Against Fictionalism

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Abstract Characteristic of model based science is its attachment to idealizations and abstractions. Idealizations are expressed by statements known to be false. Abstractions are suppressors of what is known to be true. Idealizations over-represent empirical phenomena. Abstractions under-represent them. In a sense, idealization and abstractions are one another's duals. Either way, they are purposeful distortions of phenomena on the ground. Sometimes phenomena on the ground approximate to what their idealizations say of them. Sometimes nothing in nature approaches them in any finite degree. So wide is this gulf between reality and idealization that Nancy Cartwright was moved to say of them that they are "pure fictions".

Fictionalism in the philosophy of science endorses Cartwright's attribution, and occasions an obvious trio of questions. One is whether the fictionality of non-approximating idealizations is a load-bearing contribution to the semantics and epistemology of science. If it is, a second question is whether we know the satisfaction conditions for "is fictional" in virtue of which this is so? The third is whether those satisfaction conditions might profitably be sought in adaptations of what is currently known about the semantics and epistemology of literary fiction.

In this paper I present considerations which, we may come to think, offer these questions scant promise of affirmative answers.

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1 Magnetic Pull

Like the month of June, philosophy's attention to fiction is bustin' out all over.[1] What, nearly forty years ago, was a rump movement in the philosophy of language[2] is now the subject of a bustling research programme. The early work on fiction hovered at the intersection of the philosophy of language and analytical aesthetics. Today's range is broader. The concept of fiction is invoked in virtually all branches of philosophy—in the philosophy of science and mathematics; in metaphysics and epistemology; and in ethics and the philosophy of law.[3] The scale and intensity of these developments is striking. Who among those few writing about fiction in the late 1960s and early 1970s could have forseen the decision in 2010 of a major publisher to launch its series on Basic Philosophical Concepts with a book on fiction?[4]

Impressive as it assuredly is, fictionalism's contemporary reach is too much to do justice to in the space available to me here. So in keeping with the conference theme, I shall focus most of my attention on the philosophy of model based science, with a special emphasis on theories that are descriptively intended and designed for experimental test. The thesis that I want to advance is that the fictionalist project for science is a misbegotten one, and ought to be abandoned. My reason for thinking so is that the importation of fictionality into a philosophical theory of science does more harm that good with regard to any end that it might have been intended to achieve. Before presenting a case for this negative proposal, some preliminary matters will require our attention. Let's turn to them now.

When a philosopher invokes fictions for model based science, two questions arise straightaway: *What* is being invoked? And *why* invoke it? The what-question asks for an account of what it is to be a fiction. The why-question asks for the philosophical objectives that fictions are intended to advance, and invites reflection on what it is about them that enables those ends to be achieved. It also asks whether and how fictions *add value* to the theories that call them into play.

Conceived of as a project in the philosophy of language, a theory of fiction develops accounts of inference, truth and reference for fictional discourse,[5] an enterprise which in a suitably flexible sense of the word formulates a *logic of*

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[1] With a tip of the hat to Richard Rodgers and Oscar Hammerstein II's "June is bustin' out all over", from the Broadway musical *Carousel*, 1945.

[2] See, for example, Woods [1, 2], Kripke [3], Walton [4] and Howell [5]. The journal *Literary Semantics* was established in 1972 by Trevor Eaton, and Eaton's book of the same title appeared in [6].

[3] Representative coverage is furnished by Woods, editor, [7]. For the philosophy of science and mathematics, see also Suarez, editor, [8], and for mathematics Bonevac, [9]. See also Magnani's [10].

[4] See the note just above.

[5] In mainstream approaches to the semantics of natural language, this order is typically reversed—⟨reference, truth, inference⟩. Reasons for the switch in fictional contexts are laid out in Woods and an Isenberg [11].

fiction.[6] It was widely accepted—and still is—that a satisfactory logic of fiction would, among other things, furnish satisfaction conditions for the predicate "is fictional" and its cognates: "in fiction", "fictionally", "it is fictional that", and their like. In so doing, it would fix their respective extensions: referents, objects, characters, people, events, sentences, narratives, truths, consequences, inferences, and so on. The very idea of a logic of fiction is itself something of an abstraction, instantiated in actual practice by different and often rival approaches, reflecting in turn a considerable variation in semantic assumptions and in the use or avoidance of formal methods.[7] In any event, a logic of fiction is not a symbolic logic. It is not a theory of inference, truth and reference for semi-interpreted formal languages. It is not a logistic system in Church's sense. A logic of fiction is a semantic theory of fictional discourse in natural languages. It is a literary semantics.

No one would think that full coverage of the issues that interest philosophers of even non-aesthetic stripe would be given by this triple of theories I am calling a logic of fiction. A philosopher of mind might be drawn to fictions by an interest in the creative dynamics of story-making, or by the affective etiology of a weeping reader's response to the story that makes him cry.[8] But for my purposes here a certain primacy redounds to the triple, occasioned by the interest that fiction has come to have for the philosophy of science.

Philosophers of science seek clarifications of concepts which strike them as in need of it—the concept of law, for example, or causal explanation, or natural kind. But also high on their agenda are theories of truth for the sentences of a scientific theory, confirmation theories for the theory itself, and theories of inference for the intratheoretic linkages of the theory's sentences—in particular the tie between the theory and its observational test-sentences. Also of interest are the implications of these arrangements for the question of scientific knowledge, and their aggregated impact on ontological commitment and the character of the syntactic vehicles that convey it. It would not be far wrong to take these elements as setting a large and central part of the agenda for the philosophical investigation of science. Of course, dominant though they clearly are, one should not think that these elements exhaust a philosopher's interest in science. A philosopher might be puzzled by the processes of scientific creativity or the influence of societal considerations on scientific research. Even so, when I speak here of a philosophy of science, I will mean, unless otherwise indicated, the advancement of the elements of this core agenda.

I am now in a position to offer an early proposal about scientific fictionalism.

> *The magnetic pull thesis*: When a philosopher of model based science plays the fictional card, fictionalism should be the view that, *in the relevant respects*, the logic of fiction will

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[6] As far as I know, the term "logic of fiction", originates with Cohen in [12].

[7] There is not a single equation to be found in, say, Walton's [13]. On the other hand, Parsons' [14] displays a liberal sprinkling of them, as does even more so Jacquette's [15].

[8] Concerning which, see again Walton [4], and Woods and Isenberg [11].

exercise a magnetic pull on the philosophy of science, and will do so in ways that make for a philosophically more satisfactory theory than would otherwise have been the case.

This tells us something interesting about models (in one of the myriad senses of that word). If Xs are modelled as Ys, then a theory of Ys will exert a magnetic pull on a theory of Xs. The model will pull the modelled into—or in the direction of—its own conceptual space.

In our attributions of fictionality to model based science, there is I think little to be said for numerical identity. An abstractly conceived scientific law is not in any literal sense a fiction. The population-genetic assertion that populations are infinitely large is not strictly a truth of fiction. Less implausible is the idea that when these attributions are made, they are made with a modeller's intent, that is, with the expectation that giving to infinite populations the pull of fictions would redound to the benefit of a philosopher's interest in population genetics.

I find the notion of magnetic pull adumbrated in some well-known words of Nancy Cartwright:

> A model is a work of fiction. Some properties ascribed to objects in the model will be genuine properties of the objects modelled, but others will be properties of convenience. The term 'properties of convenience' was suggested by H. P. Grice, and it is apt. Some of the properties and relations in a model will be real properties, in the sense that other objects in other situations might genuinely have them. But they are introduced into this model as a convenience, *to bring the objects modelled into the range of the* [*modelling*] *theory.*[9]

Cartwright's notion of bringing objects into the range of the theory that models them is nearly enough my notion of magnetic pull. A good example of this is Bayesian epistemology, as reflected in some observations by Hartmann and Sprenger:

> Bayesian epistemology [in contrast to analytically intuitive epistemology], draws much of its power from the mathematical machinery of probability theory, which starts with *mathematical intuition*. The construction of Bayesian models is much triggered by what is mathematically elegant and feasible … The mathematics takes on a life of its own (to adopt a phrase due to Hacking), and the comparison with intuitive examples comes only *after* the Bayesian account is given.[10]

In the notion of pull we find the suggestion of conceptual change. It is not always recognized the extent to which a philosopher's attention to a concept of interest involves a degree of tampering—of tampering, as we might say, for the concept's own good. Even the straightforward clarifications so routinely sought by philosophers more often than not move beyond the exchange of synonyms into the more venturesome territory of explication and, more aggressivily still, rational reconstruction. A question of standing interest for philosophers is the extent to which such transformations leave the original concept recognizably present in the

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[9] Cartwright [16], p. 156. Emphasis added. In her text, "[modelling]" is "mathematical." But Cartwright's point is not restricted to mathematical modelling.

[10] Bernecker and Pritchard, editors, [17], p. 629. Emphases in the original.

rethinking of it. It is a question which calls in doubt whether a principled distinction exists between analyzing an old concept and synthesizing a new one. Kant is good on this distinction. Analysis, he says, is the business of philosophy. It is the business of making concepts clear. Synthesis, on the other hand, is the business of mathematics. It is the business of making clear concepts.[11] The magnetic pull thesis attracts these same questions. But the main thing to emphasize here is that fictionalists are of the view—or should be—that our understanding of highly idealized model based science will be improved by reconceptualizing the relevant features, by modelling them, by thinking of them in ways that will add value to a philosophically tenable appreciation of them.

It is prudent to harbour a healthy respect for this difference between an abstractly idealized scientific law and anything a fiction could realistically be taken to be. When a philosopher of science calls upon fictions to do some heavy lifting in his work, he is engaging a "perspective external to the practices" of science.[12] It is easy enough to appreciate the misgivings which so alien a presence might stir in the breast of a cautious philosopher. But there is also the point that, notwithstanding the brisk developments of late, when compared to the philosophy of model based science the logic of fiction is something of a rookie—not only a more recent development but also a good deal less centrally situated in the mainstream of technical philosophy. Even so, we shouldn't over-do this juniority. While there is plenty of occasion to wonder whether any of the going logics of fiction have achieved maturity enough to exercise the drag envisaged by the magnetic pull thesis, this needn't be on account of the recency of these logics. It is generally agreed that the logic of *Principia Mathematica* turned out not to model the arithmetic of the natural numbers. This was not because the logic of *Principia* was new. It was because it was the wrong model. Newness is not the problem with logics of fiction. But callowness might well be.[13]

All this talk of models is dizzying. There is more ambiguity in the word "model" than is perhaps quite good for it. Sometimes a model of something is anything that counts as a simulation of it or, more broadly, any way of thinking it as being, or being like, including ways it could not possibly be. Closer to our current concerns is the threefold ambiguity in which models are structures, or are sentences holding in those structures, or are entities—the things those sentences quantify over. Fictionalism reproduces this trio, yielding up structure-fictionalism, sentence-fictionalism and entity-fictionalism. For our purposes there is no need for trinitarian finickiness. Context will be our guide.

The comparative newness and rawness of the logic of fiction, and of the fictionalisms to which it has given rise, shouldn't distract us from a recognition of fictionalism's ancient lineage, nominalism. When a philosopher is a nominalist about

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[11] See Kant [18]. Almost the identical distinction, albeit without mention of Kant, is to be found in Russell's [19], pp. xv–xvi, 15, 27, 112 and 114; originally published in 1903.

[12] In the words of Fine [20], p. 120.

[13] A substantial survey can be found in Woods [21].

numbers he will think that numbers exist in name only. If, in turn, he is a nominalist about fictionality, he will think that numbers are fictions in name only. In that case, his would be a second-order nominalism asserting that it is a fiction in name only that numbers exist in name only. Over the ages, a standing problem for nominalism has been to find for the in-name-only qualification a nontrivial interpretation. It is likewise a problem inherited by the rookie fictionalisms of the present day.

If infinite falsehoods were indeed fictions in name only, the required logic of fiction for model based science would itself have to be a logic of fictions in name only. This introduces a complication. The complication is that it is not clear whether a good logic of fiction would be needed to exert a magnetic pull on the desired logic of fictions in name only. Perhaps it is not too much to assume an affirmative answer. If so, a logic of fiction would have to precede a logic of fiction-in-name-only.

This is not perhaps a welcome complication. Perhaps it makes of fictionalism a slipprier problem than we would have liked it to be. I don't doubt the accuracy of the magnetic pull thesis. If fictionalism is true for science, if fictions are fit for honest work there, a logic of fiction will have to be brought into play, and with it the distinction between a logic of fiction and a logic of fiction-in-name-only. Suppose, however, that fictionalism is not true. Might it not be possible to show this without significant investment in the linkages between logics of fictions and logics of fictions-in-name-only? I will come back to this in Sect. 5.

2 Infinitely False Idealizations

The magnetic pull thesis is relativized to "relevant respects". What would those respects be? Here again is Cartwright:

> A model is a work of fiction … There are the obvious idealizations of physics—infinite potentials, zero time correlations, perfectly rigid rods, and frictionless planes. But it would be a mistake to think entirely in terms of idealization, of properties which we conceive as limiting cases, to which we can approach closer and closer in reality. For some properties are not even approached in reality.[14]

Seeing the importance of this feature of them, Cartwright goes on to say that they are *pure fictions*.[15] They are utter falsehoods utterly on purpose.

It is important to note the cardinality implications of these non-approximating idealizations. Consider two further examples.[16] In population-genetic models of

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[14] Cartwright [16], p. 153.

[15] Also important for scientific models are abstractions, whose principal alethic significance is the suppression of what is true on the ground. For further discussion, see Woods and Rosales [22].

[16] Concerning which see also Godfrey-Smith [23]: "Scientists, whose business is understanding the empirical world, often spend their time considering things that are known not to be parts of that world. Standard examples are ideal gases and frictionless planes. Examples also include infinitely large populations in biology, neural networks which learn using biologically unrealistic

natural selection, populations are infinitely large. In neoclassical economics, utilities are infinitely divisible. In the first case, the largest possible and smallest possible actual populations are equally close to the ideal; they both fall infinitely short of it. Similarly, both the smallest and largest numbers by which an actual utility—pleasure, for example—may be divided fall equally close to its ideal; again, they both fall infinitely short of it. To give to these idealizations the name that is due them—"infinitely truth-nonapproximating falsehoods"—would be accurate but stylistically inelegant. I propose a less ponderous description. They are "infinitely remote idealizations". They are falsehoods without a friend in the world.[17] Recognition of the importance of infinitely remote idealizations is widely evident in philosophy of science.[18] Their treatment as fictions is a minority position, albeit one of growing strength in recent years.

As things have so far evolved the magnetic pull thesis hasn't had much sway in fictionalist approaches to science.[19] There is a ready explanation of this. If with respect to a theory's infinitely remote idealizations fictionalism is the doctrine that a logic of fiction will exert a philosophically instructive pull on the logic of science, the structure of the modelling connection needs to be exposed, and its putative philosophical payoff has to be tethered in some disciplined way to features of that structural tie. It would be hard to overstate how far short is fictionalism's present state of play from meeting these requirements.

When you synthesize a new concept into being, you make something up. You make something up in ways that make for the truth of the sentences about its instantiations. You make those sentences true of them, but you make them false of everything in the world. Literary fictions are like this too. At least, they are somewhat similar. When Doyle made Holmes up, he did so in ways that made various things true of Holmes, for example, that he shared rooms with Watson at

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(Footnote 16 continued)

rules, and the wholly rational and self-interested agents of various social-scientific models …. A natural first description of these things is as fictions, creatures of the imagination." (p. 101).

[17] It might be thought that these infinite gaps could be made subject to variable shrinkage by the devices of probability. A statement having a probability of 0.8 is one with a higher probability than a statement whose value is 0.6. This is so, but not on point. The highest probability is 1.0. Perhaps we could say that statements having this value are ideally probable. At least, if we did say this, people would know what we meant. But 0.6, 0.8 and 1.0 are real numbers. Real numbers are everywhere dense. No real number (save for self) is any closer to 1.0 than any other. The relation of having a higher probability than is not a matter of having a value that lies closer than the alternative to the ideal probability. Of course 8 is a number that lies closer to 10 than 6 does. But these are natural numbers. Other than 1 and 0 numbers on the natural line are not probabilities.

[18] Batterman, among others, writes astutely about the philosophical questions raised by the ineliminable presence of unapproachable idealizations in theoretical science, but with no mention of the idea that they are fictions. See, for example, his [24, 25]. Other sceptics of note are Teller [26] and Giere [27], both in Suarez [8].

[19] This is starting to change. Two important exceptions are, Suárez [28] and Frigg [29], both in Woods, *Fictions and Models*. In these approaches, the borrowed treatment of fictions is the so-called pretense theory of Kendall Walton. See again his [13].

221B Baker Street. There are truths to which nothing in the world approaches in any finitely realizable degree. Of course, some real-world people share rooms at some real-world address, but this is not the comparison we seek. Nothing that is remotely possible of realization in the real world approximates in any finite degree two unreal people sharing rooms in a real-life city. We would seem to have it, then, that the truths of literature are infinitely remote from the truths of the world and they are truths that their tellers make up. So isn't it true to say that these makings-up of science are fictions?

The short answer is yes. That is, yes up to a point; indeed, up to the two points of similarity we've taken notice of just now. With this resemblance in mind, when you characterize an infinitely remote idealization as a fiction, you are attributing to it two of the characteristics that everyone already knows such idealizations to possess. What you assert is a two-part similarity. The similarity clearly exists, but noticing it exercises no magnetic pull on the concept of the infinitely remote idealization.

3 Outsourcing

Fiction is a borrowed concept in any philosophical theory of science that invokes it. The borrowed concept is a concept "external" to the conceptual space of the borrowing theory. Concept-borrowing theories reflect a distinction between a fiction's work-producing status and what we might call its *façon de parler* status. For philosophers such as Arthur Fine, "fictionalism" is just another name for antirealism,[20] for the view that a sentence such as "Numbers are fictions" is only a lexical variation of "Numbers aren't real". In this usage, numbers are fictions in a manner of speaking. It is not hard to see why *façon de parler* fictionalism would not be of much interest to the philosopher of science.[21] Although the *façon de parler* variant is, rather more than not, fictionalism's standard form, it is rarely acknowledge as such. Remarks by Alisa Bokulich provide an instructive example of this fact. She writes:

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[20] Fine writes: "Over the last few years the realism-antirealism arguments … and a somewhat larger number of epithets …. When an especially derisive antirealist label is wanted, one can fall back on the term "fictionalist", coupled with a dismissive reference to Vaihinger and his ridiculous philosophy of 'As If'". ("Fictionalism", *Midwest Studies in Philosophy,* 18 (1993), 1–18, p. 1.) Fine's use of "ridiculous" is a matter of mention rather than use. Fine is no Vaihingerian, but he is far from thinking that *The Philosophy of 'As If'* is ridiculous.

[21] This is not to say that *façon de parler* fictionalism is inherently antirealist. Fictional realists hold that Holmes is a real thing, albeit not in the way that we ourselves are. Realistically inclined idealizers claim that infinite populations are real, albeit not in the way that the population of London is. If the attribution of fictionality to those idealizations is just another way of saying that they are real, but not in the way that the population of London is, the attributor is a *façon de parler* fictionalist.

As we know well today, however, these Bohr orbits are *fictions*—according to quantum mechanics the electron in an atom does not follow a classical trajectory in a stationary state and is better described as a cloud of probability density around the nucleus. I want to defend the view that, *being a fiction*, Bohr's model of the atom does in fact explain the spectrum.[22]

We have it, then, that orbits are fictions because they are not truths of QM. They are idealizations without a friend in the QM-world. They are infinitely unapproachable falsehoods in Cartwright's sense and infinitely remote falsehoods in mine. Granted that such idealizations have genuine explanatory force in QM, it is easy to see that the Bohr model is a well-motivated contrivance. But what, beyond calling them infinitely unreasonable idealizations, is added by also calling them fictions? What is it about "being a fiction" that renders an unrealizable falsehood capable of explanatory force that "being an unrealizable idealization" lacks"? Finding that this question is not posed in "How scientific models explain", I think that we must conclude that Bokulich's fictionalism is also of the *façon de parler* kind.

Let's say no more of *façon de parler* fictionalism. The fictions we want for science will have a more load-bearing role to play. The magnetic pull thesis requires no less of them. The scientific fictionalist has two broad borrowing options.

> *The homegrown* option: A logic of fiction for a concept-borrowing theory—e.g. the philosophy of population biology—will be *sui generis*. The theory will construct its own purpose-built treatment of fiction.
>   *The outsourcing option*: A logic of fiction for a concept-borrowing philosophical theory will be a borrowed logic of fiction, suitably adapted. Theories exercising the outsourcing option are thus borrowers of fiction twice over. They are borrowers of the concept and they are borrowers of a logic of it.

If we examine the current literature, we see that when substantive borrowing actually occurs, the outsourcing option is the almost universally exercised one, and that the source of the borrowing is typically some or other theory of literary fictions.[23]

Whichever option we might decide to exercise, an earlier question presses for answers. It is the value-added question. What of importance would be left out of a philosophical account of model based science if it didn't assign a working role to fictions—the why-question—or, having done so, didn't also provide an independent account of what it is to *be* a fiction—the what-question? These questions

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[22] Bokulich [30], The emphasis, in the first instance, is hers, and in the second mine.

[23] See again Suárez and Frigg. An exception is Vaihinger's [31], the book arises from Vaihinger's doctoral dissertation of 1877. Meinongean theories, in turn, are adaptations of an antecedently developed metaphysical theory. See again Parsons' *Nonexistent Objects* and Jacquette's *Meinongean Logic.* Also important is Bonevac's home-made mathematical fictionalism, in "Fictionalism", Sects. 7.2–7.8, made especially interesting by the fact that Bonevac is not himself a fictionalist.

apply equally to both options, homegrown and outsourcing. But since outsourcing is our focus here, we should direct the question to it.

4 Neutral Fictionalism

When Xs are modelled as Ys, the pull of a theory of Ys on a theory of Xs can be deflationary, inflationary or neutral. A neutral pull is actually no pull at all. It is pull in name only. If "Y" is just another name for X—or concretely, if "fictional" is just another name for "infinitely remote idealization"—then idealizations aren't modelled as fictions, and a logic of fiction exerts no pull on the logic of science in respect of them. Fictions in this sense are fictions in a manner of speaking. Again, they are *façon de parler* fictions.

Let us come back to the point that sometimes the attribution of fictionality is intended to call attention to a similarity between some feature of fiction and some aspect of the thing to which fictionality is ascribed; that is, it serves as a simulacrum of it.[24] Everyone knows that fictions are made up by authors. Everyone knows that idealizations are made up by theorists. They are made up by their progenitors in ways that make them stick. Sir Arthur Conan Doyle made it *stick* that in the stories Holmes lived at 221B Baker Street. Population biologists made it *stick* in genetic theories of natural selection that populations are infinitely large. No one believed it when Quine said that theories are free for the thinking up.[25] The truth is that making the makings-up of population biology stick is subject to complex and not easily discerned conditions. Something like this is also true of Doyle, though more gently so. Not even Doyle can make it stick that Holmes lived in Baker Street without finding the contextual conditions that enable it. These would be resemblances worth making remarking on if conditions for making things stick in fiction exercised a magnetic pull on conditions for making things stick in population biology. But there hasn't to date been a jot of evidence to support the existence of that pull, and lots to support its nonexistence.[26] Until something more convincing comes along, the prudent course is to take similarity fictionalism for what it is. It too is fictionalism without conceptual pull.

We now have the wherewithal to sound a gentle admonition:

> *Lesson* 1: Avoid *façon de parler* fictionalism and like varieties with neutral pull.

It is sometimes said (by physicists) that there are two matters in which biologists exhibit a notable deficiency. They aren't as adept as they should be at data

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[24] Virtually all the going fictionalist accounts of mathematics are *façon de parler* accounts or similarity accounts. See again Bonevac's [9]. See also Cartwright's discussion of representation in [16], p. 156.

[25] Quine [32].

[26] See here Woods and Rosales [33].

analysis; and they haven't quite got the hang of model construction. Perhaps this is a bit too partisan a complaint, but let that pass for now. For our purposes it suffices to ask: "Suppose a biologist wanted some instruction in the building of powerful models. Should he enroll himself in a course on creative writing, or should he hire a physics post doc?" Early papers of Patrick Suppes contain helpful admonitions about these and related matters.[27]

5 Unreasonable Effectiveness

Let the genetic model of natural selection be our guide. The model provides that populations are infinitely large. In so doing, it fails (utterly) to tell us anything true about population size. But also in so doing, it helps tell us something true about natural selection in real populations—in populations on the ground. The ensuing theory is an empirical success. It performs well at the empirical checkout counter. It is a theory that gives us a knowledge of how natural selection actually works. The idealization of infinite largeness is no mere heuristic. It plays an ineliminable role in generating the theory's results, the results to which it owes its empirical adequacy. A good deal of what is philosophically interesting about this branch of population biology is that without its infinitely false provision for population size its empirical adequacy would collapse. It is a falsehood that can't be "de-idealized."[28]

On the face of it, this is an epistemically discouraging dependency, nicely described by Eugene Wigner as an "unreasonable effectiveness".[29] The unreasonable effectiveness problem has spawned a sizeable and contentious literature that touches in one way or another on virtually every issue of significance for the epistemology and metaphysics of science, including every way of being a realist and every way of not being one. To the extent possible, I want to avoid these entanglements. They are, to be sure, matters of importance, but they are not the engagements for which my project has been fashioned.

There are two cases to which I want to give particular attention—two problems that seem to arise quite naturally in the contexts presently under consideration. The first is posed by

The detonation question: How widely spread in a theory T is the alethic impact of its ineliminable idealizations? How contagious is the property of infinite falsehood?

The second question is to be found in recent remarks of Nancy Cartwright:

Although on some theories of fictions, fictional descriptions need not be false to the real world, it is nevertheless characteristic of fictions that they are. This seems to be the central

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[27] See Suppes [34, 35].

[28] I borrow the term from McMullin [36]. See also Suarez [28].

[29] Wigner [37].

feature literary features share in common with the claims of mathematics of metaphysics and of many scientific models. From this starting point Woods' challenge … is to explain how focus on this shared characteristic helps solve the problem in view, which in my case is to understand the use of false models *to generate* true claims about target situations. That, it seems, can be a tall order.[30]

This we might call

The grounding question: A principal task of an empirically intended theory T is the generation of the observation sentences O_i on which its empirical adequacy ultimately depends. Schematize this generation relation as $T \vdash O_i$. Generation is a kind of derivation or grounding relation. But given T's dependency on infinitely false idealizations, derivations in the form $T \vdash O_i$ are unsound. Do we not have it then that T lends no grounding support to the O_i it generates, and to which it owes its empirical adequacy? The grounding issue is a nasty looking problem. When a theory carries a structure in the form $T \vdash O_i$, and the O_i are the observational consequences to which T owes its empirical adequacy, and yet T cannot properly speaking be said to ground its observational consequences, how does it get to be the case that the O_i's truth reflect well on T? Intuitively speaking the O_i reflect well on T because they are results for which T is responsible. How can T take the credit for the O_i if it makes no case for them?[31]

Let P be any problem—these two or any other—putatively occasioned by the unreasonable effectiveness of a model based theory T. Let the invocation of fictionality be intended as a substantive contribution to P's resolution R. My question here is not whether R resolves P but rather, assuming that it did, what would it have been about the invocation of fictionality that made or helped make it so? A second question is more ambitious. Once we started paying attention to what they actually are, might it not turn out that fictions possess a property Q thanks to which, for any R that resolves P, fictions make no contribution to it? If so, the invocation of fictions would add no value to P's resolution. This second question helps box my compass. It gives me a strategic option to consider. It motivates the search for an affirmative answer. It motivates the search for a relevant Q. Let us call this the *Q-strategy*.

Suppose further that a search for the relevant Q could be achieved without having to produce a full-bore logic of fiction. This would be a boon twice-over. The defeat of fictionalism would be both *principled* and *cheap*. Whereupon, a second strategy announces itself.

The pre-emption strategy: To the extent possible, one's search for Q should avoid the need for a full-bore logic of fiction.

Again there is a reason for this caution. Slightly over-simplified, there are more logics of fiction than you can shake a stick at.[32] The more that one's search for Q is wedded to a given logic, the more it imbibes the dissensus that surrounds it. Of

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[30] Cartwright [38]. Emphasis added.

[31] The distinction between consequence and ground is a crucial in all case-making contexts, yet the logic of grounding is not as technically well-advanced as one might expect it to be. For recent work, see Fine [39].

[32] See again my "Fictions and their logics", in Jacquette's *Philosophy of Logic*.

course, fictionalism aside, there is also considerable dissensus in the logic of science about how to handle Wigner's problem and others. The fictionalist's goal should be to minimize that dissensus, if not remove it outright. It is remotely possible that throwing a contentious logic of fiction into the mix could turn out well. Perhaps there would be synergies that offered relief in both directions, that calmed the philosophical waters of fiction and science alike. But it is not typically the case that adding dissensus to dissensus is the way to bring about this kind of amity. An indication of the extent and depth of these rivalries can be found below in an appendix.

With these questions now at hand, let me say again what I intend my task to be. Without having to develop a comprehensive logic of fiction (the pre-emption strategy), I will try to find a property of fictions Q in virtue of which, depending on the problem under consideration, one or other of two results is achieved. Either Q condemns the problem to irresolution, or it shows that fictions make no contribution to its solution if indeed it has one (the Q-strategy).

6 Empirical Adequacy

The detonation and grounding questions arise from a worry about how a theory ineliminably tethered to an un-de-idealizeable falsehood could ever manage to achieve empirical adequacy. The technical notion of empirical adequacy has been a central topic in the philosophy of science since 1980 when Bas van Fraassen advanced a detailed account of what we should mean by it.[33] There is wide, if not universal, satisfaction with van Fraassen's characterization, and that is good enough for what I am about here. The intuitive notion is that

> A theory is empirically adequate exactly if what it says about the observable things and events is true—exactly if it 'saves' the phenomena' (p. 12).

More formally,

> To present a theory is to specify a family of structures, its models; and secondly, to specify certain parts of those models (the empirical substructures) as candidates for the direct representation of observable phenomena (p. 64).

Then a theory is empirically adequate "if the structures which can be described in experimental and measurement reports" are isomorphic to the empirical substructures of some model of the theory.

Van Fraassen's further claim that for theories of the sort under review, empirical adequacy is the epistemically best to hope for, that empirical adequacy doesn't confer truth upon their nonobservational sentences. This is van Fraassen's constructive empiricism. In the spirit of wanting to stay out of unnecessary trouble, I accept van Fraassen's construal of empirical adequacy but stand mute on

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[33] Van Fraassen [40].

constructive empiricism.[34] I want to have my say about fictionalism in science without having to settle the hash of constructive empiricism.

7 Observational Consequences

The unreasonable effectiveness questions place a not inconsiderable burden on the structure we are schematizing as $T \vdash O_i$. Here, too, we meet with a thicket of difficult and largely unresolved philosophical controversies, indeed three of them. One is a snarl of questions concerning how to interpret the $\vdash$-relation(s). The other two concern the interpretation of $\vdash$'s relata. Here, too, I want to stir clear of these entanglements. This is the right way to proceed. At least it is the right way to proceed if the Q-strategy admits of an execution that permits it. This it would do if we were able to find the sought-after Q without heavy investment in adjacent matters. I will say that such a Q is indeed findable, provided we make some assumptions about empirically intended model based science. One is that it is sometimes empirically adequate. Another is that when this is so it is made so by the success of its observational consequences at the empirical checkout counter.

8 Deflationary Fictionalism

Neutral fictionalism is fictionalism without pull. Deflationary deflationism is something different. The same is true of inflationary fictionalism. A deflationary fictionalism with respect to a theory is a fictionalism that takes something *out* of it. An inflationary fictionalism with respect to a theory is a fictionalism that puts something *into* it. Deflationary theories are well-known to philosophers, even to those who have slight acquaintance, or none at all, with literary semantics. Arguably, the most widely discussed is Russell's doctrine of logical fictions.

Logical fictions are logical constructions by another name. At *Principia Mathematica* 20, Whitehead and Russell discuss the no-class theory of classes, and conclude that classes are logical fictions. A better known example is logicism, the thesis that arithmetic reduces to *PM*'s pure logic, that is, to the fusion of quantification theory and its treatment of set theory. The purported reduction turns on a truth preserving equivalence relation under which the theorems of number theory are re-expressible without relevant loss in the language of pure logic. Thus the natural numbers are logical fictions too.

It is widely believed that logicism was motivated by a determination to slip from the embrace of ontologically licentious entities. In fact this is a Quinean wrinkle. *Principia*'s central motivation for the reduction of arithmetic was to

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[34] For telling objections, even so, see Rosen [41].

favour proof over postulation. Without the reduction, some of the statements required by arithmetic would have to be introduced without proof, that is to say, by axiomatic stipulation or by what Quine would later call discursive postulation.[35] According to Russell,

> The method of 'postulating' what we want has many advantages; they are the same as the advantages of theft over honest toil. Let us leave them to others and proceed with our honest toil.[36]

If logicism is true, numbers are eliminable without cost to the truths of arithmetic. These days hardly anyone thinks that logicism *is* true.[37] But, true or not, we have a perfectly manageable concept of fictionality at our disposal. Perhaps the logical fictions of *Principia* didn't do the work intended for them in Whitehead and Russell's epistemology of mathematics. But that needn't have been because of a deficiency in the very idea of them. Nor need it have precluded that concept's utility in different contexts of philosophical enquiry. Why could it not be given consideration for use by the scientific fictionalist?

No. The goal of the logical fictions programme was to preserve the truths of arithmetic in a way that severed their apparent commitment to numbers. This is achieved by an equivalence between the sentences of number theory and sentences of pure logic, which latter carry no appearance of a commitment to numbers. In this way "2 is the only even prime" could be true without anything's being the number two. Clearly this won't work for the infinite falsehoods of model based science. Suppose that for "Populations are infinitely large" there were a truth preserving equivalence with a sentence carrying no apparent commitment to infinite populations. Then we would lose the necessity to recognize infinite populations, but we wouldn't preserve the truth of "Populations are infinitely large". For it is false that populations are infinitely large. When we say that the number two is a logical fiction, we enable ourselves to say that "2 is the only even prime" is true even if there are no numbers. If infinite populations were logical fictions, then "Populations are infinitely large" would be true even if there were no infinite populations. Since "Populations are infinitely large" is not true, infinite populations aren't logical fictions. So, we have a second lesson to propose.

Lesson 2: Avoid logical fictions.

A further source of deflationary difficulty can be found in what Bentham has to say about fictions.[38] Bentham's fictions intersect without present interests in three

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[35] Besides, Whitehead and Russell didn't think that classes had anything like a decisive ontological advantage over numbers. (Why else would they advance the no-class theory?).

[36] Russell [42], p. 71. Reprinted 1993.

[37] That is, the original project failed. Attempts to rescue significant parts of logicism have been attempted over the years, some making notable progress. See here Burgess [43].

[38] Bentham [44], It is a matter of note that Ogden is Vaihinger's English translator. Bentham, by the way, should not be confused with his nephew the logician George Bentham. See Bentham [45].

ways, two of which have deflationary significance. Under the encouragement of Odgen and (especially) Quine, Bentham is seen as the holistic precursor of the semantic preference for the sentence over the term, and, in his doctrine of paraphrasis, adumbrator of contextual definitions of the sort that underpin the reductive cleansings of *Principia*.[39]

> [A] fictious entity is an entity to which, through the grammatical forms of the discourse employed in speaking of its existence is ascribed, yet in truth and in reality existence is not meant to be ascribed."[40]

In their use as contextual eliminabilities Benthamite fictions, no less than the logical fictions of the logicists, are not load-bearing in any theory in which they occur. A logical fiction in a theory is something that is not needed for its truths. But, again, if we effected a Benthamist reduction which removed infinite populations from population genetics, we would leave intact the infinite falsity of "Populations are infinitely large". We must conclude, therefore, that a philosopher of science of fictionalist leanings would be wasting his time outsourcing his interest in fictions to Bentham's provisions for them. A fictionalism in the manner of Bentham would, as with Russell's, be a half-hearted deflationism.

9 Whole-Hearted Deflationism

Half-hearted deflationism gets rid of entities but not of the sentences which carry the appearance of commitment to them. This is fine if the sentence was true from the outset and remains true once its apparent referents have been made to go away. Deflation is whole-hearted when the sentences up for treatment are false and yet can be made to go away without collateral damage to theories in which they occur. Half-hearted fictionalist deflation gets rid of entities. Whole-hearted fictionalist deflation gets rid of falsehoods. Let's consider this now.

It is natural to see in the infinitely remote falsehoods of model based science a connection to a family of problems surrounding a theory's theoretical sentences, sentences that lie strictly beyond the reach of the observable. One of philosophy's standing worries is whether theoretical sentences have any epistemically defensible place in empirical science. One solution is to get rid of a theory's theoretical sentences without damage to its observational power—in other words, to defeat the presumption of indispensability. Two of the better-known examples of this approach involve Ramsey sentences and the Craig elimination theorem.[41] Both these contributions raise technical matters requiring a certain adroitness of

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[39] See Quine [46], pp. 67–72. Quine writes at p. 69: "It was the recognition of this semantic primacy of sentences that gave us contextual definition. I attribute […] this to Bentham."

[40] Bentham [47].

[41] Ramsey [48]. Craig [49–51]. See also his [52].

exposition and analysis. But we can make do with brief informal sketches that give their gist.

Beginning with Ramsey, suppose that the vocabulary of a theory contains the name "neutrino" and that many of its theorems describe the properties that neutrinos possess. Let Φ be a neutrino sentence ascribing property F. Then a Ramsey sentence with respect to Φ and F arises from Φ by replacement of "neutrino" with an individual variable and application of the existential quantifier. Whereas Φ purported to say that neutrinos have property F, the Ramsey sentence says that property F is possessed by something. Thus, the Ramsey sentence is topic-neutral, whereas Φ is committed to an unobservable entity.

There is a similar basis to Craig's elimination theorem. Suppose we divided the terms of a scientific theory into observational terms o and theoretical terms t. Then if there exists a logistic system S which formalizes the theory and the theory gives a set of purely o-consequences, then there is also a system S^o containing only o-terms that gives those same o-consequences.

One might think that either way, Ramsey's or Craig's, the problem of falsehood-indispensability for science is now solved, that whole-hearted deflationism is the way to go. If, for example, the falsity of the sentence "Populations are infinitely large" arises from the fact that "population" is a theoretical term purporting to denote a theoretical entity, then the fact that the population genetics can get on with its job without the term, or its putative denotatum, removes the ground for the complaint that the theory is indissolubly wedded to a falsehood. This gives us two alternatives to consider -the falsehood-indispensibility problem is solved in one or both of these ways, or it is not. If not, that is the end of the matter. It remains unsolved even if we call the denotata of t-terms fictions. But if the problem is solved, then the problem is *solved*. There is no need to invoke fictions.[42] Fictions would be surplus to need.

We can generalize on such cases. The trouble that contextual elimination gives to the fictionalist is that, although truth preserving, it is not *falsity removing*. Since our present problems pivot on the infinite falsities of model based science, surely the sensible course would be to search for an equivalence which, under the requisite constraints, mapped those falsities to truths. Let L be a sensory language—a language of how things appear. Let M and M* be two models of a scientific theory, M containing the theory's idealizations and abstractions and M* entirely free of such. Then M and M* are elementarily equivalent with respect to L just in case they satisfy the same sentences of L. For the problems currently in view, why

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[42] Apart from their potential as indispensable-falsehood solutions, Ramsey and Craig eliminations are faced with internal difficulties. If, for example, we Ramseyized an entire theory, except for its logical particles, then Löwenheim-Skolem considerations would now apply and with them, some would say, the loss of the theory's scientific content. As for Craig's claim that the o-consequences are invariant under the transition from S to S^o, there is no effective way of producing these o-consequences in the first place without the aid of t-terms. So, there is an important sense in which the transformation doesn't cancel t-term dependencies.

wouldn't the prudent course be to search for an equivalence with respect to L that deflated a model based theory's M in favour of an equivalent M*?

Of course, there is always the question of whether such an equivalence can be found or convincingly presented. That is a matter of some moment for those who want to replace a theory's load-bearing falsities with sentences not thus stricken. For our purposes, however, it is not a pressing issue. For either such equivalences are convincingly available or they are not. If they are, there is no problem occasioned by a theory's ineliminable falsities, hence no problem to be solved or even influenced by the attribution of fictionality. If, on the other hand, the sought for equivalences aren't convincingly available, the falsities of the theory stay ineliminably in place, and the invocation of fictionality does nothing to deflate them. This gives us a third lesson to consider.

Lesson 3: Whole-hearted deflationary measures for infinitely false idealizations dispossess fictionalism of a coherent rationale.

10 Dyadicizing Truth

Against this it could always be proposed that there is indeed a coherent rationale for fictionalizing the remote falsities of science. Virtually everyone agrees that the sentences of a story are false (or anyhow not true), and yet a good many insist that they are also true. The inconsistency that looms in so saying is disarmed by a plea of ambiguity. "Holmes lived in Baker Street" is false in actuality but true in the story. Indeed it would seem that the central task of a theory of truth for fiction is to sort out the details of this dyadicization of truth—truth in actuality and truth in fiction. Why, it might be wondered, couldn't we exercise this same option for model based science? Why couldn't we find a sensible basis for distinguishing truth in actuality from truth in a model (or truth in a theory)? And why couldn't an account of truth in models be expected to yield to the pull of a theory of truth in fiction? It is an interesting suggestion, raising more questions than there is space for here. Even so, it strikes me that one particular difficulty stands out. It is that no literary semanticist thinks that fictional truth cancels actual falsity, that it deflates it. In making it true in the story that Holmes lived in Baker Street, Doyle never intended to override its actual falsity. Doyle was not trying to add to London's population without, so to speak, benefit of clergy. The same applies to truth in a model. If it is false on the ground that populations are infinitely large, it is a falsity undisturbed by the truth in the model of its negation. Truth in a model doesn't wipe out falsity in the world. Neither does truth in a model cancel the difficulties occasioned by falsity in the world. Accordingly,

Lesson 4: Avoid the truth-dyadicization strategy.

11 Inflationary Fictionalism

Deflationism is an approving response to Ockham's injunction not to multiply entities beyond necessity. Inflationism pulls in the opposite direction. It is an approving response to the admonition to multiply entities as may be needed. Examples abound, not the least of which are the nonconservative extensions of logic and mathematics. Inflationary manoeuvres add to a theory items it previously lacked—a new axiom, a new transformation rule, an abstraction or idealization that alters the theoretical landscape in some significant way, and so on. It can now be appreciated that the magnetic pull thesis embodies a strong approval of inflationism in model based science. If Xs are modelled as Ys then, as the thesis attests, a theory of Ys will exert a magnetic pull on a theory of Xs. If Xs are modelled as fictions, a theory of X should yield to the pull of what a theory of fiction calls for. Fictions, as described in that theory, should be given honest work to do in the theory of Xs. Fictions should inflate the theory of Xs to its advantage. The magnetic tug thesis says that inflating a model based theory of science with fictions, without the guidance of a theory of fictions, is inflation to no good end. It is an inflation that adds no value.

I have already said that fictionalists about science hardly ever pay for their fictional inflations with a theory of fictions, although most of the comparatively few who do try to pay their dues by harnassing the literary theory of Kendall Walton. Whatever the merits of Walton's pretense theory,[43] this is very much the right way of proceeding. That is to say, it is the right way of proceeding if fictionalism itself is the right way to proceed.

But it isn't, as witness now Bentham's treatment of *legal* fictions.

12 Detonation

I said that Bentham's fictions intersect with our present interests in three ways. The first two have to do with the primacy of sentences over terms and the paraphrastic eliminability of terms without damage to truth. The third way is something quite different. Fictions in this third sense arise from the view that legal facts are fictions, for example, the legal fiction that corporations are persons. This, says Bentham, is a fact generated by social policy, in particular, by the desire that corporations be subject to the laws of tort. Legal fictions are made distinctive by virtue of the fact that they are created and given force by the human will and are maintained by society's determination to be governed by them as if they were the real thing.

At first blush, we might well suppose that legal fictions are an attractive inflationary possibility for outsourcing fictionalists. Perhaps their most agreeable

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[43] Reservations are advanced in my "Fictions and their logics".

feature is that legal fictions are stipulated into being in accordance with their inventors' overarching interests. In the legal case, those interests are the requirements of justice broadly speaking. In the scientific cases, it will matter whether or not the inclusion of a fiction has the effect of fictionalizing the whole theory in which it has been placed. On the legal side, the answer is in the affirmative. Decisions that consummate legal proceedings issue forth in legal facts (the legal fact that the accused is guilty, the legal fact that damages are owed, and so on). But no one seriously supposes that a legal fact always has a counterpart actual fact.[44]

This is an important feature of legal fictions. Legal fictions are subject to what we might call "the semantic integration property". Legal facts combine with real facts to produce further facts. It is a legal fact, even if not an actual one, that the Acme Bank is a person. It is an actual fact that office-holders of the Acme Bank defrauded its clients. So it is a further fact that the person that the Acme Bank is owes damages to its clients. On Bentham's understanding, there is an additional feature to take note of. In semantic integration contexts, the property of legal facthood is passed on to dependent facts. The fact that the bank owes damages to its clients is a legal fact even if (for metaphysical reasons) it couldn't be an actual fact. Accordingly,

> *Dependency distribution*: A characteristic of Bentham's legal fictions is that the fictionality property is distributed to dependent sentences in semantic integration contexts.

Because legal fictions have the dependency distribution property, they provide an affirmative answer to a detonation question of its own. It is the question of how widely spread is the legal fiction property in semantic integration contexts. Bentham's answer (and I think the right one) is that it is utterly contagious in those contexts. It detonates there. It is striking that the detonation property is not peculiar to legal fictions. It holds of them then not because of their legality but rather because of their fictionality. It is fictional fact that Holmes is a man and a real fact that men have oesophaguses. So it is a fictional fact, not a real one, that Holmes has an oesophagus. It is a fictional fact that Holmes lives in London and an actual fact that London is in England. So it is also a fact that Holmes lived in England, not an actual fact but a fictional one.[45]

The dependency distribution property causes literary fictionality to detonate in semantic integration contexts. If the infinitely remote idealizations of model based science were fictions, they too would have a dependency distribution problem. The property of infinite falsity would denote in semantic integration contexts. An empirically intended model based theory T is just such a context. False sentences combine with true sentences in ways that instantiate $T \vdash O_i$. If the infinitely remote

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[44] This is especially true of criminal cases at common law. Acquittals constitute the legal fact of innocence. But legal innocence significantly outpaces actual innocence. This is deliberate. It arises from a social policy designed to minimize wrongful convictions. Better a false acquittal than a false conviction.

[45] Unless, of course, Doyle provides otherwise. Either way, these are fictional facts, not real ones.

falsehoods ineliminably embedded in T detonated there, the dependent O_i would themselves be forlornly false, and T could not imaginably fulfill the conditions required for empirical adequacy.

This is a setback for the fictionalist project in science. Fictions detonate and infinite falsehoods don't. So infinite falsehoods can't be fictions. This gives us the sought-after property that fulfills our Q-strategy. It does so in a way that also executes the pre-emption strategy. No full-bore logic of fiction is needed to recognize that fictions detonate in semantic integration contexts.

In a way, the detonation question for forlorn falsehoods was a trick question. It is a logical commonplace that, unlike truth, falsity is not preserved under consequence. How surprising can it be, then, that when $T \vdash O_i$ holds, the falsity embedded in T is not passed on to the O_i? The very fact of T's empirical adequacy precludes the detonation of its falsities. It is precisely here that fictionality's explosiveness achieves a grip. Since detonation is not a problem for falsely tinctured Ts, fictions are not required to fix it. Yet if fictions were called into play, they would *create* a denotation problem for T, and would guarantee that it could not be solved. For, again, detonation precludes empirical adequacy.

I take this to be a serious discouragement of the fictionalist programme for science, and it bears in an interesting way on the grounding question. If the O_i of an empirically adequate T are underivable in the absence of T's infinitely remote falsehoods, then T's connection to those O_i cannot be grounding. T cannot be said to have demonstrated those consequences or to have provided a reason that supports them. This is a puzzle. But suppose, now, that fictions were called into play with a view to solving it. Then T wouldn't be empirically adequate. (Fictionality detonates.) The grounding question asks how T can be empirically adequate if it doesn't lend grounding support to the O_i in virtue of which this is so. But if fictions are let loose here, the empirical adequacy of T is lost. The grounding question wouldn't arise.

I don't want to end this section without some mention of Vaihinger. Vaihinger's *The Philosophy of "As If"* is a work of importance whose neglect is something to regret, and whose repair is beyond what I have space for here. Vaihinger's enthusiasm for fictions is striking and, one might think, excessive. It is sometimes hard to see how anything manages not to be a fiction of some or other Vaihingerian sort. There are ten different types of them, some admitting of subtypes. It is not easy to capture what lies in common among so aggressive a variety, but one thing is clear. Vaihinger seems to think—although not in these words—that fictions have the dependency distribution property, that the property of fictionality detonates in semantic integration contexts. Vaihinger is an unapologetic instrumentalist.[46] Theoretical science may serve us well or badly, but a scientific theory is never true even when good.

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[46] See again Fine's "Fictionalism" and Bonevac's "Fictionalism", Sect. 3.4.

13 Non-empirically Intended Theories

So far I have concentrated on empirically intended theories designed for experimental test, where a favourable test confers empirical adequacy. Not all theories are empirically intended. They are theories for which empirical adequacy isn't an intelligible goal. Think here of highly idealized normative theories in the manner of Bayesian treatments of belief revision or classical approaches to rational decision. The idealizations advanced by such theories—for example, that a rational agent will close his beliefs under consequence—are advanced in the certain knowledge of empirical discomportment with them. They don't describe how an actual reasoner actually reasons, but rather how an actual reasoner *should* reason or what he should try to approximate to in his reasoning. By far the hardest philosophical problem for model based normative theories is establishing the normative authority of its idealizations.[47] But what matters for us here is that it is widely thought that these theories are often successful and, when they are, they owe nothing of their success to an empirical adequacy they don't even seek. This raises a problem for my negative thesis, that is, for the claim that fictionality's detonation property wipes out all prospects of empirical adequacy. If a theory is a normative theory, how can it matter that fictionality has the detonation property? Detonation kills empirical adequacy, but empirical adequacy is not what good normative theories require or aspire to. Wouldn't this mean that there could be a place for fictionalism in normative models of belief revision, decision and the like?

No. Unlike empirically adequate theories in which the property of empirically infinite falsity doesn't detonate, in normatively idealized theories the property of empirical falsity *does* detonate. But here the detonation is (thought to be) compensated for by the normative authority of those derived falsehoods. Like all theories, a normative theory lives by its results. Theories generate conclusions intended for acceptance. We might schematize their structural arrangement as $T \vdash N_i$, where as before T is the theory, $\vdash$ is a consequence relation and the N_i are, with a certain contextual flexibility, T's "theorems". We take it as given that T's descriptively false normative idealizations are essential to the derivation of its theorems. Like the original idealizations, the theorems of T play a twofold role. They are descriptions of the behaviour of ideally rational agents, and they are not necessarily achievable norms for actual agents, for beings like us. Any theorem of T which depends on an idealized norm will itself take on that same normative texture. (Oughts in, oughts out.)

Suppose now that we exercised the fictionality option. In any serious application of them, fictions are made up. In literary cases they are created by authors. In scientific cases they are created by theorists, by modellers. There are few absurdities that won't be embraced by some philosopher or other. But the idea that the ideals of rationality are both normatively authoritative for you and me and anyone else who treads this planet, and yet free for the modeller's stipulation, is an idea

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[47] See here Gabbay and Woods [53], See also Woods [54], Chap. 8.

that scarcely bears thinking about. Eddington is famous for saying that theories are put up jobs.[48] Of course, this was a joke. Eddington knew better than most that what you put a physical theory up to has to be paid for at the empirical checkout counter. Equally, no matter their stipulations, all the classical approaches to the normative modelling of rationality readily acknowledge that the bill for the makings up have to be paid somewhere. At a minimum, the model's idealizations would have to be descriptively adequate for ideally rational agency and thereby—it was supposed—normatively authoritative as a matter of objective fact for real-life reasoning or some plausible approximation of it. The fictionalization of the theory's theorems wipes out all prospect of meeting these objectives. One cannot make it descriptively accurate of ideal agency that belief is closed under consequence by putting on one's modelling hat and simply saying that it is. It is one thing to say that *in the model* ideal rationality is such-and-such. It is another thing entirely to say that the model is an accurate descriptor of perfect rationality. If fictionalization makes descriptive adequacy in idealized as regards real-life rationality an unachievable goal, so likewise it forecloses upon normative legitimacy in actual contexts. So we have learned another lesson.

> *Lesson* 5: If T is a normatively idealized theory, fictions undo its claims to normative authority.

14 Abductive Fictionalism

Disciplined and reflective thinking about science doesn't by any means always take the form of theories, whether syntactically or semantically construed. A shorter way of saying this is that not all exercises in scientific reasoning take the form, once completed, of structures such as $T \vdash O_i$. Most scientists are seized of the provisionality of even their most empirically well-favoured theories. Most scientists know that, whatever other properties it possesses $\vdash$ is not a relation of monotonic consequence. Our best theories to date lie exposed to the potential for damage occasioned by new information consistent with the original premises but which, when added to them, snaps the $\vdash$-relation. On the other hand, some scientific reasoning is provisional in a much deeper way. It is reasoning of a kind that generates hypotheses for subsequent empirical test. Such reasoning has a broadly abductive character, discussed briefly by Aristotle under the name *apagogē*, translated as *abduction*. But it is to Peirce that we owe the modern invocation of it. In the best known of his scattered remarks on the subject, Peirce writes of abduction as follows:

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[48] I owe the attribution to Quine in [55].

The surprising fact C is observed. But if A were true, C would be a matter of course. Hence there is reason to suspect that A is true.[49]

It is easy to see the Peirce's schema falls well short of a robust definition of abduction. For one thing, the schema embeds notions whose meanings, although intuitively familiar, are not precisely clear—"surprise", "matter of course", "reason to suspect". Even so, the schema gives unmistakable instruction about some of abduction's defining features, instruction which is reinforced in further passages of Peirce's work.[50] Peirce thinks that abduction is a form of guessing, and that a successful abduction provides no grounds for believing the abduced proposition to be true.[51] Rather than believing them, the proper thing to do with abduced hypotheses is to send them off to experimental trial.[52] Also important is that the connection between the abductive hypothesis and the observed fact is formulated subjunctively.[53] Similarly, the inference drawn from this subjunctive conditional is not that the abduced hypothesis is true but only that there is reason to suspect that it might be, and might be in a way that makes it a plausible candidate for empirical testing.[54]

Abduction is guessing. The most interesting epistemological fact about guessing is how good we are at it. It is the same way with abduction. We are good at it too. Perhaps the second most interesting epistemological fact about abductive guessing is how little is known of what enables us to be good at it. This is especially so when it comes to sorting out the conditions under which we shrink indefinitely large spaces of possible hypotheses to the one (or the few) that make the abductive cut. When, in his quest for a unified treatment of the laws of black body radiation, Planck thought up the quantum hypothesis, it was a proposition for which there wasn't a shred of antecedent evidence and none at all adduced by its presence as antecedent in the subjunctive conditional on which its provisional conjecture was based. Planck thought that the very idea of the quantum was bereft of physical meaning.

It is no condition on abductive adequacy that abduced hypotheses turn out well at experimental trial. There are more things whose truth was a reasonable thing to conjecture than actually turn out to be true. When Le Verrier conjectured the planet Vulcan he did so on the strength of the entirely defensible subjunctive conditional that if there were a heretofore undiscovered planet in that part of the heavens, Mercury's orbital perturbations would indeed be "a matter of course".

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[49] Peirce [56], 5.189.

[50] For a recent analysis of Peircean abduction, see Woods [57]. This is a refinement and correction of an earlier treatment in Gabbay and Woods [58]. Also important are Aliseda [59], and Magnani [60]. An earlier treatment is Lipton's [61].

[51] Peirce [62].

[52] *Collected Papers*, 5.99; 6.49-6, 473; 7.202–219.

[53] *Collected Papers,* 5.189.

[54] *Collected Papers*, 5.189.

That was a sensible abduction at the time, notwithstanding that in the end it didn't pan out experimentally.

In some sense, the quantum hypothesis was down to Planck. Planck was the one who thought it up. Planck was the one who selected it for provisional engagement in a suitably adjusted physics. Some philosophers might see in these involvements a case for fictionalism. For aren't the sentences of fiction also down to their authors? Aren't the sentences of fiction the product of the author's thinking up, and of his own selection? When Conan Doyle thought up *The Hound of the Baskervilles* wasn't he imagining how things might have gone on the moors of western England in those years?

We have seen this point before. It is true that those and other similarities exist. But, again, what improvement in our understanding of physics would be achieved by calling the quantum hypothesis a fiction? It is well understood that if H is a working hypothesis in a theory, it is there on sufferance. It is on sufferance until such time that it earns its keep or is experimentally discredited. When the quantum hypothesis eventually paid off, it ceased being a hypothesis. Fictions aren't like this. Stories are not set-ups for subsequent experimental trial. That Holmes lived at 221B Baker Street is a fiction whose experimental test is entirely unmotivated and wholly untouched by a negative result if one were actually performed. Hypotheses are abduced. This is not the way in which fictions arise. How Doyle contrived Holmes' residency may not be entirely clear in all its details, but finding for "Holmes lived in Baker Street" a place as antecedent in a true subjunctive conditional of requisite abductive force is clearly not how it was done. This gives us a further lesson to draw:

Lesson 6: Abduced hypotheses aren't fictions.

15 Explanationist Fictionalism[55]

Some people think that Holmes was a psychopath. That I think is rather harsh, but let it pass. Suppose that Holmes *was* a psychopath and that this is a feature to which Doyle paid some attention. Suppose that some further Holmes stories have recently been discovered. In them Holmes' dark side is given careful and detailed scrutiny. It is possible, is it not, that in the story Doyle gives a plausible-seeming diagnostic account of his creation's affliction, an account in which hypotheses H_1 and H_2 play a role? (Doyle was himself a medical doctor.) Might not a reader of the stories seize upon these hypotheses and subject them to a scrutiny which his laboratory at King's College Hospital makes available to him? Couldn't such investigations turn out well for H_1 and H_2? Of course. Why then couldn't we say

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[55] For explanationist fictionalism, see the three papers of Part III of Suarez [48] and the references therein: Elgin [63], Bokulich [64], and Morrison [65]. See also Bukulich [30].

that those stories served as hypotheses generators, hypotheses which, as it turned out, are true of the world?[56]

Yes, they did, but with a difference. Stories are subject to an anti-closed world presumption. Except where the author provides otherwise, the world of a story is the *world*. Stories would lack readers were this not so. Holmes lived in London. If the London in which Holmes resides bore no resemblance, except author-declared ones, to London, Holmes would be swallowed up in a swamp of indeterminacy, losing thereby any conceivable interest for even the most compliant reader. Holmes was a man. If the man that Holmes was bore no resemblance, except author-declared ones, to how men actually are, this stifling indeterminacy recurs. We are put, so to speak, in a state of massive amnesia with respect to Holmes. Who could possibly care about a man who neither has nor lacks an oesophagus, and most of humanity's other parts? What use to us, thanks to the author's failure to pronounce on it, is a man who neither had nor lacked a mother or who lives at no specific distance from Berkeley Square? Indeed, I daresay that there are some people whose knowledge of Late-Victorian and Edwardian London derives entirely from the Holmes stories of that period.[57]

It is true that novels can give us knowledge of the world. But a certain caution is now called for. Doyle's stories can't make it true *in the world* that *Holmes*' dark side is explained by the hypotheses in question. The diagnosis that is accurate for Holmes in the story is accurate for us in the world. Even so, that H_1 and H_2 work for Holmes is not sufficient reason to think that they work of us. If it turns out that they do work for us, it will not have been because they did the same for Holmes in the story. Doyle's stories make those hypotheses true of Holmes, not of us. Still, those hypotheses are available to us if we want them, just by reading the story. No one in his right mind would pay those hypotheses the slightest mind if the anti-closed world assumption for fiction weren't true. In the stories, the hypotheses turned out to be explanatory for Holmes under the conditions of life and cir-cumstance his world placed him in. But auctorially contrived exceptions aside, Holmes' world is our world as it was then. It would be entirely surprising if what turns out to have been the case in Holmes' world weren't in most instances what turned out to be the case here. More particularly, any true generalization about men and about the London of the day will be instantiated by Holmes in default of Dole's provisions to the contrary.

Stories of this sort have a sort of explanatory value. What explains Holmes' darkness in the story explains our darkness in the here and now. Stories can be instructive in these ways. Scientific theories frequently exhibit this same virtue. Their goodness lies in the clarity that their explanations effect. It is sometimes supposed that such resemblances are sufficient cause to ascribe the fictional

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[56] A real-world example: Freud made a psychoanalytic investigation of the character of *Gradiva*: *A Pompean Fantasy,* a novella by Wilhelm Jensen.

[57] Next to Dickens, no important writer reveals London's social complexities and physical textures better than Doyle.

character of explanatorily instructive stories to scientific theories possessing this same explanatory character. Upon reflection, however, there is nothing to be said for the idea. The theories that have caught the eye of fictionalists owe their explanatory force to the ineliminable presence of falsehoods. It is this combination of falsity and indispensability that attracts the attribution of fictionality. But the explanatory value of the diagnosis that pivots on H_1 and H_2 owes nothing whatever to any falsehood, notwithstanding their occurrences in Doyle's stories and their diagnostic success there. It is true in the story that they work for Holmes and true in the world that they work for us. The sentence "H_1 and H_2 explain such and so symptoms" is true in the story and true in the world. But "H_1 and H_2 explain Holmes' symptoms" is true in the story and false in reality. Its falsity in reality is occasioned by its reference to Holmes. It is not occasioned by the falsity of the diagnosis. The anti-closed world assumption being what it is, what might be true is that the stories played a causally stimulating role in getting our real world scientist thinking seriously enough about H_1 and H_2 to run his own laboratory tests. But there is nothing in the procedural manuals of experimental science that requires or leaves room for the recording of these causal provocations.[58] So, then, another lesson:

> *Lesson* 7: If T is an explanatory theory, fictions have no constructive role there.

16 Suppressing Detonation

In the matter of highly idealized but empirically successful science, the Q that I claim to have found is that the property of fictionality distribute to dependent sentences, that fictionality detonates in semantic integration contexts. If this is so, Q is indeed a deal-breaker for the fictionalization of empirically adequate model based science. For if the property of empirical forlorn falsehood detonated in such theories, the observational consequences on which empirical adequacy depends would themselves be forlornly false, hence as far from truth as it is empirically possible to be. If the detonation property for fiction is indeed the Q that I seek, fictionalism is finished for empirically adequate idealized theories. It is stunning setback, both principled and cheaply attained. Perhaps this will strike some readers as too quick (and too easy) by half.

Certainly there are theorists of fiction who are not all disposed to accept the detonation property. There are different sources of this disinclination. One is the attachment shown by Meinongeans and some others to the idea that fictional objects are inherently and widely incomplete and, accordingly, that most sentences about them are without truth value (that is, are neither true nor false in the story). A

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[58] Recall August Kekulé's vision of the chemical structure of benzene, occasioned in the hallucinatory grip of *delirium tremens.*

second source of this scepticism is a more general dissatisfaction with the anti-closed world assumption. The assumption assumes that most of what is true of a real entity of a given type will also be true of a fictional entity of that same type. If the assumption fails, the radical incompleteness thesis reasserts itself. A third reason to query the detonation claim arises from the truth-dyadicity thesis. Let's schematize "true in fiction" as $\mathbf{f}$ and "true in actuality" as $\mathbf{a}$. There arise at once questions about the closure properties of sentences $\ulcorner\mathbf{f}(\Phi)\urcorner$, $\ulcorner\mathbf{f}(\chi)\urcorner$, $\mathbf{a}(\chi)$, and so on. A related matter is the extent to which $\mathbf{f}$ and $\mathbf{a}$ distribute through the truth functional connectives. A case in point: $\ulcorner\mathbf{f}(\Phi)\urcorner$ and $\ulcorner\mathbf{a}(\sim\Phi)\urcorner$ might be all right separately. But, dialetheicists apart, everyone agrees that we can't have $\ulcorner\mathbf{a}(\Phi \wedge \sim\Phi)\urcorner$, for any Φ, and some writers won't allow $\ulcorner\mathbf{f}(\Phi \wedge \sim\Phi)\urcorner$ either.[59] These uncertainties stimulate a readiness to crimp closure conditions for $\mathbf{f}$-sentences and, even more aggressively for admixtures of $\mathbf{f}$-sentences and $\mathbf{a}$-sentences. The impact of these foreclosures range from a much reduced capacity for semantic integration to outright exclusion of it.

Perhaps these reservations are a seemly caution. Certainly there is no room here for dogmatism. But it would be wrong to think that the elimination of semantic integration contexts for fiction gives to philosophers of science of fictionalist bent cause to rejoice. It is quite true that if fictional sentences don't semantically integrate with real-world sentences, or do so only in some sternly crimped way, fictionality won't detonate in semantic integration contexts or will do so only to a sternly crimped degree. One way to block detonation is to block semantic integration. It is also true that semantic integration is essential for empirically adequate theoretical science. But semantic integration is not *sufficient* for a property's detonation. Whether a property detonates in a semantic integration context depends on which property it is. As we have seen, fictionality does and infinitely remote falsity doesn't. Whatever else we might say of it, a highly idealized but empirically adequate theory T is a semantic integration context. It is a semantic integration context in which the property of infinitely false idealization doesn't detonate. If semantic integration weren't an available context for fiction, it couldn't be true that the fictionality property detonates in semantic integration contexts. Whereupon, we have it that if infinitely false idealizations were fictions, T could not be a semantic integration context. But if that were so, T would lack the observational consequences on which its empirical adequacy depends.

On the other hand if fiction admitted of semantic integration under only tightly restricted conditions, there would be limited occasion for detonation of the fictionality property. Even this is too much for fictionalism to bear. If the idealizations of $T \vdash O_i$ were fictions, then in any circumstances in which part of T were a semantic integration context, infinitely remote falsity would distribute to the dependent O_i, wrecking their contribution to empirical adequacy. As for T's further parts, the parts that aren't semantic integration contexts, O_i couldn't be derived save from T's antecedently available observational sentences. In that case,

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[59] Perhaps the most rigorous opponent of fictionally true inconsistencies is Lewis, in [66].

T's empirically verified observational consequences could reflect no dependency on the idealizations of T. Accordingly,

> *Lesson* 8: There is no relief for fictionalism in crimping T's semantic integration status.

17 A Brief Concluding Word

From early on I have recommended that the fictionalism question for science be handled without a large involvement in the logic of fiction. It has been satisfying to see that this is an achievable objective. Part of my disinclination to rely over-much on literary semantics is that the logic of fiction is surprisingly difficult, and the state in which we presently find it is riven by fundamental and dug-in disagreements. The contemporary record contains work of considerable ingenuity and sophistication. But the advice to avoid unnecessary work proved to be sensible and happily fulfillable.

It is no part of what I have been proposing here, still less of what I believe, that the literary semantics project be abandoned, that we capitulate to its difficulty and its captiousness. Fiction remains a standing, if as yet unresolved, challenge to a philosophically adequate semantics for natural language. To abandon it now would be intellectual dereliction. Even so, the fictionalist question for science requires neither its settlement nor its engagement.

It is possible, even so that actually contrary to what I have been saying here my Q-strategy and my pre-emption strategy haven't worked. It is possible that there is no Q that knocks scientific fictionalism out of the box. It is possible that there is such a Q but that it can be properly excavated only in a full-bore logic of fiction. Or it may be that fictionalism is true and that a true theory of fiction is somewhere to be had. But again, I ask, why would one look for it in the precincts of literary semantics? If a logic of fiction were necessary for implementing the requirements of the magnetic pull thesis for fictionalism in science, why wouldn't it serve us better to build one from the ground up?

Appendix

Present-day theories of literary fictions reflect sharply different ways of cutting the cake. Here are two of them, made possible by subscription to or rejection of the following pair of assumptions:

> *Parmenides' Law*. Quantification and reference are existentially loaded. There is nothing that doesn't exist. It is not possible to refer to what isn't.
>
> *The Non-existence Postulate*. The purported objects and events of fiction do not exist. No object is a fictional object. No event is a fictional event.

It is doubtful that any philosophical claim could divide considered judgement more deeply than these two. Certainly they are, in their intractability, no improvement on the divisiveness occasioned by realism-antirealism wrangles in science or anywhere else. Why, then, for our philosophical anxieties about science, would we seek succor in the realist-antirealist war zones occasioned by the Law and the Postulate? Desperate times call for desperate measures, but isn't this going too far?

> A further point on which literary semanticists are divided is
>
> *Frege's Dismissal*. Since literature doesn't matter for science, a literary semantics would be of only marginal interest.[60]

In a rough and ready way, the first two of these clashing standpoints motivate the (incomplete) sample below, with the third somewhat orthogonal to them as in a second grouping, also just a sample.[61]

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[60] "On *Sinn* and *Bedeutung*" translated by Max Black, in Michael Beaney editor *The Frege Reader*, pages 151-171, Oxford: Blackwell, 1997; p. 157. In "On denoting", Russell too gives fictional sentences the brush-off. They are, he says, sometimes true in a "secondary sense", without pausing to say what this sense might be. Strawson displays a similar casualness. In [67], he allows that sentences in *Pickwick Papers* are about Mr. Pickwick only in some (wholly unexplained) sense of "about".

[61] An excellent survey is Howell's "Literary fictions, real and unreal", in *Fictions and Models*, pages 27-107.

List One

Pro the law and the postulate	Contra the law and the postulate
Sayso semantics.[62]	Meinongean theories[63]
Pretense theories[64]	Existence-neutral logics[65]
Frege-Russell theories[66]	Artifactual theories[67]
Free logics[68]	Fictional worlds theories[69]
Theories of substitutional quantification[70]	

List Two

Pro Frege's dismissal	Con Frege's dismissal
Free logics	Sayso semantics
Frege-Russell theories	Meinongean theories
Strawson's "On Referring"	Pretense theories
	Artifactual theories
	Fictional worlds theories

There is in these multiplicities fair warning. As we have it now, the state of play in the logics of literary fictions give uncertain guidance to the realist-antirealist debate in science, or elsewhere. It is a conflicted matter in the philosophy of science. It is a conflicted matter in the philosophy of literature. So where in the philosophy of literature is the payoff for the philosophy of science?

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[62] *The Logic of Fiction*, and "Fictions and their Logics".

[63] Richard Routley, *Exploring Meinong's Jungle and Beyond*, Canberra: Research School of Social Sciences, Australian National University, 1980, Parsons, *Nonexistent Objects,* 1980, and Jacquette, *A Meinongean Logic,* 1996, and Nicholas Griffin, "Through the Woods to Meinong's jungle", in Kent A peacock and Andrew D. Irvine, editors, *Mistakes of Reason: Essays in Honour of John Woods,* pages 15-32, Toronto: University of Toronto Press, 2005.

[64] Walton, *Mimesis as Make-Believe,* and David Lewis, "Truth in fiction".

[65] Routley [68] and Woods, *The Logic of Fiction*.

[66] Frege, "On *Sinn* and *Bedeutung*", Russell, "On denoting" and *An Introduction to Mathematical Philosophy.*London: Allen and Unwin, 1967. First published in 1919.

[67] Thomasson [69], and "Fiction, existence and indeterminacy", in Woods, *Fictions and Models*, and Juan Redmond, *Logique Dynamique de la Fiction: Pour un Approche Dialogique,* London: College Press, 2012.

[68] Lambert [70–72]. van Fraassen [73, 74], Burge [75], and Sainsbury [76].

[69] Woltersdorf [77], and Pavel [78].

[70] *The Logic of Fiction.*

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