Commensurability of Science During Paradigm Shifts And Standards Of Progress

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In this essay, I will talk about the development of scientific theories in the philosophy of science. I will explain the way in which science is thought to be created by Thomas Kuhn in "The Structure of Scientific Revolutions". As a result of the Kuhn's description of science as a framework consisting of paradigms, Kuhn contends that scientific advancement is noncumulative. For Kuhn, an old paradigm must be supplanted irrationally in entire by a new and incommensurable alternative paradigm through the process of a scientific revolution (Kuhn, 12). However, I will argue that Kuhn's position on this matter is entirely not correct. Instead, I argue that, within the paradigmatic structure of science that Kuhn advances, progress within the paradigms of science can be shown to be cumulative and rational. Examples of this can be found in the various ways in which scientists continually reference and operate with the work of the old paradigm despite their adherence to the new. After my argument, a reaction from Kuhn is imagined on the alleged correspondence between paradigms. I show that Kuhn would find that although paradigms may communicate among one another the standards by which they communicate and ultimately compare among one another is inherently irrational and cannot be justified. At last, I attempt to explain away Kuhn's imagined reaction by arguing that rational discussion and judgement among paradigms is possible using experience in our epistemological pursuits.

Description of Normal Science

In his paper, Kuhn illustrates that in its normal functions' science is considered to be a 'puzzle-solving' enterprise (Kuhn, 35). Science, in this 'normal' status, is distinguished by its adherence to concrete foundational principles and intentionally operates with distinct and delineated disciplines. Under these conditions, science also follows a specific methodology for research by way of

streamlining a strategy for directing analyses and a streamlining a way for accepting beliefs. In 'normal' science, researchers are intentionally not educated to scrutinize these foundational principles and methodologies by which science has been accepted to abide by. Instead, issues that are discovered while within this 'normal' science that conflict with the foundational principles of the scientific community is hidden or masked, usually not included, or addressed when scientists attempt to tackle riddles, until they begin to pile up enough to become apparent in the eyes of the scientific community. As a result, the foundational principles that constitute a paradigm are occasionally *forcibly* tested.

In 'normal' science the shared foundational values across all disciplines create a community of researchers which is oriented towards the identical goal of progress. As such, they are left to face dilemmas in identical ways and develop solutions to dilemma in a similar fashion to one another. Dilemmas may be things such as deciding between important issues that should be settled (which riddles merit unraveling). It because of this routine exercise that 'normal' science mimics a 'puzzle-solving' approach to dilemmas. Notably, it is *only* during this standard period of 'puzzle-solving' that researchers and science can be said to be acting in a rational and progressively manner. "Puzzle-solving" remains progressive until researchers are left with a stack of riddles that they cannot illuminate, a situation which is described as a 'scientific crisis' (Kuhn, 66). Only in situations of 'scientific crisis' are researchers willing to consider a complete amendment of the foundational principles, although not completely rationally according to Kuhn, that were previously indispensable to their 'puzzle-solving' contemplations as a way to return back to them.

Scientific Revolutions, and Paradigm Incommensurability

Kuhn contends that in the aftermath of the of 'scientific crisis', when paradigms are switched, sometimes alluded to as a scientific revolution, the foundational principles are always changed in such an extreme way that the riddles, or hypotheses, that the previous paradigm had are no longer in any correspondence with the new (or any other paradigm for that matter). In other words, an

objective view of progress between paradigm shifts becomes impossible. Consequently, for Kuhn and his followers, it becomes be irrational to believe that science could be cumulative when there is no sensible communication or translation possible between the paradigms and their suitors (Kuhn, 201). Since we could never properly understand a paradigm in relationship to all other paradigms, we could also never figure out what the best paradigm is, or even a preferential one, for making progress. As a result, Kuhn describes the transition between paradigms as an 'all-or-nothing' wonder in which science, after it is upset, must start once more and lose the greater part of its earlier achievement. A described instance of this happening in the "Fear of Knowledge" by Paul Boghossian is the substitution of Newtonian mechanics by the Einsteinian relativity hypothesis (Boghossian, 124).

Kuhn contends that the incommensurability of paradigms results as a cause of two different reasons that occur when paradigms shift. The first issue of commensurability of paradigms is that paradigms are not compatible in regard to the rundown of issues that should be explained. This point sensibly follows since all paradigms must shift because the list of issues that must be resolved have gotten too great for the current foundational structure to determine. In this manner, a move will be guaranteed, and in a move, there will consistently be fortunes and misfortunes regarding which issues are supposed to be unsolved in the return to ordinary science (Boghossian, 124).

The second issue of commensurability is that paradigms are not translatable among one another. In their use of terms, definitions of words, language, or vocabulary they employ, paradigms are essentially diametric and opposed to one another. Kuhn argues that the new paradigm will communicate using an alternative language from its suitor paradigms due to their differing values and thusly this difference will result in ideas that cannot be properly understood . When some understanding is possible, correspondence is to a limited or qualified degree in which paradigms are permanently locked talking past one another. Suitor paradigms will not be seen through a rational lens since there is no way in which to have the option to

address debate on their principal values without first being in that paradigm itself. Since no sensible connection could be made for either of the competing theories which could contain language that is impartially expressible or translatable it would make their debates unsound to each other forever. For instance, Newtonian gravity communicates an alternate definition of ‘mass’ or ‘space’ than the Einsteinian theory of general relativity. In this way, by using the definitions of one paradigm, according to Kuhn, it would not be conceivable for a researcher who studied under the Einsteinian paradigm, or vice versa, a student which studied under the Newtonian paradigm, to completely and impartially understand each other, or argue amongst each other, or make the discoveries that are mutually compatible since they employ them in a different world all together.

The failure of translation can happen at a global level or a local level although ultimately the results from either result in consequences that are equivalently grave. In a global failure of translation, the thoughts between paradigms could be diverse to such an extent that no interpretation of ideas is conceivable at all (Kuhn, 201). In other words, no part of the language in a paradigm would translate and we would not be able to tell any difference between two suitor paradigms at all. In a local failure, only certain words or expressions are lost in interpretation. In the case of our earlier example of mass in competing paradigms, “for Newton energy is conversed while Einsteinian is convertible with energy” (Bird, 2018).

This difference in definition may alone seem markedly insignificantly but under analysis can reveal itself to lead to the same degree of incommensurability as a global failure. For example, even under conditions of local failure Kuhn realized that “these sorts of conceptual differences indicated breaks between different modes of thought, and he suspected that such breaks must be significant both for the nature of knowledge, and for the sense in which the development of knowledge can be said to make progress”. Thusly, researchers, by simply describing their world in certain ways, such as in their primary values, change the way in which researchers themselves experience reality (simply looking through the lens of a paradigm such as which problems to solve). A completely different experience of reality leads terms such as ‘mass’ in suitor paradigms, such as Einsteinian and

Newtonian, to espouse entire difference in conceptual schemes regarding reality and not just definitions of words. Two researchers in the differencing paradigms would not be able to locate the same problems because they would be looking at an entirely different world and be attempting to solve entirely different dilemma in wholly incompatible frameworks. Thus, both issues of incommensurability, Kuhn contends, lead to loss in cumulation of thoughts across paradigms and forestall the target of advancement in science.

Resolving Incommensurability between Paradigms

To address the issue of cumulation in science across paradigms, we must first solve the dilemma of incommensurability between paradigms. The issues of incommensurability, the issue Kuhn describes of different concerns of problems, and their varied translations, can be addressed and explained away by showing that understanding does occur between the theories of paradigms even though they may not translate into an impartial language (Kuhn, 201). If this were to happen communication could on a global and local level when paradigms shift. Such a situation can be argued for with the use of a realist approach in our epistemology.

In the scope of this paper, a realist approach can be said to be one the acknowledges that the difference in terms between paradigms can be reconciled since they fundamentally refer to external phenomena which can indeed be said to be always objective despite our perception of them (Kuhn, 111-113). As a result of applying this approach here, the lenses through which philosophers always experience their warped reality can be taken off to show that our scientific theories and methodology for justification is always grounded in an unremovable sense of reality. Kuhn had argued otherwise against a realist approach and tried to show that methodology ran so deep that it affected the total world around philosophers. However, to maintain this position of this is to suggest that a case of relativism and one which is simply only based on a different interpretation of the semiotics within paradigms. Such a case of relativism is not , which is not compatible with the fundamental goals of science itself.

Boghossian argues against this relativist approach by showing that such a linguistic difference only illuminates the difference in representation and the thing represented, not a diversity of entire realities (Boghossian, 123). By taking this realist approach, we also make it possible to say that the underlying ideas in these paradigms are always somehow consistent and connected and should fundamentally be reconcile or related (to some degree). A stage for their commensurability could eventually be found since competing paradigms fundamentally describe aspects of the same world (perhaps only in different ways).

An example of rational commensurability between paradigms is demonstrated when we witness scientists working within multiple paradigms. This instance is particularly relevant in the development of a new paradigm. For example, Einstein, in creating his ideas on general relativity continually referred to the work of Newton even though it was an older paradigm from the one he was imagining. In fact, his ideas implicitly depend on some of the central ideas Newton constructed earlier in his work; especially since Newton's ideas had not been disproved by Einstein's ideas. Taking this into consideration, it is easy to see that Einstein could understand the meaning of the vocabulary and terms in their respective paradigms. And perhaps the various other paradigms of gravity that came before since they too ultimately reflected on the ideas of the same world. Hence, for Einstein, and many other scientists, when paradigms shift, an identical translation is not necessary to have a conversation and analysis between these competing paradigms in order to decide which is superior. Simply an understanding of the ideas in each of their respective paradigms is necessary. Thus, despite what Kuhn suggests, it seems that ideas between paradigms may communicate even though they do not fully translate.

Just like Einstein did when working on his theories, scientists today continue to work beyond the boundary of a single paradigms. In their calculations, scientists switch between paradigms by using Newtonian calculations for most of their work while only reserving Einsteinian calculations for close approximations (such as at travel at the speed of light). Resultantly, neither theory shown to be incorrect or disagrees with one another. Rather, they are over all compatible and

merge to enrich the understanding of the researcher. The understanding achieved for the researcher is possible without the paradigms ever sharing their vocabulary and terms. In this way, by showing that the old paradigm was not just discarded and still useful for researchers today, we may say that science continues to cumulate and be progressive since the ideas between the old and new theories continue to be understood by scientists, used, and cherished.

Another positive consequence of the realist approach is the resolution of the first problem of commensurability. Under a realist approach, researchers can accurately measure the weight of problems in a paradigm. Since we can communicate between paradigms by understanding them on their own terms their problems can be judged on which issues are important to explain and resolve. Philosophers of science, such as Larry Laudan, shows this in Curd Martin's book "Philosophy of Science: the Central Issues". Laudan argues the meaning of *importance* has a subjective variation as well as an objective one (Curd, 238). The former is far less relevant than the latter for our purposes; the former is an issue of politics that is not relevant to our investigation into science.

When using the objective approach of importance, one that is applied in an epistemic setting, we may argue that a problem or theory has a greater weight due to its *probative importance*. This importance is produced by looking at the consequences that may follow by resolving the problems important to us in competing paradigms and analyzing the benefits and consequences of their suggested resolutions (Curd, 238).

Laudan's ideas show us that that the consequences of discarding some problems and retaining others are not actually a subjective matter but is an objective dilemma since they can be properly justified by empirical and rational factors – not due to political values regarding which problems are more important or satisfying to solve for the scientific community right now (perhaps for the sake of securing funding or perhaps during the case of a pandemic to apply radical approaches). The most compelling objective solutions ought to be those which solve the greatest breadth of dilemmas and accrue 'puzzle-solving' 'normal' science for the longest time. The

solutions are not those which only solve dilemmas that are currently fashionable in the scientific community. By consequence, a paradigm can objectively be said to have failed to be preferential for acceptance and be a less compelling paradigm than a competing one which when it does not solve enough compelling problems (or satisfyingly enough) as other competing ones. By taking this probative variation of importance, we can say that scientific revolutions continue to be progressive by way that the dilemma they are attempting to solve either inevitably become reduced or become simplified. These epistemic values remain consistent between paradigms, and are indicators of good science, allowing tenets of science to be cumulative despite their alleged irrationality.

Justification Between Paradigms

A possible response from Kuhn or someone who holds such a position may be imagined here. For 'Kuhnians', only debates which rely on 'constitutive shared values', or within a single paradigm, remain rational (Curd, 227). Even when these values can be shown to be consistent across competing paradigms, and paradigms are made commensurable through understanding still someone with a 'Kuhnaian' position would argue it is not possible that there is some way to justify an objective standard of progress itself and not one that could be for certain described impartially since a person is inevitably tied to bias by the paradigm of which the researcher is in. An objective analysis of probative importance would continue to be an overall biased approach because the researcher would be confused by their competing ideas of what progress is across paradigms. What may appear to be progressive to one paradigm does not satisfy the standard of what progress is another paradigm leading to inherent conflict since the standards by which the standards are established are themselves derived from the paradigm to which one believes in (Kuhn, 42-43).

This is the case since the idea of objectivity in itself is derived from shared values, and these values are by themselves an act of political expression – even if it were for objective pursuits such as in science (Kuhn, 42). Shared values only arise by virtue of being shared and not since they are actually justified signifiers of truth. Values that judge paradigms are said to be context-independent in science are

those of truth, scope, and straightforwardness (Curd, 229) are actually not so independent of context but rather motivated by social rules. These values find themselves produced as legitimate indicators of truth as a result of social petitioning and not because they can be justified to do so. Scientists only believe these rules for justification since they are convenient but not actually truthful. By consequence, 'Kuhnians' would find that even still there is no way to have a rational debate across paradigms since the standard of values that govern the governance over a selection of paradigms themselves are politically derived and dependent on the paradigm one is in (Kuhn, 43-44). Political values cannot have any efficacy in assessing truth (and probative truth) in deciding between paradigms when we are concerned with progress. Thus, science continues to shift irrationally across paradigms since standards for governing the standards between paradigms are themselves paradigm dependent.

Justifying Values by Experience

McMullin ideas allow us to assert that the examination which Kuhnians offers of shared qualities is inadequate to clarify the explanations behind the improvement of science (Curd, 232). Kuhnians depicts that it is absolutely impossible to show the association between our qualities, for example of straightforwardness, and their yield in truth since the standards that govern this evaluation are by themselves evaluative (Curd, 232). An approach to defeat the deterrent is to speak to the virtues of experience in our epistemology (Curd, 232).

Experience based justification can satisfy our commitment to shared epistemic values in an objective manner. Epistemic values such as straightforwardness are said to succeed without any politics from scientists when deciding between competing paradigms . This may be provided with the addition of experience, since it can be demonstrated to be a signifier of truth in science without any social motivations.

Scientists cannot prove that by themselves that these shared values are indicators of predictive accuracy, yet we can say that they are subordinate to the primate goals of predictive accuracy and

explanatory power by the empirical discovery that these theories are consistently more reliable explainers. Occam's razor is an example of this. Hence, although there is no clear demonstration of simplicity as a virtue of truth, we do admit that time and time again through experience that a greater simplicity leads us to a greater sense of truth. As these indicators have remained successful indicators in the past, McMullin argues, they will "likely remain good predictors in the future" which merits their legitimacy (Curd, 232) when deciding between competing paradigms. In this way, experience allows us to maintain that scientific theories continue to progress across paradigm shifts and our standards for deciding the idea of progress continues to be relevant.

Conclusion

In summation, I have discussed the way scientific theories persist, progress, and evolve. Initially, I clarified the way science is described to be historically created by Kuhn. By aftereffect of this portrayal, Kuhn argued paradigm progression as a noncumulative [something] in which an old paradigm is displaced in whole by an incommensurable new one. This is due to issues of weighting problems and translating language. But I have argued that this view to be incorrect. Translation is not necessary for understanding the languages of competing paradigms, and an objective analysis of importance in problems is possible without being warped by committing to a paradigm. With commensurability shown to be possible in science, I contended that cumulative progress of science is the certainly possible. This is demonstrated to be the situation by the different manners in which researchers constantly reference and work in crafted by the old paradigm regardless of their transformation to the new. A response from Kuhn, or those in his position, is imagined here accepting their correspondence however challenging the idea that progress can itself be shown to be an impartial criterion of judgement without commitment to a single paradigm. I battled my imagined response from Kuhn's by attempting to show that debate between epistemic convictions can be shown to be entirely rational by making use of experience to our epistemological pursuits.

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