence. It is also faithful in the sense that it fits Kuhn’s picture of science. It accounts for the interaction between the linguistic aspect (incommensurability) and the metaphysical aspect (world change). Finally, it solves the worlds problem in that it explains what the two senses of the word mean and how the metaphysical theory follows from, or underwrites, Kuhn’s picture of science.

In his reading of *Structure* Hoyningen-Huene first identifies the worlds problem as a tension between referring to nature as the world and also saying the world changes
with a change of paradigm. The tension is between using the world as the object of science and suggesting it changes. Hoyningen-Huene thinks that Kuhn is aware of this tension, and that it is written this way purposefully. My thesis so far agrees with this; the metaphysical aspect is an important part of Kuhn’s work and Kuhn seems conscious of this. This is especially apparent with these remarks:

The scientist must, for example, be concerned to understand the world and to extend the precision and scope with which it has been ordered (Kuhn 1970, p. 42).

In so far as their only recourse to [the world of their research] is through what they see and do, we may want to say that after a revolution scientists are responding to a different world (Kuhn 1970, p.111).

In Structure the distinction seems important but is also vague. He attempts to clarify his position in his later works, but as was demonstrated last chapter, it was still rather metaphorical.

The two passages just quoted represent the two senses in which world is used in Structure. Hoyningen-Huene describes what can be said about the first sense of world, the unchanging world as found in Structure. It is untouched by scientific revolutions.

After a revolution, it is merely seen ‘in a different way,’ covered by a conceptual web’ which shifted over the course of the revolution. It is a ‘hypothetical fixed nature’ to which we have no access. (Hoyningen-Huene 1993, p.33)

According to Hoyningen-Huene world1 is interpreted as something which is perceived in a different way after a revolution and at the same time is something to which we have no neutral access. Obviously those two qualities are at odds and Hoyningen-Huene suggests it is because of the nature of the relation between the two concepts. Kuhn later shifts the meaning to be closer to the second sentence and drops the ideas of it
being perceived or ‘covered by a conceptual scheme’. Hoyningen-Huene identifies that as one of the sources of vagueness of world in *Structure*.

Hoyningen-Huene says that world₂ on the other hand can be interpreted as the perceived world which the scientists work within. He also notes how this distinction coincides with Kant’s metaphysics:

It is a ‘perceived world’, ‘a world already perceptually and conceptually subdivided in a certain way.’ Paradigms are ‘constitutive’ of this world or nature, or more precisely, the world is ‘jointly determined by nature and the paradigm’… (Hoyningen-Huene 1993, p.32)

…it appears that ‘world’ and ‘nature’ here coincide to some extent with what Kant calls ‘nature in the material sense’ or even ‘world’: the ‘aggregate of appearance,’ the ‘object of all possible experience,’ the sum of the objects of experience.’ For both Kant and Kuhn, epistemic subjects are coconstitutive of this world, for which I will henceforth use the term ‘phenomenal world’ (Hoyningen-Huene, p.33).

The Kantian phenomenal world is an appropriate approximation of world₂ as found in *Structure*. Kuhn calls himself sort of Kantian in respects to metaphysics, and describing the world scientists working within as the ‘sum of the objects of experience’ fits his later work. It fits in that it is a strong enough characterization to include what Kuhn thought was lacking in the Hacking characterization. The phenomenal world encompasses all there is to what scientists are studying. According to Kant though the phenomenal world is sort of fixed in nature, or at least the categories which determine experience are. Kuhn is not entirely Kantian in this case. The important similarity is that this world constitutes all of experience and is also constituted in some way by the epistemic subject. Hoyningen-Huene identifies another similarity between Kuhn and Kant with respects to world₁:
The most important parallel consists in Kuhn’s and Kant’s insistence on the pure object-sidedness, hence unknowability, of the world-in-itself and thing-in-itself, respectfully (Hoyningen-Huene p. 34).

This parallel is not entirely clear in *Structure*, but it is apt in his work afterwards. An example of this is when he resists an idea of belief being about a ‘mind-independent reality’ and his talk of world1 being a posit in the postscript to *Structure*. Hoyningen-Huene uses some atypical terms in describing the world problem which are important to qualify as they are essential to his characterization. Object-sided is a property which applies to things which are presented as part of the natural world (i.e. not imagined, or thought) within the world of experience (world₂) but belong to world₁. Subject-sided things are what we typically think of as mental content and belong to world₂. Hoyningen-Huene uses this instead of the typical objective and subjective because he wants to avoid the connotations of objective being in a rough sense ‘real’ or the opposite of subjective. It has to do with how these things (I keep calling them things because it applies to everything that can be experienced) are presented to the epistemic subject, not how they actually are. This is relevant later on when Hoyningen-Huene goes more into detail about the concept of world₁ and its relation to world₂.

Hoyningen-Huene’s understanding of the metaphysical theory presupposed by Kuhn’s work starts with the distinction between the phenomenal world and the world-in-itself. The qualities of the phenomenal world according to Hoyningen-Huene are: there can be many possible phenomenal worlds, it is the world referred to as reality in most contexts, and it is not arbitrary or whimsical (Hoyningen-Huene p. 268). It is also mostly constituted by genetically subject-sided moments. The term genetically means something roughly similar to how Kuhn uses it, in that the form of those moments (how
we perceive and categorize things) is passed down by our culture. This characterization of the phenomenal world being mostly subject-sided does not seem intuitive, considering the phenomenal world is also supposed to be the common-sense real world. The language here is to do with ‘moments’ and it is not altogether clear what that is, but my interpretation is that a subject-sided moment is a moment of experience where the subject is the thing which a belief (for instance) is about. An object-sided moment would then be a moment in experience where an object is considered as what the belief refers to for the epistemic subject. When it comes to thoughts or forming a belief, the difference would be between something like ‘That noise on the roof is leading me to believe it is raining outside’ and ‘I am outside and being rained on, my clothes are wet. I have no choice but to believe it is raining right now’. However, if this were a completely apt interpretation it would seem that object-sided moments would predominantly make up the phenomenal world. Another way to reiterate the distinction is that the object-sided moments are more-or-less unequivocal and subject-sided are open to debate when it comes to what we think about them. Unequivocal and ‘open to debate’ both refer to the beliefs we form based on the experiences within those moments.

Hoyningen-Huene then goes on to describe the world-in-itself. He says that it is the product of ‘conceptual subtraction’. When you subtract all the subject-sided moments from the phenomenal world you are left with the concept of the world-in-itself. Hoyningen-Huene emphasizes that while it is a concept it is “unequivocal in the sense that, regardless of which phenomenal world it starts out with, the same world-in-itself results” (Hoyningen-Huene, p.267). We cannot say much about the actual subtraction
process because we do not have access to the world-in-itself. The subtraction process is an inference of its more general characteristics based on the fact that it contributes to the constitution of the phenomenal world. The fact that it contributes to the constitution of the phenomenal world is a sentiment Kuhn shares. This is apparent when he says that we must posit an independent, ‘real’ world in order to understand nature. To reiterate Hoyningen-Huene’s point in more of my own words, he is saying that the world-in-itself is a posit/concept that constitutes the basis of our experience. It is because we have experiences that present themselves as coming from nature that it must be the case that there is at least this posit underwriting experience, of world independent from ourselves. It is also real in the sense that any object is real in this metaphysical scheme.

Hoyningen-Huene mentions that this metaphysical theory seems idealist in the rough sense, but like Kuhn he also thinks that its characteristics lend themselves to some critical distinctions. He compares it to what he calls ‘the caricature of idealism’. It is the idea that reality is entirely constituted by the individual consciousness. It is an invention of consciousness and nothing truly distinguishes reality from dreams. It is the whimsical sort of idealism. In response to this caricature he raises three critical distinctions. “First of all, for Kuhn, reality, that is, a particular phenomenal world, is indeed object-sided, independent of all influence by subjects, in its substantiality” (p. 268) For instance, the distinction between dream and reality is a difference in substantiality. Substantiality means, in this sense, the way that experiences present themselves. Some are fleeting and are not a stable, or do not accord with commonly held laws of physics at the time (e.g. dreams). Other experiences are presented as
more coherent with what one has experienced in the past and obey rules such as causality. This is critical and, looking back at Hacking, an important part of what made his solution ill-fitting. The substantiality of the phenomenal world compared to the caricature is due to the fact that “for Kuhn, a phenomenal world is a particular reshaping of the world-in-itself, of that which is in itself.” (Hoyningen-Huene p. 268). The world-in-itself is contained within the phenomenal world and a scientific revolution is one way it is reshaped into a new phenomenal world. This is what the substantiality of the phenomenal world follows from. The phenomenal world’s properties are also of the same substantiality (i.e. not dependent on the whims of the subject), although, they are not completely object-sided.

According to the [straightforward] version of realism, the properties are, in origin, entirely object-sided; they are given of whole cloth to epistemic subjects and aren’t open to dispute. Kuhn’s position is located somewhere between these course, popular forms of idealism and realism (Hoyningen-Huene, p.269).

Here we see the tension of this solution with the nominalist one. I believe, and argued, that the nominalist solution was not appropriate because it was not quite right to attribute to Kuhn’s view the characteristic that properties are not real in the sense which Hacking states it.

The second distinction Hoyningen-Huene makes between Kuhn’s metaphysics and the caricature of idealism (and realism) is regarding its social nature (Hoyningen-Huene p. 269). It has to do with the similarity relations found in language that are important to later Kuhn when it comes to incommensurability. The rules for grammar are taught to students of a language the same way someone learning to become a member of a language using community inherits their way of structuring of the world. Using the
same analogy, you can change the way you use grammar, but that is not the same as changing the grammar of a language. To change the way you use grammar is to be in violation of a linguistic community’s rules. Unlike grammar, the experience of the structure inherited by a language-using community is not something one can change on a whim; it’s not a gestalt switch. You can slowly over time ‘lend impetus’ toward linguistic change, but, the point is, success of this change is entirely a social process. Hoyningen-Huene concludes that the way in which Kuhn’s metaphysics is ‘idealism’ is that it is social in nature, not individual. This is something which is crucial to Kuhn’s understanding of incommensurability as explicated in the last chapter, and also something which the nominalist solution does not account for.

The final crucial difference is that the linguistic structure of the community (similarity and dissimilarity relations) is influenced by object-sided moments, the world-in-itself. The corollary of this is that the phenomenal world is not completely independent of all influence from the world-in-itself. Properties can be object-sided, and in this way they offer resistance to how the community organizes its linguistic structure. The key term for this aspect is resistance. Object-sided properties do not uniquely determine the phenomenal world or the community’s linguistic structure. This is what allows for there to be anomalies to any given scientific theory leading to what was once a paradigm-change in Kuhn’s work. It allows for consensus to break down for not purely social means. If it were not the case that Kuhn’s metaphysics allowed for this it would be much closer to the caricature of idealism, and also nominalism. The theory must at least admit something influences the phenomenal world or the rest of the aspects break down.
Through describing the critical differences between Kuhn and the caricature of the idealist, Hoyningen-Huene delineates the details of Kuhn’s metaphysical theory. Kuhn’s unchanging, singular world is the world-in-itself and his world that changes with a paradigm shift is the phenomenal world. The phenomenal world is the world which the scientists experience and work within. It constitutes what they call reality. It is neither, roughly conceived, completely mind dependent or mind independent. It is substantial in that it has both subject-sided moments and object-sided moments, and hence, not entirely fleeting. It is inherited by the linguistic community one belongs in, so it is entirely social and not changeable on whim. The linguistic community provides the framework for its experience, but the community is also influenced by the object-sidedness of the properties it presents. These are properties that originate from the world-in-itself, but we do not have epistemic access to that world. The world-in-itself is only conceivable by inferring from the idea of the phenomenal world with the subject-sided moments subtracted. The phenomenal world is a posit in that sense but it also must be the case in order to explain the resistance of the phenomenal world to the linguistic community. It also seems like it is a necessary sort of posit within science’s study of nature. It is impossible to tell the subject-sided moments from the object-sided moments to any precise degree and therefore impossible to have an undistorted view of the purely object-sided world (world-in-itself).

Conclusion

This is a summary of Hoyningen-Huene’s interpretation, and solution, of Kuhn’s worlds problem. It solves the worlds problem in the following way. It explains how we
can have two different sense of the word ‘world’ within *Structure* and have Kuhn’s picture of science remain intact. The phenomenal world is what underwrites incommensurability. Once the linguistic structure of the community changes so does the phenomenal world. The terms no longer refer to the same things. On the other hand, scientists are in a sense still studying one, unchanging natural world (the world-in-itself) as according to Kuhn’s account of normal science within *SSR*. It is just that that world is a posit (but not imagined) and a world which is understood conceptually. The sense in which scientists study it is the same sense that scientists study a black hole by observing the objects rotate around it. The world-in-itself indirectly influences the study of science and the development of a science’s linguistic community by providing the resistance that the phenomenal world gives to scientific endeavors. Hence, it allows for anomalies. Meanwhile the emphasis of incommensurability being due to world change remains intact. Recall the question I asked in chapter 1: ‘Does the Copernican paradigm now affect the objects of everyone’s world? Is the sun we now experience different from the sun the common person experience during the time of Ptolemy?’ We do experience different stellar objects than Ptolemy did, but both our solar system and his are the same in that it presented itself in an object-sided sort of way.

In chapter 2 I considered some of the critical studies of Kuhn’s work and how they reduced quickly to being a tension between different metaphysical systems. In Hoyningen-Huene’s formulation it is a matter of agreeing whether or not the phenomenal world changed at critical junctures in science, or whether it changed at all. In chapter 3 I demonstrate that Kuhn’s refinement of incommensurability as a matter of interpretation has important metaphysical underpinnings. This metaphysical theory is
also not quite explicit in how the lexical structure is related to the world, and how it is co-constitutive. Hoyningen-Huene’s characterization explains how the two different senses of world interact. The lexical structure encounters resistance from the phenomenal world’s object-sidedness. This resistance is an indirect interaction with the world in-itself and it changes the linguistic structure of the community. This then leads the phenomenal world to be structured in a different way than it was previously because, to a large extent, the structure is constituted by social factors.

To support that this is a faithful interpretation of Kuhn’s picture of science, consider this quote from World Changes where Kuhn is responding to Ernan McMullin:

In other areas what I need to do is explain what Ernan sees as equivocations and inconsistencies in my position. That will require my presupposing, at least for the sake of argument, that you have already set aside the notion of a fully external world toward which science moves closer and closer, a world independent, that is, of the practices of the scientific specialties that explore it. Once you have come that far, if only in imagination, an obvious question arises: what, if not a match with external reality, is the objective of scientific research? Though I think it requires additional thought and development, the answer supplied it Structure still seems to me the right one: whether or not individual practitioners are aware of it, they are trained to and rewarded for solving intricate puzzles at the interface between their phenomenal world and their community’s beliefs about it (Kuhn 1993, p.338).

Hoyningen-Huene’s metaphysical reconstruction can be seen as faithful in the previous mentioned sense of supporting Kuhn’s picture of science and also in the sense of explicating what Kuhn seemed to think about his metaphysical position. From this quote and some other passages mentioned, Kuhn thought it was important that the world the scientists lived within be the ‘real world’, the phenomenal world. It is also crucial to incommensurability that it is able to change in some fashion. Now instead of: “In a
sense that I am unable to explicate further," it is: “because phenomenal worlds change with a change in the linguistic structure of the community”. This is why the Hacking solution was inadequate; it did not lend substance to Kuhn’s picture of science. ‘Bare individuals’ were not ‘real’ the same way that properties were not ‘not real’.

To conclude this thesis project, I will summarize the important points. In Structure Kuhn makes vague metaphysical claims that, despite being vague, are important to the picture of science developed within the book. He reiterates the importance, and acknowledges it, directly and indirectly throughout his later works. The influence of this metaphysical theory is not recognized by the critics of Structure, whose arguments quickly reduce down to a difference in metaphysical theory, despite originally being about incommensurability. This demonstrates how critical the metaphysical theory is to Kuhn’s concept of incommensurability. To further this point and provide clarity, Kuhn’s response to his critics is examined. It is determined that his defense involves an elaboration of what Hoyningen-Huene called the phenomenal world, and how that world is co-constituted by the linguistic community and how the world presents itself. Ian Hacking’s solution to the worlds problem is examined and determined to be inadequate because it does not sufficiently, or faithfully, account for important elements of Kuhn’s picture of science. This is juxtaposed against Hoyningen-Huene’s characterization which succeeds because it fits Kuhn’s picture of science and provides more explanation of the interaction between the phenomenal world and the world-in-itself. The usefulness for this sort of solution is highlighted in chapter 2 and 3 in examining criticisms and defenses of Structure. This is because, contrary to what Davidson says, Kuhn’s
scientists are not simply dictionaries apart. The explanation of how this is the case strengthens Kuhn’s position regarding incommensurability and his picture of science.
Bibliography


