YOU SAY YOU WANT A REVOLUTION. WELL… YOU KNOW… WE ALL WANT TO CHANGE THE WORLD

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Abstract. According to the *Structure of Scientific Revolutions*, when a scientific revolution occurs the world changes. A closer reading of the text suggests that the world itself does not change: it is only the way we conceptualise the world that changes. But the text also seems to suggest that we have no access to the world except via concepts. It follows that we have no way of talking about the world itself, so there is no way of making such a claim. This is a familiar problem of a number of views, including Kantianism and Mahāyāna Buddhism; and it seems to commit such a view to contradictions at the limit of expressability.

Keywords: scientific revolution; contradictions; expressability; paradigm shift; worldview; change.

1. INTRODUCTION

In 1962 Thomas Kuhn published his *Structure of Scientific Revolutions* (here-after, *SSR*)[1]. The book unleashed a whirlwind on the philosophy of science and beyond. It revolutionized the way that the philosophy of science was done, overturning the somewhat ossified state of the subject – which had been dominated by logical positivism/empiricism – and brought the history of science to center-stage. And every discipline which aspired to scientific status rethought its self-vision in Kuhnian terms. The word 'paradigm' entered the vernacular as a new catch-all phrase, far and beyond anything that Kuhn had ever intended.

Of course, the book and its contents came in for extended philosophical scrutiny. What follows concerns only a small, but central, part of Kuhn's book:

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[1] T. S. Kuhn, *The Structure of Scientific Revolutions*, 2nd edition, Chicago, University of Chicago Press, 1970.

namely, his remarks on scientific revolutions and the changes in *Weltanschauung* which they occasion. Chapter 10 of *SSR*, "Revolutions as Changes in World View", contains the main discussion of the matter. We will see that Kuhn's views here betoken changes in paradigms far beyond those areas that Kuhn envisaged[2].

2. KUHN AND THE CHANGING WORLD

According to Kuhn, a mature science is structured by periods of normal science ruptured by scientific revolutions. There is much to be said about such revolutions, but the central thing to focus on here is that in a revolution the conceptual tools we use to investigate the world, our paradigm, changes. In some places, Kuhn goes so far as to suggest that when there is a scientific revolution, it is not just our paradigm that changes; the world itself, changes:

> [The ease of seeing new things] may make us wish to say that, after Copernicus, astronomers lived in a different world.
>
> [T]he principle of economy will urge us to say that after discovering oxygen Lavoisier worked in a different world.[3]

However, in other places he says that it does not:

> Whatever he may then see, the scientist after a revolution is still looking at the same world.[4]

The apparent contradiction here is patent. And Kuhn is well aware of it. He says:

> I am ... acutely aware of the difficulty created by saying that when Aristotle and Galileo looked at swinging stones, the first saw constrained fall, the second a pendulum. The same difficulties are present in an even more fundamental form by the opening sentences of this section: though the world does not change with a change of paradigm, the scientist afterwards lives in a

[2] This is a written up version of a lecture given at the (online) conference: *On the Objectivity of Scientific Knowledge. Models and Theoretical Representations of Structure and Progress in Science. Thomas Kuhn's Legacy*, Institute of Philosophy and Psychology, Romanian Academy, Bucharest. Many thanks go to the members audience on that occasion for their thoughts, and to my colleague Muhammad Ali Khalidi for his helpful comments on a draft of the paper itself. It should go without saying that the scholarly literature on Kuhn enormous, and a lecture of this kind was not the place to go into it. Those interested in such matters can start with A. Bird, "Thomas Kuhn", in E. Zalta (ed.), *Stanford Encyclopedia of Philosophy*, 2018, https://plato.stanford.edu/entries/thomas-kuhn/.

[3] *SSR*, pp. 117, 118.

[4] *SSR*, p. 129.

> different world. Nevertheless, I am convinced that we must learn to make sense of statements that at least resemble these[5].

I think the contradiction is easily resolved – and that Kuhn would have been happy with this resolution had it been put to him. As he explains in the chapter, the paradigm determines our *phenomenological* world, that is, the world as experienced; it is this that has changed. This does not imply that the world *as such* has changed.

You could, I suppose, hold that it does. A thoroughgoing idealist would. However, this is not Kuhn's view. Moreover, it is an uncomfortable view. There is a clear sense in which Newton and Einstein lived in the same world as each other, and were studying exactly the same things that happen in it – in the way that Newton and Darwin were not studying the same things.

3. PERCEPTION AND LANGUAGE

So we need to draw a distinction between the phenomenological world and the world *an sich*. That's fine; but the move takes us into a deeper problem. To see why, start with the obvious fact that, by definition, our phenomenological world is the world of perception. So the new paradigm requires us, quite literally, to see differently. As Kuhn says:

> At times of revolution, when the normal scientific tradition changes, the scientist's perception of his environment must be re-educated – in some familiar situations he must learn to see a new gestalt.[6]

And it is not just perception that changes. The change of paradigm brings about a change of concepts. Indeed, a major reason that perception changes is that perception is theoretically-loaded. As Kuhn puts it:

> Surveying the rich experimental literature from which these examples [just mentioned] are drawn makes one suspect that something like a paradigm is prerequisite to perception itself.[7]

Moreover, our descriptions of what we see are given in language, which is itself paradigm/concept-loaded:

> [I]s sensory experience fixed and neutral? Are theories simply man-made interpretations of given data? The epistemological viewpoint that has most often guided Western philosophy for three centuries dictates an immediate and unequivocal, Yes! ...Yet [the view] no longer functions effectively, and the

[5] *SSR*, p. 121.
[6] *SSR*, p. 112.
[7] *SSR*, p.113.

> attempts to make it do so through the introduction of a neutral language of observations now seem to me hopeless.[8]

Moreover, there is no neutral language:

> As for a pure observation-language, perhaps one will yet be devised. But three centuries after Descartes our hope for such an eventuality still depends exclusively upon a theory of perception and of the mind. And modern psychological experimentation is rapidly proliferating phenomena with which that theory can scarcely deal.[9]

Even to talk about the same light rays hitting the retina of a scientist before and after a revolution is to describe matters in certain conceptual terms. In other words, there is no paradigm-free language. As Kuhn sums up the situation;

> Many readers will surely say that what changes with a paradigmis only the scientist's interpretation of observations that are fixed once and for all by the nature of the environment and the perceptual apparatus... [However, r]ather than being an interpreter, the scientist who embraces a new paradigm is like the man wearing inverting lenses. Confronting the same constellations as before and knowing that he does so, he nevertheless finds them transformed through and through in many details.[10]

Those details are recorded in paradigm-dependent language. That is, they are details of our phenomenological world.

Let us put the pieces together. The world we see and talk about, the world our paradigm gives us, is our phenomenological world. To talk about the world *an sich*, we would need a paradigm-free language, and there is no such thing. Hence, we cannot talk of the world *an sich*.

But Kuhn *does* talk of the world *an sich*. Just have a look at some of the quotations above. Even to say that the world is perceived differently before and after the change of scheme presupposes that there is a world such that *it* is perceived in different ways. Kuhn has jumped out of the frying pan into the fire.

4. THE FAMILIAR TERRITORY

The problem we face is, in fact, a familiar one from the history of philosophy. Some Kuhn commentators[11] have seen a similarity between Kuhn and Kant. And a similar problem does, indeed, obtain for Kant. Though he does not hold that our conceptual scheme changes in the way that Kuhn does, Kant thinks that our conceptual

[8] *SSR*, p. 126.
[9] *Ibidem*.
[10] *SSR*, pp. 120–122.
[11] E.g., P. Hoyningen–Huene, *Reconstructing Scientific Revolutions: Thomas S. Kuhn's Philosophy of Science*, Chicago, University of Chicago Press, 1993.

schemas apply to the phenomenal world only. There is a noumenal world. This includes, but is not restricted to the things in themselves which give rise to our perceptions. But for various reasons, our concepts apply only to the phenomenal realm, not the noumenal realm. Yet Kant obviously talks about noumena – as it takes only a superficial reading of the *Critique of Pure Reason* to see – and so requires that our concepts can be applied to it[12].

Though this would be unknown to most Kuhn commentators, a similar problem arises in Mahāyāna Buddhism. All forms of Buddhism endorse the distinction between a conventional and an ultimate reality. For all schools of Buddhism, conventional reality is our (normal) phenomenological world, our *Lebenswelt*. In Mahāyāna Buddhism (of its many different forms), ultimate reality is held to be ineffable. Concepts apply only to the conventional world. Indeed, concepts are partly *constitutive* the conventional world. But such Buddhist philosophers, too, talk about ultimate reality. Indeed, they say much about it[13].

Kant and the Buddhist philosophers, then, trespass just as much into the ineffable as does Kuhn.

5. NO EXIT

Kant and Mahāyāna Buddhists are of course well aware of the problem, and essay ways out of it.

Thus, Kant draws a distinction between a positive notion of noumenon, and a negative notion of noumenon. It is indeed illegitimate to say anything about the positive notion; but the negative notion is quite legitimate: it serves to establish the limits of our categories. But to say that there are things beyond the limits of our categories is to talk about them, and so apply our categories to them[14].

Kant's move is clearly an unhappy one, as Kant is well aware. Indeed, he completely rewrote the section of the *Critique* dealing with the matter because of this. However, the new version could not avoid the fundamental problem, as may critics have noted. Here, for example, is Kemp Smith:

> But beyond thus placing in still bolder contrast the two counter-assertions, on the one hand that the Categories must not be taken by us as other than merely subjective thought functions, and on the other that a limiting concept is indispensably necessary, Kant makes no attempt in the new passages to meet the difficulties involved. With the assertion that the Categories as such, and therefore by implication, those of reality and

[12] For further discussion of the problem in Kant, see G. Priest, *Beyond the Limits of Thought*, 2nd edition, Oxford, Oxford University Press, 2002, ch. 5.

[13] See, further, G. Priest, "Classical Logic *Aufgehoben*", ch. 4 in G. Priest, R. Routley, J. Norman (eds.), Paraconsistent Logic, Munich, Philosophia Verlag, 1989, chs. 5, 6.

[14] For further discussion, see G. Priest, *Beyond the Limits of Thought*, ch 5.

> existence, are inapplicable to things in themselves, he combines, without any apparent consciousness of conflict, the contention that things in themselves must none the less be postulated as actually existing.[15]

The Tibetan Buddhist philosopher Gorampa (1429–1489) also tries to get out of the problem by drawing an appropriate distinction: that between the nominal ultimate about which one can talk, and the true ultimate about which one cannot talk. When we talk of the ultimate we are talking of the nominal ultimate. As one commentator puts it:

> In the *Synopsis*, Gorampa ... divides ultimate truth into two: the nominal ultimate ... and the ultimate truth....While the ultimate truth ... is free from conceptual proliferations, existing beyond the limits of thought, the nominal ultimate is simply a conceptual description of what the ultimate is like. Whenever ordinary persons talk about of conceptualize the ultimate, Gorampa argues that they are actually referring to the nominal ultimate. We cannot think or talk about the actual ultimate truth because it is beyond thoughts and language; any statement or thought about the ultimate is necessarily conceptual, and is, therefore, the nominal ultimate.[16]

But again, one needs to talk about the true ultimate even to draw the distinction. Indeed, if, when we talk about the ultimate, we are merely talking about the nominal ultimate, the claim that the ultimate is ineffable is simply false. In the light of what is about to come, it is worth nothing that early Mahāyāna Buddhists appeared to be quite happy with the thought that one can say some things about the ineffable ultimate. The ultimate is a contradictory (dialetheic) object[17].

6. KUHN'S PREDICAMENT

Because Kuhn fails to make the crucial distinction between the phenomenological world and the world *an sich* explicitly, he never gets around to attempting evasive moves of the kind that Kant and Gorampa do. Neither would he have much hope of success if he did. Clearly Kuhn talks of the world *an sich*, whilst maintaining there is no language in which to do this. Supposing, after Kant, that this is an illegitimate notion, or, after Gorampa, that when we are talking about it, we are really talking about something else, does not help – for exactly the same reasons.

[15] N. Kemp Smith, *Commentary to Kant's* Critique of Pure Reason, 2nd edition, London, Macmillan, 1923, p. 413 f.

[16] C. Kassor, "Is Gorampa's *Freedom from Conceptual Proliferations* Dialetheist? A Response to Garfield, Priest, and Tillemans", in *Philosophy East and West*, 63, 2013, pp. 399–410, p. 401.

[17] See G. Priest, *The Fifth Corner of Four*, Oxford, Oxford University Press, 2018, ch.6.

Here, then, is Kuhn's predicament *in nuce*:

- There is a distinction between the phenomenal world and the world *an sich*. They are different since the first changes during a scientific revolution, and the second does not.
- The percepts and concepts of a paradigm deliver access to our phenomenological world.
- In particular, our language describes our phenomenological world.
- To describe the world *an sich* we would need a paradigm-free language, and there is no such thing.
- So we cannot talk about the world *an sich*. It is ineffable.
- But we do talk about the world *an sich*.

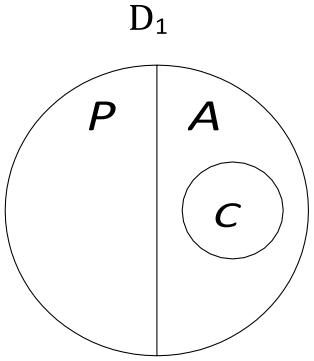
The distinction between the phenomenal world and the world *an sich* was meant to get Kuhn out of a contradiction. But the move seems to generate an even more intractable one.

7. A WAY OUT?

What is to be done? Clearly, one might contest some of the moves that get Kuhn into his problem, to resolve the contradiction. This might be either a move of exegesis – what he meant – or of a substantial philosophical kind – what he should have said. I leave it to Kuhn scholars to argue about these possibilities.

In this last section I want to do something quite different. Taking a leaf out of the book of earlier Mahāyāna Buddhist philosophers, **I** want to consider the possibility that objects in the world *an sich* – or at least some of them – really are both effable and ineffable. In particular, I want to give a formal model of the situation which shows that the view is logically quite coherent.

Let our domain of objects be D_1. (Why there is a subscript '1', we will see in a moment.) This can be divided into phenomenal objects, *P* and objects *an sich*, *A*. All objects in *A* are ineffable. But those in a certain subset of *A*, *C* (for contradictory), are effable as well.



Now, what is it to be (in)effable? To be ineffable is to have no expressible properties. So to be effable is to have some such properties. In the language of second-order logic, what we need, then, is a model of the following:

- if $d \in A$: $\neg\exists X\, Xd$
- if $d \in C$: $\exists X\, Xd$

where our second-order quantifiers range over the set of all expressible properties, D_2.

A formal model of the situation may be constructed in second-order logic. The language is standard, with just monadic predicates and variables. The semantics are those of the paraconsistent logic *LP*[18].

An interpretation for the language is a structure, $\langle D_1, D_2, \delta\rangle$, where for any term, t:

- $\delta(t) \in D_1$

and for any predicate, P:

- $\delta(P) \in D_2$

D_2 is a set of pairs, $\langle Y, Z\rangle$, such that $Y \cup Z = D_1$. X is the set of objects than make P true, and Y is the set of objects which make it false. I will write $\delta(P)$ as $\langle \delta^+(P), \delta^-(P)\rangle$.

If we write $\Vdash^+$ for truth, and $\Vdash^-$ for falsity, the truth and falsity conditions are:

- $\Vdash^+ Pt$ iff $\delta(t) \in \delta^+(P)$
- $\Vdash^- Pt$ iff $\delta(t) \in \delta^-(P)$
- $\Vdash^+ \neg A$ iff $\Vdash^- A$
- $\Vdash^- \neg A$ iff $\Vdash^+ A$
- $\Vdash^+ A \wedge B$ iff $\Vdash^+ A$ and $\Vdash^+ B$
- $\Vdash^- A \wedge B$ iff $\Vdash^- A$ or $\Vdash^- B$
- $\Vdash^+ A \vee B$ iff $\Vdash^+ A$ or $\Vdash^+ B$
- $\Vdash^- A \vee B$ iff $\Vdash^- A$ and $\Vdash^- B$

[18] On second-order *LP*, see G. Priest, "Paraconsistent Logic", vol. 6 in D. Gabbay, F. Guenthner (eds.), *Handbook of Philosophical Logic*, 2nd edition, Dordrecht, Kluwer Academic Publishers, 2002, pp. 287–393, 7.2.

For quantifiers, to keep matters simple, we augment the language with a name, k_d, for every member of D_1, and a name, K_d, for every member of D_2. That is:

- for $d \in D_1$, $\delta(k_d) = d$
- for $d \in D_2$, $\delta(K_d) = d$

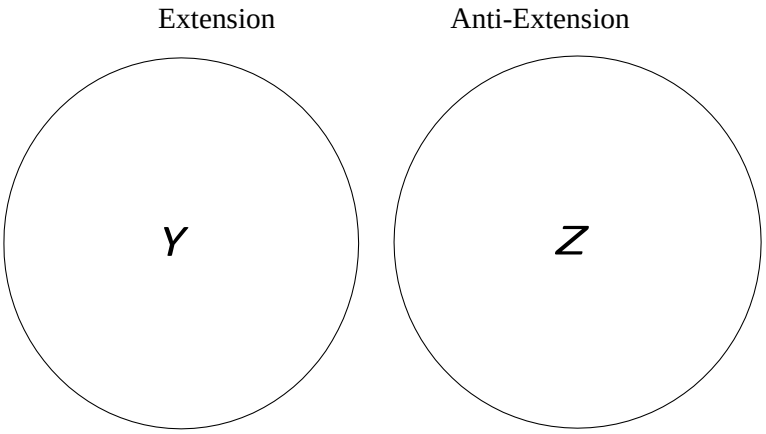
Then:

- $\Vdash^+ \forall xA$ iff for all $d \in D_1$ $\Vdash^+ A_x(k_d)$
- $\Vdash^- \forall xA$ iff for some $d \in D_1$ $\Vdash^- A_x(k_d)$
- $\Vdash^+ \forall XA$ iff for all $d \in D_2$ $\Vdash^+ A_X(K_d)$
- $\Vdash^- \forall XA$ iff for some $d \in D_2$ $\Vdash^- A_X(K_d)$

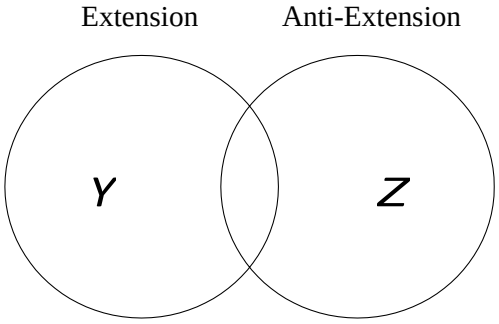
Validity is defined as truth preservation in all interpretations, in the standard way:

- $\Sigma \Vdash A$ iff for every interpretation, if $\Vdash^+ B$ for every $B \in \Sigma$, $\Vdash^+ A$.

For those who have never met these paraconsistent semantics before, note that they are exactly the same as those of classical second-order logic, with one exception. In classical logic, the extension and anti-extension of any predicate (or predicate variable) are disjoint. That is:



whereas in this paraconsistent logic, they can overlap:



Given this machinery, the model is easy to specify. It is such that:

- $C \subseteq A \subseteq \mathrm{D}_1$
- For all $d \in A$ and $\langle Y, Z\rangle \in \mathrm{D}_2$: $d \in Z$
- For some predicate, F, and $Z \subseteq \mathrm{D}_1$: $\delta(F) = \langle C, Z\rangle$

Then if $d \in A$:

- $\Vdash^+ \forall X \neg X k_d$
- So $\Vdash^+ \neg\exists X\, X k_d$

But if $d \in C$:

- $\Vdash^+ F k_d$
- So $\Vdash^+ \exists X\, X k_d$

I note that there is a standard principle of comprehension in second-order logic, to the effect that every condition defines a set. In the present context, one may formulate this as follows. For any formula $A(x)$, there is a $D \in \mathrm{D}_2$ such that for all $d \in \mathrm{D}_1$:

- $\Vdash^+ K_D k_d$ iff $\Vdash^+ A(k_d)$

I have not assumed that this holds in our interpretation. However, if it does, let $A(x)$ be $\neg\exists X\, Xx$. Then there is a D such that for all $d \in D_1$: $\Vdash^+ K_D k_d$ iff $\Vdash^+ \neg X\, X k_d$. So for all $d \in A$ (and *a fortiori* C), $\Vdash^+ K_D k_d$. Hence $\Vdash^+ \exists X\, X k_d$. That is, the second fact is a corollary of the first. In a word: if d is ineffable there is something true of it: that it is ineffable.

8. CONCLUSION

The last section may appear to have taken us some way away from Kuhn, but in fact it has not. As we have seen, Kuhn's views take us naturally into a place where we appear to have to countenance a contradiction: that some things are both effable and ineffable.

That, of course makes no sense in a logical theory which cannot countenance contradictions, such as so called classical logic, the orthodox logic of our day. However, as we have seen, it can make perfectly good sense in a paraconsistent logic.

Classical logic has been something like a paradigm of logic for about the last 100 years, underlying "normal science" in logic and philosophy. Over recent years, it has come under increasing attack from those who endorse a non-classical logic because of the puzzles and anomalies to which it gives rise. Their persistence shows that these have not been satisfactorily addressed.

In particular, a non-classical paraconsistent logic has been deployed to handle many paradoxes – including paradoxes of ineffability (such as König's paradox of the least indefinable ordinal)[19]. Kuhn's own theory of science therefore points the way to a paradigm shift in logic itself[20].

[19] G. Priest, K. Tanaka, Z. Weber, "Paraconsistent Logic", in E. Zalta (ed.), *Stanford Encyclopedia of Philosophy*, 2022, https://plato.stanford.edu/entries/logic-paraconsistent/.

[20] See, further, G. Priest, "Classical Logic Aufgehoben", ch. 4 in G. Priest, R. Routley, J. Norman (eds.), *Paraconsistent Logic*, Munich, Philosophia Verlag, 1989.