Steve FULLER[1]

KUHN AND THE MYSTERY OF CONSTITUTING THOUGHT, WORD AND DEED INTO A WORLD

Abstract. Ever since my first book, *Social Epistemology*, I have argued that Thomas Kuhn's philosophy of science presupposes a version of 'many worlds realism'. This paper continues that line of argument by situating Kuhn's thinking about language and science in the context of shifting philosophical developments in the 1950s-1970s. Kuhn's view is related to others exposed to the same developments, especially Willard Quine, Donald Davidson, Wolfgang Stegmüller and Karl Popper. Notably, Quine and Davidson were not tempted to go down the 'many worlds' route, largely due to a background commitment to a behaviorist understanding of language that precluded any role for 'world-making'. However, Alfred Tarski's 'semantic' theory of truth made a notable impression on the logical positivists and Popper, inclining the latter towards his own version of many worlds realism. As Kuhn astutely observed in his later writings, whether one adopted a monist or pluralist approach to the world depended on whether translation or meaning was the key to making sense of language. The paper ends by suggesting that the German historiographical concept of *Sonderweg* ('special way') might provide an interesting, more normatively charged understanding of the sort of many worlds realism promoted by Kuhn.

Keywords: Kuhn, Quine, Popper, realism, translation, meaning, *Sonderweg*

Many mysteries surround the massive reception of *The Structure of Scientific Revolutions* (Kuhn 1970*)*, which made it the most influential work on science in the second half of the twentieth century (Fuller 2000). One such mystery is the relative ease with which philosophers who had

---

[1] "Auguste Comte" Chair in Social Epistemology, Department of Sociology, University of Warwick, U.K, https://orcid.org/0000-0002-2190-6552. Email: <S.W.Fuller@warwick.ac.uk>

previously discussed science almost exclusively in terms of its language accommodated Kuhn's perspective, in which language occupies a *prima facie* subordinate position. As Science and Technology Studies researchers have rightly observed, pre-Kuhn philosophy of science was largely about the logical structure of scientific theories, even when their dynamics were considered (*à la* Popper and Lakatos), while after Kuhn greater attention was paid to the 'practices' of science in a broad sense that seemed designed to include anything *but* the language of science – at least as it appears in academic journal articles.

One explanation for this curious situation is that notwithstanding the subtleties of the debates in the philosophy of language in the 1960s and '70s, most philosophers of science still had a looser attitude to language than their philosophy of language colleagues. For philosophers of science, language was simply the expression of thought in a privileged form. This certainly explains the logical positivists' original attraction to Gottlob Frege's *Begriffschrift* ('thought writing') approach to logical notation (Sluga 1980, chap. 3). Against this backdrop, Kuhn's apparent demotion of scientific language still left the 'thought' informing the language very much intact, now understood in terms of scientists' beliefs or the intended objects of their inquiries. Kuhn was interpreted to have simply distributed this 'thought' across the variety of artefacts and behaviors that constitute 'scientific practice'.

This idea had already become familiar through the 'structural anthropology' of Claude Lévi-Strauss, whose bricoleur-based image of the 'savage mind' suggested that thinking could occur just as much outside as inside the head. This thesis has been developed further by cognitive scientists and anthropologists as the 'extended mind' and 'cognition in the wild' (Levi-Strauss 1966; cf. Clark 1997, Hutchins 1995). Among philosophers of science themselves, such a loose attitude to language helped to boost the fortunes of the 'language of thought' thesis in cognitive science debates in the 1980s, as championed by Jerry Fodor (1975). Fodor went on to refocus Kuhn's 'incommensurability' between scientific paradigms as 'cognitive impenetrability' within a single mind, whereby a scientist might continue to respond to something as if it were real even if after they have been told that it is not real. This routinely happens to non-scientists in the case of optical illusions (de Gelder 1989).

Nevertheless, Kuhn's later work clearly shows that, appearances to the contrary, he took those earlier debates in the philosophy of language very seriously (Kuhn 2000, chaps. 2-3). It resulted in an irony that only Kuhn might have appreciated: What philosophers liked about Kuhn was 'incommensurable' with what Kuhn liked about philosophers. This perhaps explains why Kuhn's discussions of the major contributors to the philosophy of language of the period – Willard Quine, Hilary Putnam and Saul Kripke – were never reciprocated. Only Kuhn's Princeton student Philip Kitcher (1983) responded to him dutifully on matters at the interface between the philosophy of language and the philosophy of science. Yet, there is no doubt that while writing *Structure*, Kuhn was subject to many of the same influences as Quine (1960) when he was writing *Word and Object*, both in the late 1950s.

At that time, the dominant presence in psychology at Harvard was B.F. Skinner, who was writing the definitive account of language as the operant conditioning of 'verbal behavior', which he understood as an indirect but economical means to get things done in the world – namely, by using people as intermediaries. This arguably made human language the most efficient of all animal communication systems, at least as measured by the relationship between signifying effort and material consequences (Skinner 1957; cf. Fuller 1988, chap. 2). For Skinner, as for Quine, the key is people's responsiveness to what is said to them rather than any intrinsic connection between word and object. Thus, if you hand over a knife when asked, it does not matter to the success of the transaction whether you are providing a kitchen utensil or a lethal weapon. Indeed, to worry about such matters constitutes what Quine (1974) called the 'original sin' of language, whose fallen users science ultimately 'redeems'.

Quine's appeal to Augustinian imagery here was intended as a call for scientifically minded philosophers – so-called 'naturalized epistemologists' – to observe the conditions in the world that regularly make communication involving a given set of words successful. These need not correspond to what the communicating parties themselves think they mean when speaking and responding to those words. Indeed, the parties may mean different things when they use the same words without affecting the efficacy of the exchange. Moreover, there need not

even be a fact of the matter that settles which party knows the 'meaning' of their communication. All that is required is that the exchange sufficiently satisfies the parties that they continue in productive engagement.

Quine characterized this feature of language – again, understood as verbal behavior – as the 'indeterminacy of translation', whereby the same set of utterances can be subject to indefinitely many different interpretations, each of which accounts for the linguistic phenomena equally well. A special case applies to science, whereby theory choice is 'underdetermined' by the available evidence. Here one needs to imagine – as arguably Francis Bacon did – that a laboratory experiment is a transaction between the scientist and nature, the ultimate significance of which is secondary to its ongoing reliability. In this context, what matters is that the 'evidence', understood as the result of a controlled observation, can be routinely generated. Without that baseline condition, the various theories on offer to explain the evidence lose their salience.

The historic precedent for this way of thinking – beyond Pierre Duhem, who is often cited – is Leibniz's idea of *phenomena bene fundata* ('well-grounded phenomena'). This becomes especially important in twentieth century quantum mechanics, whereby the pattern of microphysical observations conform to a range of mathematical formulae (*e.g.*, Heisenberg's uncertainty principle, Schrödinger's wave equation, Dirac's delta function), the meanings of which remain highly contested by both philosophers and physicists – but without disturbing the normal conduct of scientific research in terms of testing hypotheses whose outcomes can be agreed (cf. Hesse 1963, chap. 1). However, here's the twist, which reveals the power of Skinner's operant conditioning: Because a phenomenon is 'well-grounded' only if it can be demonstrated on a reliable basis, it must be producible on demand, somewhat like a dramatic effect or even a magic trick. The history of modern science is largely about the management of these demonstrations (cf. Shapin 1994).

Kuhn shrewdly observed that for Quine, the indeterminacy of translation implies that the quest for universal translation and common meaning are mutually exclusive projects (Kuhn 2000, 61). Whereas for Quine common meaning must go, for Kuhn universal translation must go. What is at stake here? Consider what Quine famously called 'referential opacity' (Quine 1960, chap. 4). It is another way of expressing what he

regarded as the original sin of language, namely, to think that talking about things in radically different ways implies talking about radically different things. On the contrary, the same thing may be talked about in radically different ways. Moreover, following Frege, Quine believed that by regularly demonstrating an underlying identity to disparate appearances, science has over the centuries brought order to the world in a way that can be most perspicuously captured in mathematical logic. Thus, an important moment in astronomy's ontological consolidation came when Pythagoras discovered that the 'Morning Star' and the 'Evening Star' refer to the planet Venus under different conditions of observation.

However, it is not clear that this neat episode is representative of science as a whole, since it involves tracing back two functionally differentiated descriptions ('morning star' and 'evening start') to a common physical source prior to its functional differentiation (Venus). But when the physical object is known from the outset – as in the case of the knife discussed above – over time it may become functionally differentiated (*e.g.*, into a kitchen utensil and a lethal weapon) to such an extent that the object is no longer significant in itself but only as a placeholder for other things that could perform the same function. Such a situation is reasonably understood as one in which the original object has acquired multiple meanings, which may easily result in a breakdown in the established response patterns that in the past had stabilized the exchange of words and deeds. In short, we may come to talk about radically different things when using a word such as 'knife'. This is how Kuhnian incommensurability gets a foothold in our understanding of language and science. Thus, the shift from Quine to Kuhn in terms of the idea of 'language as tool' amounts to an evolution from navigating the one world to constructing alternative worlds.

Quine is often portrayed as viewing science as a continually evolving 'web of belief' that aims for internal coherence as it incorporates new data. The phrase 'web of belief', taken from the title of a popular book on reasoning that Quine published later in his career (Quine and Ullian 1970), is somewhat unfortunate, since a Quinean 'belief' is a non-psychological state closer to Gilbert Ryle's characterization of concepts as 'inference tickets', a verbal rite of passage in making one's way in the world. In this context, a 'theory' is simply an account of the world's

coherence at various moments in science's evolution that allows one to make further progress. It reflected Quine's nominalist approach to logic and metaphysics, which retained the logical positivist view of 'meaning' as a purely private matter lacking 'cognitive significance'.

The positivists had applied this phrase to the public character of language as normally demonstrated in 'translation' in that broad positivist sense that includes not only a successful exchange of words but also the conversion of a string of such words into a prediction (aka 'operationalization'), say, during the test of a hypothesis in a laboratory experiment. In any case, what Quine meant by 'cognitive significance' was most certainly *not* a Kuhn-style 'paradigm', with its implication of a world-picture whose vision defines a problem horizon. Indeed, Kuhn's semantically rich conception of paradigm – or 'model', in the jargon of more recent philosophy of science – ultimately threatened to commit the original sin of language by letting the words determine the world, rather than vice versa.

Donald Davidson (1986) carried this line of thought to its logical conclusion, effectively outperforming Quine at his own game. Davidson argued that what linguists and logicians call 'semantics' is nothing but the moment-to-moment reconciliation of prior expectations and passing responses. This was a more fine-grained articulation of Davidson's widely cited but often misunderstood 1973 presidential address to the American Philosophical Association, 'The Very Idea of a Conceptual Scheme' (Davidson 1974). There he had argued that the sort of incommensurability that Kuhn associated with paradigm differences amounted to what, in homage to Quine, Davidson called the 'third dogma of empiricism' – namely, that one can draw a neat distinction between 'theory' and 'data', with the latter somehow captured and extended by the former. Put bluntly, Davidson followed Quine in denying the existence of either separate languages or separate theories, let alone *Weltbilder* that might be projected from them, as Kuhn's conception of paradigm seemed to suggest. Both believed in a 'flat ontology', in which organized strings of words function as relatively durable but ultimately makeshift tools for navigating the only world in which we all live, regardless of whatever private views one might hold about the 'meanings' of those verbal tools at a given time and place.

A good way to see the stakes here is to consider *symbolism*. When religion, literature and art are said to be 'symbolic' media, the implication is that the words and images used to convey certain ideas participate in those ideas to such an extent that they may come to be treated like the realities to which the words and images refer. For example, the Bible is 'sacred' because its readers treat the biblical text as a privileged portal to a highly valued sense of reality. This 'privilege' is evident from the seriousness – sometimes misleadingly called 'literalness' – with which each verbal formulation in the sacred text is taken as an invitation to imagine an alternative reality. And because the text is sacred, it is taken as normative over the actual world, a potential prompt to innovative and even violent performance.

Freud spoke of this approach to symbols as 'fetishism', and it subsequently became the target of the logical positivists, who took a different, more demystified approach to symbolism. For example, the positivist Otto Neurath championed the 'ISOTYPE' ('International System of Typographic Picture Education'), whose advertised virtue was that its pictographic character could trigger a certain range of actionable responses. He envisaged that such symbols might inform societal transformation, and they were valuable only insofar as they enabled the desired transformation. In short, the symbols had no intrinsic value and merited replacement if they failed to do their intended work. Quine and Skinner would be pleased.

For his part, Kuhn treated the mathematical formulae that constitute a paradigm's 'symbolic generalizations' as a framework for identifying patterns in the data generated by normal science research. In this respect, they are not so different from Leibniz's *phenomena bene fundata*. However, through repeated application, these symbols can acquire the sort of larger meanings associated with a more robust conception of symbolism, as the formulae are integrated with the experience of researchers who think about other (philosophical, political, etc.) matters similarly and interact with each other regularly. Over time they may become schools of thought, or 'thought collectives', to recall the expression used by the Polish medical researcher Ludwik Fleck (1979), who may or may not have influenced Kuhn's idea of paradigm. In effect, these collectives spontaneously generate 'metalanguages' (more about

which below), which are interpretations of the paradigm's symbolic generalizations that channel and circumscribe their application.

The social psychology of this situation is Janus-faced. While thought collective members are thereby motivated to do more focused work, their ability to understand the work generated from alternative thought collectives is impeded. The significance of this point can be seen in the case of persistent anomalous results that confound all those working in a field, who in response draw on other resources to interpret the findings. It is here that 'incommensurability' arises, as meanings of the formulae that were previously privately circulated within a given thought collective start to be discussed openly among all the field's thought collectives, which bring to the surface submerged 'philosophical' differences about the original spirit of their common inquiry. This situation threatens to destabilize the paradigm, as language is increasingly deployed to partition the one reality that the scientists had heretofore presumed that they shared. It amounts to Quine's and Skinner's worst nightmare.

There is one sense of the notoriously protean term 'paradigm' on which Kuhn and Quine could find common ground. Arguably, it is the point from which they subsequently diverged, as Kuhn traveled down the path of referential opacity (*i.e.*, incommensurable meanings) and Quine of referential transparency (*i.e.* translatable languages). It is the sense of 'paradigm' as template or exemplar, what analytic philosophers used to call a 'paradigm case'. For Kuhn, this is the heart of puzzle solving in 'normal science'. The phenomena of nature are disciplined by the artifice of laboratory, according to a recipe for constructing problems in a way that affords solutions by applying the normal methods of science. The recipe is anchored in an original episode that proved especially efficacious, stylized versions of which continue to be presented in scientific textbooks. I say 'recipe' to convey the extent of staging and scripting required for the paradigm to work. Whereas Skinner had talked about the reinforcement of such 'operants' according to an appropriate 'schedule', Quine believed in a general 'predilection for conformity' that underwrote any schedule of reinforcement (Quine 1960, 75). Perhaps here he was influenced by Charles Sanders Peirce, who believed that 'habit' was built into the emergent structure of the cosmos,

such that 'evolution' amounts to a gradual lessening of the role of chance in the universe over time.

Kuhn did not weigh in on whatever metaphysical differences may have divided Skinner and Quine. Instead, he focused on the potential unintended consequences of applying a paradigm to new cases, which he called 'anomalies'. For example, the Newtonian paradigm was designed to account for motion in all its material forms, yet the motion of light remained stubbornly anomalous for two centuries. To be sure, Kuhn shared Quine's general 'conservative' approach to these matters, namely, that the default response should be to assimilate each anomalous episode to the existing paradigm as much as possible, and whatever cannot be assimilated should result in a minimal alteration of the paradigm, with an eye to accommodating other similar cases in the future. However, unlike Quine, Kuhn believed that the history of science has demonstrated the limited feasibility of this strategy; hence, the need for 'scientific revolutions' that periodically reset the focus of the templates governing the scientist's transactions with nature. But how might such anomalies in the application of the paradigm persist and accumulate to the point that they can no longer be contained by conservative adjustments, such that what Kuhn called a 'crisis' develops, which in turn precipitates a radical paradigm shift?

Both Quine (1960) and Kuhn (1970) cite fellow Harvardian Eugene Nida (1964) as a primary authority on translation, perhaps because at the time Nida was developing a theory of translation based on the most widely translated book, the Bible. He stressed two radically different functions that translation might serve: on the one hand, it may seek to create greater distance between the original text and the readers of the translated text to introduce them to an alternative way of seeing the world; on the other hand, it may seek to minimize the distance by encouraging readers to think and act along lines that they have already been at least implicitly pursuing. The Bible's reception history can be easily understood through these opposing lenses. The former, more alienating translation has often functioned as part of a strategy to deploy the Bible as a metalanguage for critiquing certain beliefs and practices of the text's readers. It is favored by Biblical scholars, starting with rabbis, whose expertise in the original meaning of the sacred text qualified them

to function as judges over the Jewish community. The latter, more familiarizing translation has often served to reinforce certain existing beliefs and practices of the text's readers by suggesting that they enact a version of what the Bible intended. From the onset of Christianity, it has been favored by evangelists, as exemplified by the centrality of the Gospels (generic 'good news') and the Epistles (targeted messaging) in the New Testament, both intended to present the Biblical faith as something very much within the reader's reach.

The second part of my first book, *Social Epistemology*, was largely devoted to working through the implications of Nida's Janus-faced view of translation in relation to the historiography of science, as well as recent French, German and Anglo-American work in the philosophy of language (Fuller 1988, chaps. 3-6). Nida himself cast the contrast in translation strategies in terms of 'formal' versus 'dynamic' equivalence, which looks like the difference between the semantic and pragmatic dimensions of language. However, in linguistics, these two dimensions are normally seen as complementary rather than opposing. In other words, semantics is supposed to be enriched by pragmatics, rather than 'semantic' and 'pragmatic' being alternative modes of translation, as Nida seemed to suggest.

Here I would argue that Quine and Kuhn understood the matter very much as Nida did, but they chose alternative translation strategies: Quine favoring dynamic equivalence and Kuhn formal equivalence. This explains Quine's (and Davidson's) notably demystified view of semantics. For them, the translated text is not designed to stand judge over readers in the translating language; rather, it is to be incorporated as equipment in the readers' repertoire of tools for dealing with the world as they already find it. In contrast, by stressing the radical otherness of the translated text, Kuhn presupposed a limit to meaningfulness, whereby the significance of some things can only be fully understood by inhabiting the world from which their meaning derives. In effect, Kuhn treated language not as a toolkit but an infrastructure. Thus, a text originally written before the reader was born and in a language that they do not speak implies a limit to the reader's world.

In this respect, Kuhn relativized the view of language found in Wittgenstein's *Tractatus*, which originally led the logical positivists,

notably Rudolf Carnap (1937), to develop the idea of semantics as metalanguage, especially after his encounters with Alfred Tarski. They treated Proposition 5.6 of the *Tractatus* ("The limits of my language mean the limits of my world.") as a philosophical challenge to overcome. Kuhn agreed with Carnap that the solution was not the one 'flat' world that Quine and Davidson would later advocate, but in a vision of 'many worlds'. However, Carnap and Kuhn differed over the arrangement of these worlds. Carnap's worlds were organized hierarchically, with one, so-called 'meta' language setting the truth conditions for another, so-called 'object' language. Such an arrangement suited a progressive view of scientific inquiry, whereby later theories comprehend and extend earlier ones, while identifying and removing their falsehoods. Indeed, this formed Wolfgang Stegmüller's (1976) attempt to reconcile Kuhn and logical positivism, effectively supplying the 'logic' to update Auguste Comte's original nineteenth century positivist program.

In contrast, Kuhn believed that these 'many worlds' existed not in a hierarchy but 'in parallel', so to speak (Kuhn 2000, 76). He literally held that the past is a foreign country, separated from the present in time as if in space. It led him to advocate the now academically popular opinion that a science and its history are 'separate but equal' fields of inquiry, each requiring its own kind of specialist. The position is perhaps most noticeable in its negative effects on the public communication of science, as incommensurable disciplines engage in a dialogue of the deaf. Thus, historians routinely declare scientists to be ignorant of the history of their own field, to which scientists respond that historians are irrelevant to their cutting-edge research. On this matter, Quine sided squarely with the scientists, treating the 'history of science' as something that scientists leave behind, a bit like the husks that seeds discard as they mature (Rorty 1982).

Kuhn thought that such crosstalk between scientists and their historians was ultimately futile and missed the point of incommensurability. A notorious feature of Kuhn's account of scientific change is that each new paradigm seals itself off from the past of its science by an 'Orwellian' rewrite of the science's history, which portrays all its past achievements as contributions to the new paradigm, as if other paradigm contenders had never existed. Such historiography involves enormous cherry-picking

and airbrushing, resulting in a history of science that is often virtually unrecognizable to professional historians of science. Nevertheless, Kuhn was comfortable with that arrangement, advising that professional history of science should only be done of 'closed sciences', a phrase originating with Werner Heisenberg, whom Kuhn interviewed for the US National Science Foundation's history of quantum mechanics project in the 1960s. An interesting difference between Kuhn and Heisenberg was that Heisenberg saw the closure of the past paradigm as reflecting open horizons in the new paradigm, whereas Kuhn stressed, rather Quine-like, the capacity of scientists in the new paradigm to focus more effectively on their inquiries once they treat their predecessors as dim signals dominated by noise (Bokulich 2006).

In this discussion of the dynamics of scientific change, Karl Popper proves to be an interesting witness, since he was at least as much influenced by Tarski as Carnap and the positivists were. However, Popper was attracted by a logical sensibility that Tarski shared with Kurt Gödel, namely, that no consistent language can determine the truth of all its propositions: It requires another language with greater expressive capacity than the original language. Over the years, Popper nurtured the insight to conclude that this 'greater expressive capacity' required the generation of new 'objects' that amounted to problems that needed solving once the metalanguage projecting these new objects resolved the truth conditions of the object language (Popper 1972, chap. 9). While one might be tempted to interpret Popper in the manner of Stegmüller, their projects were radically opposed in spirit: whereas Stegmüller sought epistemic closure in science, Popper embraced science's ontological openness.

This point is perhaps best illustrated by the suspension of axioms of Euclidean geometry, which in turn opened the door to the world of non-Euclidean geometries, which ushered in the relativity revolution in early twentieth century physics. For Stegmüller, Einstein's breakthrough was simply about explaining Newton as a special case of relativity theory, while for Popper it showed that by retrieving the conditions of the possibility for Newton being as correct as he was (*i.e.*, the set of coherent geometries of which Euclid's is a member), Einstein could find an alternative geometry that could encompass more of the physical universe. In terms of scientific method, Stegmüller treated Einstein as

proceeding *deductively*, whereas Popper treated him as proceeding *abductively*, which meant a recognition of the capacity of mathematics to extend our sense of physical reality beyond what had been empirically allowed (cf. Wigner 1960). In this respect, the English translation of the title of Popper's *Logik der Forschung* – *The Logic of Scientific Discovery* – may not have been so bad, after all.

Put in Marxist terms, metalanguages produce 'surplus value': They not only decide which truth claims live or die but also provide the conditions for new truth claims to thrive. In the history of science, physics has been best positioned to exploit the surplus value of mathematics, whereby an epistemological excess is converted into ontological profit. What start as mathematical innovations of use only to fellow mathematicians turn out to prefigure a new sense of reality that physics and the other sciences capitalize on. In short, scientists discover what mathematicians can only imagine. This may be the best way to think about the reality of what Popper (1972) called 'World Three'. Randall Collins has provided an interesting sociological account of how mathematics has performed this function, namely, by reflexively taking itself as the subject of matter of its inquiries, with the aid of standard notation that functions as a scaffolding to increase the levels of abstract thought (Collins 1998, chaps. 10, 13).

At a deeper level, the productive capacity of metalanguages – be they articulated in words, numbers or symbols – speaks to what the Greeks originally called *poiesis*, a quasi-divine power to conjure up worlds in speech that was possessed by those who were adept in the arts of poetry, drama and rhetoric. For Plato, the free deployment of these arts threatened social order, as rapt audiences are induced to entertain alternative normative regimes to the ruling one (Fuller 2018, chap. 2). In this regard, Kuhn is a latter-day descendant of Plato in believing that the unchecked proliferation of multiple worlds – aka 'paradigms' – would undermine the purposefulness of scientific inquiry. This helps to explain Kuhn's antipathy to sociologists who in his day claimed that theirs is a 'multiple paradigm science' (Ritzer 1975). Yet, again more like Plato and less like Quine, Kuhn did not quite wish to discard lines of inquiry that had been abandoned by scientists; he simply wanted to restrict – if not outright prevent – their access to the main business of science. While

Kuhn did not see the history of science as *progressing to* the ultimate true account of reality, he did see it as *progressing from* its past (Kuhn 2000, chap. 5). In that sense, the history of science has an increasingly fictional ('artefactual', euphemistically put) standing in relation to the dominant scientific paradigm of the day. This perhaps explains why the historians of science following in Kuhn's footsteps have tended towards the methods of art history to interpret past science (*e.g.*, Daston and Galison 2010).

But of course, one might share Kuhn's belief in the existence of simultaneously existing multiple worlds without privileging the frame of reference of present-day science. In other words, one might treat the dominant paradigm and its various alternative pasts, presents and futures in both ontologically and *normatively* symmetrical terms. This would be Plato's worst nightmare, but he understood exactly how it could – and did, in his day – happen. The alternative world is not only presented more attractively than the world as normally experienced, but also in that world the actual world appears somehow deficient in ways that might motivate actions to realize the alternative world. In this context, the great mid-twentieth century avant-gardist Antonin Artaud (1958) spoke about the 'theatre and its double', whereby the thoughts and feelings that a dramatic performance induces in audiences might not simply end in the theatre but spillover into the streets. But this state of 'critical alterity', so to speak, need not be so dramatically expressed. For the nearly half-century of the Cold War, Marxist historical materialism coexisted with liberal bourgeois social science as parallel universes, each portraying the other as extreme deviations from objective reality, aka 'ideology'. But perhaps worthier of further pursuit is the historiographical concept of *Sonderweg* ('special way'), which has been deployed both positively and negatively to characterize the distinctive path that modern German history has followed (Wehler 1985).

Sonderweg is ambiguous because while 'special way' clearly implies a path that has branched off from the dominant trajectory, it is unclear whether that 'specialness' lies in its preserving and fully realizing an original spirit that the dominant trajectory has lost or even corrupted over time or, on the contrary, its having transformed or even perverted that original spirit as the distinct character of the alternative path has unfolded. In either case, the facts and order of events need not be under

dispute. Rather, the focus is squarely on the potential for normative reversal in the narrative holding them together, effectively flipping the positive and negative evaluative poles. While the appeal of *Sonderweg* is easily appreciated as a way to understand Germany's dramatic rise and fall over the nineteenth and twentieth centuries, it might also be fruitfully deployed to address the increasing visibility of 'alternative paradigms' in science (*e.g.*, ecological, creationist, homoeopathic, etc.) that presuppose not a 'separate but equal' approach to science and its history *à la* Kuhn, but rather an approach to science where the drive for dominance consists in a struggle between rival ways of incorporating contemporary research into a common history.

References

Artaud, A. (1958). *The Theatre and Its Double*. New York: Grove Weidenfeld.

Bokulich, A. (2006). "Heisenberg Meets Kuhn: Closed Theories and Paradigms." In *Philosophy of Science* 73: 90-107.

Carnap, R. (1937). *The Logical Syntax of Language* (Orig. 1934). London: Kegan Paul

Clark, A. (1997). *Being There: Putting Brain, Body and World Together Again*. Cambridge MA: MIT Press.

Collins, R. (1998). *The Sociology of Philosophies: A Global Theory of Intellectual Change*. Cambridge MA: Harvard University Press.

Daston, L. and Galison, P. (2010). *Objectivity*. Cambridge MA: MIT Press.

Davidson, D. (1974). "On the Very Idea of a Conceptual Scheme." In *Proceedings and Addresses of the American Philosophical Association* 47: 5-20.

Davidson, D. (1986). "A Nice Derangement of Epitaphs." In E. Lepore (ed.), *Truth and Interpretation: Perspectives on the Philosophy of Donald Davidson*. Oxford: Blackwell, 433-446

De Gelder, B. (1989). "Granny, the Naked Emperor and the Second Cognitive Revolution." In S. Fuller, *et al.* (eds.), *The Cognitive Turn in Sociological and Psychological Perspectives on Science*. Dordrecht NL: Reidel, 97-100.

Fleck, L. (1979). *Genesis and Development of a Scientific Fact* (Orig. 1935). Chicago: University of Chicago Press.

Fodor, J. (1975). *The Language of Thought*. Cambridge MA: Harvard University Press.

Fuller, S. (1988). *Social Epistemology*. Bloomington IN: Indiana University Press.

Fuller, S. (2000). *Thomas Kuhn: A Philosophical History for Our Times*. Chicago: University of Chicago Press.

Fuller, S. (2018). *Post Truth: Knowledge as a Power Game*. London: Anthem.

Hesse, M. (1963). *Models and Analogies in Science*. London: Sheed and Ward.

Hutchins, E. (1995). *Cognition in the Wild.* Cambridge MA: MIT Press.

Kitcher, P. (1983). "Implications of Incommensurability." In *PSA 1982*, vol. 2 (*Proceedings of the Philosophy of Science Association*), 689-703.

Kuhn, T. (1970). *The Structure of Scientific Revolutions*. 2nd ed. (Orig. 1962). Chicago: University of Chicago Press.

Kuhn, T. (2000). *The Road since Structure: Philosophical Essays, 1970-1993, with an Autobiographical Interview*. Chicago: University of Chicago Press.

Levi-Strauss, C. (1966). *The Savage Mind.* (Orig. 1962). London: Weidenfeld and Nicolson.

Nida, E. (1964). *Towards a Theory of Translation*. The Hague NL: Brill.

Popper, K. (1972). *Objective Knowledge*. Oxford: Oxford University Press.

Quine, W.V.O. (1960). *Word and Object*. Cambridge MA: MIT Press.

Quine, W.V.O. (1974). *The Roots of Reference*. La Salle IL: Open Court Press.

Quine, W.V.O. and Ullian, J. (1970). *The Web of Belief.* New York: Random House.

Ritzer, G. (1975). *Sociology: A Multiple Paradigm Science.* Boston: Allyn and Bacon.

Rorty, R. (1982). "Philosophy in America Today." *The American Scholar* 52(2):183-200.

Shapin, S. (1994). *The Social History of Truth*. Chicago: University of Chicago Press.

Skinner, B.F. (1957). *Verbal Behavior.* Englewood Cliffs NJ: Prentice Hall.

Sluga, H. (1980). *Gottlob Frege*. London: Routledge & Kegan Paul.

Stegmüller, W. (1976). *The Structure and Dynamics of Scientific Theories*. Berlin: Springer.

Wehler, H.-U. (1985). *The German Empire: 1871-1918*. (Orig. 1973). Oxford: Berg.

Wigner, E. (1960). "The unreasonable effectiveness of mathematics in the natural sciences." *Communications on Pure and Applied Mathematics* 13(1):1-14.