

Review of French, *There Are No Such Things As Theories*

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January 8, 2021

Steven French's new book is a bold and ambitious look at the question of what sorts of things scientific theories are—or rather, what they are not. For the purposes of this review, I'll treat the book as divided into four parts, although many themes and ideas recur and re-emerge throughout. The first part (Chapters 1–2) concerns the *structure* of theories; the second (Chapter 3) concerns the *representational character* of theories; the third part (Chapters 4–6) considers the *ontological status* of theories; and the final part (Chapters 7–9) outlines and defends French's positive thesis, that (as per the title) there are no such things as theories. I'll say a little about each of the first two parts, and then discuss the third and fourth parts together.¹

The first two chapters discuss (respectively) the Syntactic and Semantic Views of theories. The potted history of this controversy goes as follows: once upon a time the logical empiricists held the Syntactic View that theories are sets of sentences or propositions, ideally formulated in some precise formal or logical language; this was then replaced by the Semantic View, according to which theories are better thought of as sets of models, or as sets of structures. More recently, there has been a revival of interest in the Syntactic View, with various authors suggesting that its merits have been overlooked.² Although more of French's sympathies appear to lie with the Semantic View

¹One general comment, albeit a very minor one: I have some reservations about the use of URLs in the text. Some of this is a matter of citation practices (is the best reference for the Lambda-CDM model really the corresponding Wikipedia page?), but it also concerns their stability: merely giving the specific URL for the Cambridge University Library's digitised copy of the Principia (on p. 195) seems like a hostage to fortune, where a safer option would be to give a full citation. It seems doubtful that in five years' time, all the various URLs in the text will still point to their intended targets; as a cautionary tale, consider that a URL in a recent translation of Wyclif's *Trialogus* (Wyclif, 2013) has, since 2017, directed to a website selling penis pumps (Thakkar, 2020).

²See Halvorson (2012); Lutz (2014, 2015); Hudetz (2017); Halvorson (2019); and references therein.

(and in particular, the formalisation of that view in terms of partial structures),³ the stated goal of this part of the book isn't to adjudicate this debate. Rather, the purpose is to use the debate to foreshadow the controversies that will be delved into as we go on. After all, ultimately theories are going to turn out to *neither* be sets of propositions nor sets of models, since they do not exist!

However, this does mean that the discussion here feels somewhat inconclusive: lots of interesting questions get raised, but we only get brief previews of the proposed answers. For example, one interesting recent development in this debate has been the idea that the Syntactic and Semantic Views are going to be dual to one another: so that any 'semantic' presentation of a theory will have a corresponding 'syntactic' presentation, and vice versa.⁴ Although this development is discussed, and put into the context of broader questions about how the views relate to one another, we don't get many details of the arguments, or of whether French thinks that these arguments are ultimately successful or not.

Moving to the second part of the book, French suggests that resolving the relationship between the syntactic and semantic views may require us to attend to the *representational* character of theories. It is in this discussion that French picks up on the first of several analogies from aesthetics: the hope is that we can make progress by comparing representation in the visual arts to representation in scientific theories—although French warns that we need to take care with such comparisons, especially if drawing conclusions as to the ontological status of the representatum.

French gives an illuminating and comprehensive overview of the recent debate over representation in philosophy of science, before offering his own preferred account: a three-stage model of 'immersion, inference, and interpretation' (p. 72) framed within the Semantic Approach (and ideally, within the framework of the partial-structures formalism). The fact that, to French's eyes, the Semantic Approach outperforms the Syntactic Approach with regards to modelling representational relationships is a reason to prefer the former. However, we are warned not to misunderstand what is going on here. Formal set-theoretic structures 'provide a useful meta-representational (or better, perhaps, *descriptive*) device at the level of philosophy of science', but we are not committed (by the use of these representational devices) 'to regarding theories and models *as* such structures': rather, 'what theories and models *are*, qua objects, is then a further issue' (p. 96; all emphases in original). In other words, just as science provides representations of the phenomena of nature that are (nevertheless) distinct from those

³da Costa and French (2003)

⁴See the references in footnote 2.

phenomena, so philosophy of science provides representations of those representations (or of that representational activity)—which, too, should not be identified with what is being represented.

Although this discussion contains lots of illuminating insights (including that just noted, about the discrepancy between representing theories syntactically or semantically and *identifying* theories as syntactic or semantic entities), I do have some concerns about whether there is really a univocal notion of ‘representation’ in play here. Beginning in the aesthetics of visual art: prima facie, there are (at least) three things that we might mean when we speak of what an artwork ‘represents’. First, there is the question of what it is that the artwork depicts; second, there is the question of what the artwork says about its art-historical, sociological, or cultural context; and finally, there is what the artwork—as a material object—can reveal about its process of creation. Thus Monet’s *Reflections of Clouds on the Water-Lily Pond* depicts the water-lilies in the artist’s Giverny home; it belongs to the water-lily series, sometimes regarded as the culmination of Monet’s career and the Impressionist movement more generally; and chemical analysis indicates that despite the variety of greens in the painting, the only green pigment used is viridian (Lyon, 1991). This suggests that we should distinguish between (at least) a painting’s denotational significance, its cultural significance, and its evidentiary significance.

We can carry this distinction over to scientific theories. For realists at least, a (successful) scientific theory will have a denotational significance, in that it depicts some phenomenon. And whether or not the theory is successful, it will typically carry information about the broader historical or sociological context of science, just as paintings do: Courbet’s remark that ‘*Burial at Ornans* was in reality the burial of romanticism’⁵ strikes me as analogous to Pauli’s comment that Einstein’s light postulate ‘proves to be the true essence of the old aether point of view.’⁶ And although theories themselves may not carry many clues about their composition, their material instantiations, or even just their original formulations, certainly do: consider what we learn about Einstein’s composition of general relativity from the Zurich notebook,⁷ or—as French discusses in a later chapter—what we learn about the development of quantum theory by a study of the early textbook treatments.

For the most part, the discussion here is concerned with denotational significance. However, the other notions do get brought in at certain points: consider, for example,

⁵(Mack, 1989, p. 89)

⁶(Pauli, 1981, p. 5)

⁷Renn (2007)

the remark that ‘Turner’s intentions in *Rail, Steam and Speed* were not to give an accurate representation of a ‘Fire Fly’ class locomotive crossing the Maidenhead Railway Bridge . . . rather he intended (or so it is claimed) to represent the rushing of technological progress. . .’ (p. 58), or that although Pollock’s *No. 5 1948* ‘is clearly not representational at all . . . even here one might push the line that it does represent something, namely Pollock’s movements when drizzling the paint’ (p. 94).⁸ This raises the concern that these different notions of representation are not being kept as distinct as we might like: the first quotation seems to involve a conflation of denotational with cultural significance, and the second is juxtaposing the absence of denotational significance in a Pollock painting with its evidentiary significance.

The third part of the book discusses the ontological status of theories, whilst also exploring further analogies from aesthetics—in particular, analogies to musical or literary works. Much of this part of the book is structured around exploring the possible resolutions of the following inconsistent triad:

- (i) Scientific theories/scientific models/musical works are abstract objects.
- (ii) Scientific theories/scientific models/musical works are created.
- (iii) Abstract objects cannot be created.

In particular, French considers what happens if we reject (ii), and so take scientists (or composers) to be discovering eternal structures in some Platonic realm; or if we reject (iii), and allow that theories (or musical works) can be created—and, perhaps, altered and destroyed. French also discusses the idea of regarding theories as fictions, and so as more analogous to literary works than musical works. Under these headings, French considers a wide variety of specific proposals from the literature: these include Popper’s proposed ‘World 3’ of the products of the human mind, Thomasson’s view of fictional characters as ‘abstract artefacts’, and Frigg and Toon’s work on models and theories as a form of make-believe.⁹

However, French takes all of these proposals to run into problems (see below), and so turns—in Chapter 7—to developing his own positive proposal: that there do not fundamentally exist any abstract entities which serve as the referents for terms like ‘the theory of evolution’ and which account for the truth or falsity of claims involving such terms.

⁸Which is not to say that these three kinds of significance are wholly independent, either: indeed, the cultural significance of *Burial at Ornans* arises precisely from the collision between its material form (that of a grand-scale history painting) and what it depicts (an ordinary provincial funeral). But this does not mean that they should be conflated, either.

⁹Popper (1972); Thomasson (1999); Frigg (2010); Toon (2012)

Instead, drawing on Cameron's account of musical works,¹⁰ he suggests that the truth-makers for claims about theories are 'the complex set of practices of the scientific community: the writing and dissemination of articles, the performance of experiments, the kinds of heuristic moves already mentioned, and so on.' (p. 191) So in ordinary English, claims of the form 'the theory of relativity exists' are made true by certain patterns of scientific practice, rather than by the existence of a (or the) theory of relativity. In order to keep track of our ontological commitments, we distinguish such ordinary-language statements from those statements—which French puts in **bold type**—that 'refer directly to the elements to which one is ontologically committed.' (p. 188) So although there are such things as theories, **there are no such things as theories**. The triad above is correspondingly resolved as follows: in English, (i) and (ii) are true but (iii) is false, whereas in an ontologically committing idiom the situation is reversed (so **scientific theories are not abstract objects, scientific theories are not created, and abstract objects cannot be created**). Chapters 8 and 9 then seek to reconcile this picture with the ways in which theories seem to play an indispensable role in (respectively) the practices of the history and the philosophy of science.

To unpack all this, let's take the following example from Feynman's potted history of Quantum Electrodynamics: 'Around 1900 a theory was developed to explain what matter was. It was called the electron theory of matter, and it said that there were little charged particles inside of atoms.'¹¹ Now, presumably everyone will agree that whether or not this claim is true depends, at the end of the day, on what physicists were up to in the period around 1900 (and thereafter).¹² Thus, the fact that the truth-makers for theory-talk are (ultimately) to be found in scientific practice is not what is at issue. Rather, the question is whether we should think that some ontologically substantial abstract entities (the 'theories') mediate this relationship or not. If we do, then the role of practice is to put us into appropriate contact with theories—either bringing them into existence if they are abstract artefacts, or setting up referential links to them if they are eternally existing Platonic structures. The truth or falsity of a claim like Feynman's then depends directly on what the theories are like, and (hence) indirectly on what the practice is like. The alternative, that French advocates, is to suppose that the relevant practices simply make the theory-talk true 'directly', with no abstract intermediaries standing between the practice and the talk.

¹⁰Cameron (2008)

¹¹(Feynman, 2014, pp. 4–5)

¹²Moreover, when Feynman admits a few pages later that 'what I have just outlined is what I call a "physicist's history of physics," which is never correct', then presumably we will agree that the reason for this is a disconnect between what he has described and what physicists were in fact up to.

At this point, however, we may start to lose our grip on what the difference between the available options really is. In particular, note that on French's analysis, the abstract-artefacts view (that theories can be created) ends up being true *provided that it is only ever formulated in ordinary English*. So is there anything more to distinguish French's view from the abstract-artefact view than the just-mentioned question of whether theories 'mediate' the truth-making? In order to answer that question, it is helpful to think about what, for French, is at stake one way or the other. Here are two advantages to eliminativism that French mentions, which I suspect are revealing of the metametaphysical backdrop that he is working with.

The first is that the abstract-artefact view must, for French, answer the question 'how do we achieve a reconciliation between the gradual process in practice by which theories are conceived, developed, and interpreted, with their instantaneous emergence as entities in World 3?' (p. 129) For example, if we take it that heuristic practices are what account for the coming into being of (say) Einstein's theory,

variants of [this question] must be faced: does the abstract artefact only come into being at the end of the heuristic process? Can we pin that down? In Einstein's case was it really when he presented the theory general theory of relativity to the Prussian Academy of Sciences? That seems somewhat arbitrary, as if the theory could not be considered to be in existence when he carried his notes or paper into the lecture theatre and then, again, popped into being when he presented it (again, when he began or when he finished?). Or did it come into being when he wrote the final sentence or the final full stop? Or when he completed it 'in his head'?! (p. 132)

With no theories, there is no popping into being to be done, and hence no troublesome questions about when (*exactly*) such popping took place.

The other advantage emerges in Chapter 8, which takes aim at the idea that the history of science presents to us a succession of scientific theories, which philosophers should give an appropriate ontology for. On the contrary, it is argued, the history of science—with the history of quantum theory used as a major case study—demonstrates that scientific practices 'are complex, overlapping, and, in some cases, entangled', and hence that 'what we are presented with in the histories and the textbooks and the reminiscences is no more than a construction for which certain features of the relevant practices have been emphasized and highlighted for all sorts of different purposes.' (p. 223) In a similar vein, French diagnoses the difficulties of explicating theoretical equivalence as arising from the misguided effort to impose rigid identifications on what we actually

find in the practice, namely ‘a plethora of putative theories, depending on how deep we go into the metaphysics and what metaphysical tools and devices we choose to deploy’ (p. 223). The upshot of this chapter, in other words, seems to be that scientific practices do *not*—in fact—support an especially rigorous practice of quantifying over theories; so our use of such quantification in English rests on an idealisation of the practices that undergird it.

What these have in common, then, is the following idea: unless we are eliminativists about theories, then we cannot allow for the messiness and indeterminacy that will attend claims like ‘around 1900 scientists developed a theory according to which there are little charged particles inside of atoms’. Indeed, we can generalise this observation. In general, where we are dealing with issues that rest on patterns of social practice, we should expect vagueness about exactly which claims about them are true, and about when these claims shift between true and false. Correspondingly, we will run into trouble if we try to impose an ontology onto such matters that is sharper or more exact than the facts themselves will bear.¹³ In this sense, it looks as though French’s arguments will quite quickly generalise to other forms of eliminativism, indeed to eliminativism about ‘social objects’ more generally—although French himself resists the suggestion, put to him by a reader, that ‘we should conclude that games, customs, and nation states should also be eliminated’ (p. 223, n. 32).

This point seems worth emphasising, since at least some of French’s opponents will (one imagines) not share the metametaphysics at work here. For instance, Thomasson’s work on the ontology of art explicitly rejects the kind of ‘ordinary/**ontological**-language’ approach to ontological commitment that French endorses, and is much more willing to allow that our ontologies might be partial and indeterminate things:

If the identity and persistence conditions for paintings or novels, for example, are at bottom established by our practices, then where our practices draw no sharp line. . . there may simply be no fact of the matter to discover. . .¹⁴

¹³We could call this the *Ly Tin Wheedle* problem, after that thinker’s ill-fated theory of monarchical succession: ‘The only thing known to go faster than ordinary light is monarchy, according to the philosopher Ly Tin Wheedle. He reasoned like this: you can’t have more than one king, and tradition demands that there is no gap between kings, so when a king dies the succession must therefore pass to the heir instantaneously. Presumably, he said, there must be some elementary particles—kingons, or possibly queons—that do this job, but of course succession sometimes fails if, in mid-flight, they strike an anti-particle, or republicon. His ambitious plans to use his discovery to send messages, involving the careful torturing of a small king in order to modulate the signal, were never fully expanded because, at that point, the bar closed.’ (Pratchett, 1988, p. 31)

¹⁴(Thomasson, 2006, p. 250); I take it that this kind of attitude will, if anything, find an even more natural home in Thomasson’s recent neo-Carnapian metametaphysics (Thomasson, 2015).

It follows that there are two separate questions here. On the one hand, there is the question of the extent to which our ordinary-language use of (existentially quantifying) theory-talk is appropriate or helpful, given the nature of the underlying scientific practices; on the other, there is the question of what metaphysics of theories this combination of scientific and linguistic practices must bring in its wake. (Again, this is going to parallel the situation in other areas of philosophy that deal with social ontologies.)

Given this, we can read the latter part of the book (in particular, Chapters 8 and 9) independently of the metaphysical issues that animate much of the rest of the discussion, insofar as we take it to be addressing the former of the two questions above. We might all be inclined to agree *in general* that the practices of science are what make claims about theories true (or false), but it is non-trivial to spell that out—and to reconcile that spelling-out with the ordinary practice of history and philosophy of science.¹⁵ French's suggestion that history and philosophy of science would do better to link the practices of science directly to issues about realism and representation, without the middlemen of theories and models, strikes me as a powerful and exciting methodological call to arms. It is reminiscent of both the strong programme within sociology of science (although focused on what social practices constitute the making of a scientific knowledge-claim, rather than giving sociological explanations for when and why such claims are made), and the 'Stanford School' in philosophy of science (although with the themes of plurality and disunity playing a somewhat less central role).¹⁶

However, one limitation to French's account is that the details of this truth-making relationship are not, in the end, fully laid out. Of course, it might be protested that the practices of theorising and modelling in science are just too diverse and heterogeneous to allow for easy definability, but that doesn't mean that some attempt to pin it down is not worthwhile. For example, returning to the analogy with (political) states, consider the classic definition in Tilly (1992, p. 1): that states are 'coercion-wielding organizations that are distinct from households and kinship groups and exercise clear priority in some respects over all other organizations within substantial territories'. Armed with this definition, we get a good handle on what kinds of practices will need to be in place in order for talk of states to be appropriate: there should be coercive practices going on, that are distinct from the practices constitutive of households and kinship groups,

¹⁵To make (yet) another analogy, perhaps we can take French to be showing us how to do history and philosophy of science without theories, much as Field (1980) seeks to do science without numbers; the interest of trying to do that holds even if one believes in theories, just as a Platonist about numbers can be interested in Field's project.

¹⁶See Bloor (1991) for an introduction to the strong programme, and (Cat, 2017, §5.1) for an overview of the Stanford School.

which are taking place (in a coordinated fashion) across a 'substantial territory', etc. This is not to say that applying the definition will be straightforward or uncontroversial in all cases, but it gives parameters by which we might seek to determine that application. Similarly, having argued that literary practices fix the criteria for a fictional character to exist, Thomasson gives as 'clearly sufficient' conditions for an author to create a fictional character 'That she write a work of fiction involving names *not* referring back to extant people or characters of other stories, and apparently describing the exploits of individuals named (or, if you like, pretending to refer to and assert things about a person, as part of an understood tradition of story-telling pretence).'¹⁷ Again, we should not expect these provisions to immediately settle any and all controversies about the existence and nature of specific fictional characters, but they provide a means of getting started.

By contrast, French forebears from giving such definitions. Indeed, in a passage contrasting his view to fictionalism, he seems to suggest that his view has no need for them:

On [fictionalist accounts] we need 'bridge principles' that relate the two domains and that give us rules for determining why it is appropriate to say '2 + 2 = 4' for example but not '2 + 2 = 5', even if there are no numbers. But this is not my view. I am not saying that talk about theories really amounts to talk about practices—again, the claim is that talk about theories is *made true* by the practices. Thus, there is no need for bridge principles; or, better, the relevant rules that link theory talk to practice are simply those pertaining to the notion of truth! ... when it comes to a statement such as 'According to standard QM, undisturbed systems obey a linear dynamic,' the reasons why it is appropriate to say that and not 'According to standard QM, undisturbed systems obey a non-linear dynamic' have to do with the practices associated with using Schrödinger's equation and so forth. Those practices make the former statement true. (p. 192)

I must admit to being puzzled on this point: I do not see how the view expressed here can get away without bridge principles. The basis of the view is that whenever a certain claim about theories is true, there will be some fact about scientific practice which is responsible for its truth. If the relationship between theory-talk and practice-facts is systematic, then presumably it could be expressed by general claims that we could take as such bridge principles; and if it is not systematic, but varies wildly on a

¹⁷(Thomasson, 2003, p. 148)

case-by-case basis, then how does one ever successfully use knowledge of the practice to adjudicate claims about theories? For instance, French suggests (p. 193) that in the particular case of QM's linearity, we could defer to textbooks as the codifications of the relevant practice. How has he arrived at the view that this is a good way to proceed, if there are no general principles that inform the relationship between (as it were) theories and practice?¹⁸

All that said, although I have focused here on those areas where I should have liked to hear more of French's ideas, this should not detract from the fact that this book is a fascinating and rich contribution to the literature, and one which highly rewards being read closely. There is much more that could be discussed than there is space to do here, but I hope the above gives a flavour of some of what can be found therein. I will close by noting one thing that really stands out about the treatment here, namely French's willingness to delve into diverse areas of philosophy in search of illumination and inspiration. Not only does this invigorate the discussion with a lively cast of examples and ideas, but it serves as a welcome reminder of how intimate the connections are (or can be) between philosophy of science and other subfields—a valuable lesson, at a time when specialisation and fragmentation are increasingly the norm.¹⁹

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¹⁸As a side-note, the distinction being used here between a discourse's subject matter and its truth-makers is interesting but underdeveloped. I take it the analogy is to other cases of reduction or supervenience (even if pain-talk is made true by distributions of neural activity, we might balk at saying that pain-talk is *about* neural activity); but how compatible is that stance with the eliminativism that French espouses? If there is no such thing as pain, or theories, then what *else* could pain- or theory-talk be about if not the underlying truth-makers?

¹⁹Thanks to Joe Dewhurst, Sebastian Lutz and Alice Murphy for comments on an earlier draft. Gefördert durch die Deutsche Forschungsgemeinschaft (DFG)—Projekt Nummer 392413352.

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