

# Recent literature on the metaphysics of grounding

Jönne Speck

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The following is a focused survey on five recent papers, that all deal with groundedness in a metaphysical framework. On one hand, this means that they discuss how the relation of grounding may be used to answer metaphysical questions. A prime example is Fine's 2001 paper. On the other hand, they examine the notion by standards of contemporary metaphysics. For example, principles of grounding are proposed on the basis of a reflective equilibrium between intuitions and desired applications.

My interest in this literature is specific. I am interested in grounding because I want to defend certain foundational theories as grounded. Accordingly, I hope to find that what philosophers discuss under this label, proves to be a robust notion of sufficient precision that provides the philosophical justification I am looking for.

My goal is a unified and philosophically attractive response to both the class-theoretic and the semantic paradoxes. Therefore, I look for a notion of sufficient generality to apply to a range of different cases.

Finally, if it is to be used as a treatment of paradox, grounding itself better be a coherent notion. In this respect, another paper by Fine (2010) poses quite a challenge.

## 1 Fine (2001) Question of Realism

Fine offers grounding as a general tool to discuss realist positions. This offer is motivated from a discussion of how the dispute is usually phrased. Thus, Fine's notion of groundedness is embedded into a wider metaphysical project.

Fine points out that the anti-realist must account for the felicity of ordinary existence claims, since otherwise her position collapses into skepticism. Hence, the anti-realist needs to distinguish between two conceptions of reality. According to the *ordinary* conception, there are, say, prime numbers between 2 and 6. But, the anti-realist holds, this is not really the case. On the proper *metaphysical* conception, namely, there are no numbers.

This metaphysical reality has been understood in two different ways.

If realism about a proposition  $\phi$  is understood in the *factual* sense, the realist holds that  $|\phi|$  is true or false in virtue of how the world is like.<sup>1</sup> Conversely, anti-realism is the view that  $|\phi|$  does not state any fact. As examples Fine lists expressivism in meta-ethics, formalism about mathematics and instrumentalism about science. In short, if reality is understood the fundamental way, anti-realism about  $|\phi|$  says that  $|\phi|$  fails to ‘perspicuously represent the facts’ (p. 3).

The alternative understanding of metaphysical reality is to think of it as the fundament to which can be reduced what is said to be real in a merely ordinary manner. Thus, anti-realism about  $|\phi|$  is the view that  $|\phi|$  is not fundamental but reduces to different propositions, whereas the realist holds that  $|\phi|$  itself is irreducible. Prominent anti-realist positions in this sense are the view that that mathematical statements reduce to logic (*logicism*), and naturalism about ethics, according to which ethical truths reduce to facts about the physical domain.

Fine now argues in considerable detail that neither reading of anti-realism is intelligible. For the present purpose, I need not follow his discussion too closely. Eventually, Fine explains why any attempt to define reality in terms of factuality or reduction is bound to fail. Anti-realism, namely, is supposed to be compatible with ordinary discourse. More generally, non-skeptical anti-realism needs to be compatible with any non-metaphysical statements. Consequently, it must not be formulated in any non-metaphysical terms.

The problem remains: Instead of distinguishing between metaphysical and ordinary reality, now we need to separate metaphysical from merely ordinary *facts*. Fine suggests that this is just as hard.

This insight gives rise to *quietism* (p. 12): as the question of realism cannot be

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<sup>1</sup>In the literature I am dealing with, propositions, facts and sentences are referred to in various ways.

I will anticipate a notation introduced in Fine’s 2011 (p. 12 below).

- ‘ $[\phi]$ ’ denotes the fact that  $\phi$  - ‘ $|\phi|$ ’ denotes the proposition that  $\phi$  - ‘ $\ulcorner\phi\urcorner$ ’ denotes the sentence, well,  $\ulcorner\phi\urcorner$

discussed but in purely metaphysical terminology, it is a pointless endeavour. Fine sets out to fend off this view. Equally well, he argues, we may explain the independence of realism from the substantial but *unique* nature of the issue.

Nonetheless, the quietist challenge persists as a methodological problem.

Even if realism can be discussed in terms of meaningful, although metaphysical, notions, it remains obscure how any dispute about these notions could be settled. Since the question of realism is supposed to be independent of ordinary statements, any notions involved in its discussion themselves show this independence. Consequently, whether they apply to a given case or not, cannot be settled on the basis of statements of ordinary discourse, on which realist and anti-realist could agree.

It is this methodological problem that Fine sets out to solve in the remainder of his paper. Accordingly, Fine's goal is to provide a general, purely metaphysical way of adjudicating between realist and anti-realist positions. It is here that the notion of ground is put to work.

Fine does not offer grounding as a criterion for factuality respectively reducibility. Instead, metaphysical reality is taken as a primitive concept. However, whether certain discourse reflects metaphysical reality (the questions of realism about this discourse) "turns on" questions in terms of grounding. This relation of one question turning on another is weaker than that of one question being explicated in terms of the other. It is a methodological relation

Fine paraphrases the grounding relation as follows. The propositions  $|\phi|$ ,  $|\psi|$  collectively ground the proposition  $|\chi|$  if its being the case that  $\chi$  consists in nothing more than its being the case that  $\phi$  and  $\psi$ . A *partly* grounds  $|\chi|$  if  $|\phi|$  is one of the propositions that collectively ground  $|\psi|$ .

Grounding is a relation between propositions. Fine distinguishes it from other such relations that are usually taken to bear on the question of realism.

First, Fine notes that the grounding relation is more liberal than that of reduction.

A statement of reduction implies the unreality of what is reduced, but a statement of ground does not (p. 15).

Grounding statements do not have 'anti-realist import' (p. ). Therefore, the realist and the anti-realist may agree on grounding statements. It is this feature that renders the notion a device to adjudicate between both positions.

Second, whether or not  $\phi$  grounds  $\psi$  is independent of their logical relation —  $\phi$  need not *analyze*  $\psi$ . Logical analysis is a linguistic matter, whereas grounding is of essentially metaphysical nature (p. 15).

Third, if  $\phi$  grounds  $\psi$ ,  $\phi$  is a way of accounting for  $\psi$ . In fact, grounding is a special kind of explanation. If  $\phi$  grounds  $\psi$  then  $\phi$  is the *ultimate* explanation for  $\psi$ . Later, Fine puts it this way:  $\phi$  explains  $\psi$  in the ‘... most metaphysically satisfying manner...’ (p. 22).

Thus, Fine’s notion of grounding seems stricter than that of Correia (see below) and other philosophers [Rosen, 2010], who use the term as a synonym for ‘holds in virtue of’.

Fine also notes that the statement “The fact that  $\phi$  grounds the fact that  $\psi$ ” does not, contrary to first appearance, commit to facts or a substantial notion of truth. The grounding relation may equally well be expressed by the simple “ $\psi$  because  $\phi$ ”. Unfortunately, Fine does not elaborate on this deflationary conception of grounding. It is not clear to me how thin the notion really can be in view of the heavy metaphysical work that Fine puts it to.

How can this notion of ground be used to adjudicate between the realist and the anti-realist? In section 6 of his paper, Fine shows that the realist about  $|\phi|$  and the anti-realist disagree about the grounds of this proposition.

More relevant for the present purpose are Fine’s methodological remarks from section 7, as to how disagreement about grounding relations is settled.

First, Fine attributes to philosophers reliable intuitions about matters of groundedness.

Further evidence for a statement of the form ‘ $|\phi|$  grounds  $|\psi|$ ’ can be found in the candidate ground  $|\phi|$  itself. This is because grounds are explanations, in fact explanations of superior character, and as such can be identified by their ‘... simplicity, breadth, coherence, or non-circularity’. Since such aspects are good evidence,  $|\phi|$  is a good candidate for a ground to the extent that it is a good explanation. Therefore, grounding claims should be assessed according to standards of explanatoriness. Explanatoriness, however, should be assessed in context. Accordingly, questions of grounding cannot be properly answered in isolation but only in context.

Notice that in sum, Fine takes groundedness facts to have an a priori status.

## 2 Batchelor 2010 ‘Grounds and consequences’

For Batchelor (2010), grounding is relation between facts, that holds independent of epistemological considerations. Accordingly, for him the canonical statement of grounding is

‘The fact that  $\phi$  grounds the fact that  $\psi$ ’

and ‘ $\psi$  because  $\phi$ ’ a mere paraphrasis.

On Batchelor’s view, grounding takes a position between related, but merely empirical or merely logical relations.

On one hand, grounding is not restricted to the spatio-temporal. It makes perfect sense to talk about the grounds for, say, mathematical facts. This is how grounding differs from causation, and it is in this sense that Batchelor calls grounding a *logical* relation. An interesting question that is left open by these remarks is whether causation is a special, empirical case of grounding.

On the other hand, Batchelor distinguishes between grounding and mere implication. Grounding is the stricter relation. If the fact that  $\phi$  grounds the fact that  $\psi$  then  $[\phi]$  implies  $[\psi]$ . However, grounding is not necessary for implication. For example, ‘ $\phi \wedge \psi$ ’ implies each conjunct, but the fact that  $\phi$  and  $\psi$  does not ground  $\phi$  nor  $\psi$ . What differs grounding from implication is its asymmetry.<sup>2</sup>

Batchelor notes that Bolzano (1837) was the first to examine the grounding relation, and anticipated many ideas of the contemporary discussion. Different from Bolzano, however, Batchelor sets out to define grounding. This definition is based on a classification of situations. A situation either obtains, in which case it is a fact, or it does not and is a mere *counter-fact*.

Batchelor sketches a hierarchy of factual and counter-factual situations. At its base, mereologically simple properties and individuals constitute *atomic* situations, some of which are atomic facts.

Complex situations are built up from what Batchelor calls ‘factuality-functions’. First, there is negation, which maps facts to counter-facts and vice versa. The atomic facts and their negations Batchelor calls the ‘elementary facts’. Second, conjunction maps the situation that  $\phi$  and the situation that  $\psi$  to the situation that  $\phi$  and  $\psi$ .

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<sup>2</sup>Batchelor speaks of anti-symmetry. However, he explicitly rejects the grounding relation to be reflexive (p. 70, second paragraph).

On this basis, now, Batchelor defines the relation of immediate grounding as follows.

- Elementary facts don't have any immediate grounds.
- A conjunctive fact is immediately grounded by any of its conjuncts.
- A fact of the form  $[\neg\neg\phi]$  has only one immediate ground:  $[\phi]$ .
- The negation of a conjunctive fact is immediately grounded by any negation of a conjunct.

Notice that Batchelor's immediate grounding is what Fine calls 'partial' ground.

The grounds of a fact are its immediate grounds but also those facts that are linked to it through a chain of immediate grounds. In other words, the relation of grounding is defined as the ancestral of immediate grounding. This setting allows Batchelor to define a number of useful notions.

First, a fact is a *mediate* ground of another if there is a chain of immediate grounds between them of length greater than 1. Second, the *ultimate* ground of some fact is one that itself has no further ground. Ultimate grounds all are elementary facts. Finally, Batchelor identifies certain families of the grounds of a given fact. Some grounds of  $[\phi]$  are *sufficient*, on one hand, if their conjunction implies  $[\phi]$ . The *complete* grounds of  $[\phi]$ , on the other hand, are simply all of them.

Having defined grounding and these auxiliary notions, Batchelor notes that

(...) all these notions of grounding concern, as we may say, not the grounds of the being of facts, but rather the grounds of their factuality (p. 70).

Presumably, Batchelor refers to the circumstance that his definition implies any grounded situation to be a fact.<sup>3</sup>

What the definition presupposes, however, is the hierarchy of facts. It involves a different sense of groundedness, which Batchelor calls 'ontic': it is the sense in which the fact that  $\neg\phi$  is grounded in its constituents, negation and the fact that  $\phi$ . An ordinary, 'factive' ground is a constituent, for example  $[\phi]$  is also an ontic ground of the

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<sup>3</sup>Assume that  $[\phi]$  immediately grounds  $[\psi]$ , and  $[\psi]$  is a counter-fact. Then  $[\psi] = [\neg\neg\phi]$ , in which case  $[\phi]$  is a counter-fact, too. Similar reasoning applies to the cases of  $[\psi]$  having other forms. By induction we get that the elementary facts don't obtain, which is a contradiction.

conjunction  $[\phi \wedge \psi]$ . The converse does not hold, however, since a constituent may not even be a fact, for example the factuality-function  $\wedge$ .

(I skip Batchelor’s remarks on pure necessity. For one, I don’t find them overly lucid. Also, they do not seem to bear on his conception of grounding.)

In the third section of the paper, Batchelor elaborates on his earlier observation that grounding ensures implication, but not vice versa. If  $[\phi]$  grounds  $[\psi]$  then  $[\phi]$  implies  $[\psi]$ , which validates the inference of  $[\psi]$  from  $[\phi]$ . Thus, groundedness facts give rise to a system of proofs. These *canonical* proofs, as Batchelor calls them, reflect the grounding relations between facts.

## 2.1 Questions

- Does Batchelor’s note (p. 71) that even necessary facts are grounded on contingent facts relate to Maudlin’s idea that even tautological truth is grounded in truth of boundary sentences [Maudlin, 2004]?

## 3 Audi (forthcoming) ‘A Clarification and Defense of the Notion of Grounding’

In his unpublished ‘Clarification and Defense of the Notion of Grounding’, Paul Audi not only develops his own account of grounding but gives an original argument for the legitimacy, indeed indispensability, of the notion.

Audi, too, takes grounding to be irreflexive, asymmetric and transitive, although for different reasons than Fine and Batchelor.

Recall that Batchelor, in addition to the grounding relation on facts, also speaks of *ontic* groundedness of individuals and properties on their *constituents* (see above). Audi, now, draws a sharp distinction between grounding and constituency. This allows him to characterize grounding on the basis of property theory (see below). However, it also separates grounding from ontological dependence, and differs Audi’s notion from how the term is used elsewhere in the literature [Rosen, 2010].

Audi ties grounding closely to how *properties* are related among each other. The fact that  $Fa$  grounds the fact that  $Gb$  only if the properties  $F$  and  $G$  are *essentially connected* (p. 10). Audi hastens to add that this terminology is not meant to be committed to a “thick” account of essence. All he requires is that

$$\forall x(Fx \rightarrow Gx) \text{ (p. 4)}$$

However, he assumes that which properties are essentially connected is a matter of necessity; it does not vary, so to speak, across worlds.

$$\Box \forall x(Fx \rightarrow Gx)$$

Audi derives that whether the condition on grounding holds, too, is a necessary matter.

Finally, Audi argues that grounding is not preserved by conjunction. If the fact that  $\phi$  grounds the fact that  $\psi$ , the fact that  $\phi$  and  $\chi$  may still fail to be a ground of  $\psi$  (Audi calls this *non-monotonicity*).

In sum, Audi's understanding of grounding adds aspects to its conception in Fine or Batchelor. Audi's notion is therefore stricter than that of Fine or Batchelor. Also, he takes more seriously the challenge of justifying the notion.

His main argument is from the explanatory force of grounding statements. Fine, too, uses this idea to justify his use of grounding (see above). But Audi develops it into an explicit argument.

The fact that  $\phi$  explains the fact that  $\psi$  can be used to explain the fact that  $\psi$  only if the first determines the latter. By 'determines' Audi simply means that the one fact 'makes it the case' that  $\psi$ . It is for this reason that *causes* are satisfactory explanations. However, Audi argues, many good explanations cannot be taken to state causation. He gives several examples, all of which I find convincing, and concludes that there is non-causal determination: grounding.

Later in his paper (§7) Audi turns to the interesting question as to how grounding differs from reduction. He considers this to be an important difference. In fact, Audi argues that reducibility does not even imply groundedness, since reduction implies identity, grounding, however, is irreflexive.

In a footnote (fn 56), Audi states that his partial grounding is a derivative notion, defined in terms of total grounding: the fact that  $\phi$  *partially* grounds the fact that  $\psi$  if the fact that  $\phi$  is one of the facts that ground the fact that  $\psi$ .

### 3.1 Questions

- Could Audi's notion play the methodological role Fine wants grounding to play?
- Audi understands grounding from the essential connection of the properties involved. Does this imply that if  $[Fa]$  grounds  $[Ga]$  then necessarily so? What more



is required of essential connection than  $\forall x(Fx \rightarrow Gx)$ ? More precisely, isn't this sufficient for grounding? In which case the grounding statement is equivalent to a necessity, hence necessary itself.

- Is there a weaker, yet relevant sense of reducibility on which groundedness does imply reducibility?

## 4 Correia 2011 'Grounding and truth-functions'

In this paper, Correia develops a formal theory of facts and grounding that answers to the metaphysical notion as discussed by the other authors, too.

He considers the definition of grounding in modal terms, but in view of criticism in the literature [Audi, , Correia, 2005, Rosen, 2010] follows a different route. Correia develops an axiom system for a primitive grounding relation.

A basic assumption of Correia's is that grounding is expressed in any of the following forms:

1. The fact that  $\phi$  is grounded in the fact that  $\psi$ , the fact that  $\chi$ , ... .
2.  $\phi$  in virtue of the fact that  $\psi$ , the fact that  $\chi$  ...
3.  $\phi$  because  $\psi$ ,  $\chi$ , ...
4. the fact that  $\phi$  is explained by the fact that  $\psi$ , the fact that  $\chi$ ,...

Correia distinguishes between two views on the logical form of grounding statements. On the *predicational* view, the basic form of grounding statements is (1). On the *operational* view, the logical form of grounding is captured by statements like (3), and grounding expressed by the sentential operator 'because'.

Recall at this point that Fine (2001) endorsed the operational view because it incurs less commitments (see p. 4 above). Correia takes the same stance.

Correia's grounding relation is many-one. This means, its left-hand side takes a plural term. As indicated by the canonical statements (1) to (4), a grounded fact has usually more than one ground. Moreover, Correia is clear that plural reference to facts cannot be reduced to singular reference to a conjunctive fact, since this would contradict the

irreflexivity of the notion.<sup>4</sup>

Thus, Correia's grounding relation is *total*, different from Batchelor's *partial* grounding (p. 6 above), but in line with Audi's theory (p. 8).

Correia points out that the predicational view, according to which the logical form of grounding statements is (1), leads to the question for the truth-conditions of statements 'the fact that  $\phi$  is the fact that  $\psi$ '

As this issue, however, is not directly relevant for my present concern I move on to Correia's formal theory of grounding. It is a classical first order system extended by propositional quantifiers. However, Correia does not allow for *plural* quantification over facts, despite his commitment to grounding as a many-one relation.

Further, Correia defines two relations:

1. The fact that  $\psi$  is the disjunction of some fact equivalent with  $\phi$  (' $\phi \geq^d \psi$ ').
2. The fact that  $\psi$  is the conjunct of some fact equivalent to some disjunct of the fact that  $\phi$  (' $\phi \geq^{cd} \psi$ ').

On this basis, Correia proposes axioms for the primitive operator  $\mathcal{B}$  (read: 'because'). Interestingly, Correia prefers to have transitivity and asymmetry as theorems.

In §6, Correia provides bridge principles between grounding and propositional logic.

He points out that certain intuitive principles (t1–3) require a conceptualist account of facts, according to which the fact that  $\phi$  may not be identical with the fact that  $\psi$ . Other candidates, again, contradict the principle that

N\* It's not the case that  $\phi$  because  $\phi$  and  $\psi$ .

(N\*) follows from the transitivity and irreflexivity of grounding, on the assumption that  $\phi$  grounds  $\phi \wedge \psi$ . Correia does not say so, presumably because he does not want, at this point, to invoke this assumption which relates grounding to conjunction. Instead, he prefers to derive (N\*) from other bridge principles (see below).

Therefore, Correia eventually settles with the following bridge axioms.<sup>5</sup>

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<sup>4</sup>To see why, consider the truth that

the fact that  $\phi$  and  $\psi$  is grounded in the fact that  $\phi$  and the fact that  $\psi$ . If the plural term on the right hand side was reducible to singular reference to a conjunctive fact, we would obtain 'The fact that  $\phi$  and  $\psi$  is grounded in the fact that  $\phi$  and  $\psi$ '. This contradicts the assumption that grounding is irreflexive.

<sup>5</sup>In order to parse these axioms, recall that ' $\phi \not\geq^{cd} \psi$ ' means that the fact that  $\phi$  is no conjunct of any fact equivalent to some disjunct of the fact that  $\phi$ .

TF1 If  $\phi \not\equiv^{cd} (\psi \vee \phi)$  and  $\phi$  then ( $\phi$  or  $\psi$ ) because  $\phi$ .

TF2 If  $\phi \not\equiv^{cd} (\psi \wedge \phi)$  and  $\psi \not\equiv^{cd} (\phi \wedge \psi)$  and  $\phi$  as well as  $\psi$ , then ( $\phi$  and  $\psi$ ) because  $\phi$  and  $\psi$ .

In §6.3, then, Correia lists without further discussion the remaining bridge principles TF3 to TF6.

TF3 If  $\phi$  because  $\Delta$ , then ( $\phi$  or  $\psi$ ) because  $\Delta$ .

TF4 If  $\phi$  because  $\Delta$  and ( $\psi$  or  $\chi$ ), and  $\psi$ , then  $\phi$  because  $\Delta, \psi$ .

TF5 If  $\phi$  because  $\Delta$ , and  $\psi$  because  $\Gamma$ , then ( $\phi$  and  $\psi$ ) because  $\Delta, \Gamma$ .

TF6 If  $\phi$  because  $\Delta, (\psi$  and  $\chi)$ , then  $\phi$  because  $\Delta, \psi, \chi$ .

One more axiom is added to Correia's system. Despite its suggestive title, this *reduction* axiom does not answer to the intriguing question to which extent groundedness implies reducibility. It states that grounding has a 'disjunctive nature', in the sense that if the fact that  $\phi$  is grounded in the some facts  $\Delta$ ,  $\phi$  is equivalent to a disjunction, one of whose disjuncts is the conjunction of all these facts.

In the final section of his paper, Correia proves his theory complete with respect to certain algebras. Since he himself rejects the metaphysical picture drawn by these structures, I do not think this result to be of great philosophical significance.

## 5 Fine (2010) A Puzzle of Ground

In this paper, Fine aims to show that some principles of groundedness are inconsistent (with principles of logic). This inconsistency, however, is no reason to give up the notion of grounding. Instead, Fine argues, we need to find a balance between the logical principles involved and the principles of grounding.

In a nutshell, the paradox is derived as follows.

It's a fact that everything exists. This fact, call it  $f_0$ , is one thing that exists, so its existence contributes to making it the case that everything exists. So, everything exists *partly in virtue* of this fact's existing. Likewise, though,  $f_0$  exists in virtue of everything existing. So everything exists partly in virtue of everything existing. This can't be. It contradicts the irreflexivity of grounding.

Several substantial assumptions about grounding as well as logical principles are involved in this reasoning. Fine sets out to make them explicit. He defines a theory of the

primitive operator ‘<’, where ‘ $\phi < \psi$ ’ is to be read

It’s the case that  $\psi$  partly in virtue of its being the case that  $\phi$ .

Notice that Fines’ target notion is that of *partial* grounding, different from, but inter-definable with, the *total* conception as in Audi or Correia (see above).

As to the logic of his system, it is worth noting that Fine does not assume the law of excluded middle (‘LEM’), but two of its first order implications. These are the two statements which follow from the schematic formulation of LEM by universal respectively existential quantification.

Universal Middle  $\forall x(\phi(x) \vee \neg\phi(x))$

Particular Middle  $\exists x(\phi(x) \vee \neg\phi(x))$

Similarly, Fine does not assume self-identity, but the two principles that follow from it by universal and existential quantification.

Universal Existence  $\forall xEx$

Particular Existence  $\exists xEx$

Fine remarks that his logic of the conditional  $\rightarrow$  is weaker than classical, even minimal logical: he does not assume conditional proof. Unfortunately, he does not comment on the possibility of defining a classical conditional in terms of  $\neg$  and  $\vee$ .

To this logic, Fine adds term-forming operators ‘the fact that ...’ (abbreviated ‘ $[\phi]$ ’), ‘the proposition that ...’ (abbreviated ‘ $|\phi|$ ’) and ‘the sentence that ...’ (‘ $\ulcorner\phi\urcorner$ ’). The proposition- and sentence-terms behave in the expected way: any sentence has a name, and gives rise to a term denoting the corresponding proposition. The notion of fact underlying Fine’s system, however, is very broad, too, certainly more comprehensive than Audi’s (see above). Fine, namely, confines himself with a single, general rule for the fact-operator:  $\frac{\phi}{\exists f = [\phi]}$ . One important consequence of this is that Fine’s system licences existence-facts of the form  $[\exists x\phi(x)]$ .

Most of the axioms for  $<$  are in line with what other authors have assumed. The grounding relation is transitive, irreflexive and factive (p. 100). However, Fine does not assume  $<$  to be well-founded (Correia adds a non-circularity axiom to his system).

The substantial ground-theoretic assumptions, however, concern the interplay of  $<$  with the underlying logic and theory of facts.

Disjunctive Grounding  $\phi \rightarrow \phi < (\phi \vee \psi)$

Universal Grounding  $(\forall x\phi(x) \wedge Ey) \rightarrow \phi(y) < \forall x\phi(x)$

Existential Grounding  $\phi(y), E(y) \rightarrow \phi(y) < \exists\phi(x)$

According to Fine, these assumptions are motivated by the thought that any truth is grounded, in particular any truth expressed by a logically complex sentence. If this conviction is paired with the view that the classical truth-conditions reflect the grounds of complex truths the bridge principles above follow.

Fine suggests that the principles

Factual Grounding  $E(f) \wedge f = [\phi] \rightarrow \phi < E(f)$

Propositional Grounding  $T(p) \wedge p = |\phi| \rightarrow \phi < T(p)$

can be motivated similarly, to the extent that ‘ $E[\phi]$ ’ and ‘ $T(|\phi|)$ ’ are complex statements.

In section five of his paper, Fine derives the paradox within this system (p. 102), first in fact-theory, from the assumption that everything exists, then for propositions, from Universal Middle, and finally again for facts, this time from the assumption that something exists.

Then, he turns to explore possible solution routes.

Fine argues that it would not help to retract to a notion of intransitive, because *immediate* ground, since the contradiction could still be derived using its ancestral. More generally, a notion of ground that allows for circularity cannot account for the intuition that if  $\phi$  because  $\psi$ , then the fact that  $\phi$  provides a satisfactory explanation as to why  $\psi$ , or at least any such explanation of the fact that  $\phi$  can be extended to one of the fact that  $\psi$  (p. 105). Any notion of ground that answers to this intuition, however, will lead to the inconsistent reasoning.

Fine turns to objections against Factual Grounding.  $\phi$  may be true without there to be a fact  $\psi$ , since

1. truth does not require correspondence to a fact (thin notion of facts ), or
2. existence of  $[\phi]$  may be independent of whether  $\phi$  or not (thin notion of existence).

Fine reformulates the puzzle such that these moves do not help (p. 107). The usage of existence, namely, is not needed — equally well one may reason in terms of facts *obtaining*. This modification is straightforward for the particular version (the one based on the assumption ‘Something exists’ — now we use ‘Some fact obtains’). In the case of the argument based on the universal statement, the universal quantifier is restricted to facts that obtain.

Next, Fine considers the thought that Factual Grounding fails for the reason that  $\phi$  because of the fact that  $\phi$ , and not the other way around as suggested by the axiom.<sup>6</sup> This route may be found plausible, for example, on a truth-maker account.

Nonetheless, Fine rejects it, as it leads to a vicious regress of grounds (p. 107).

Fine concludes from his discussion that the following principles are not to be called in question:

- Factual Grounding
- Propositional Grounding
- Truth introduction

A possible route is the restriction of

- Factual Existence
- Propositional Existence

which Fine identifies with Russell's predicativism, and rejects, too.

The remaining principles, however, are all justified from classical logic, Fine argues. This link is obvious for the logical principles

- Universal Middle
- Particular Middle
- Universal Existence
- Particular Existence

but needs some motivation in the case of the grounding principles.

- Universal Grounding
- Existential Grounding
- Disjunctive Grounding

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<sup>6</sup>Keep in mind that grounding is irreflexive.

Fine claims that these are implicit in the classical truth-conditions (p. 108). I do not see, however, the order of justification here. Does Fine suggest that the classical truth-conditions are based on groundedness considerations? In this case, classical logic surely could not be used to justify the grounding principles. Or is it rather that the theory of ground is just a way of spelling out classical semantics? In this case, the puzzle of ground seems just another truth paradox.

At any rate, Fine infers that classical logic is ‘... in tension with itself’ (p. 108); whereby he must have in mind a broad understanding of logic that includes the metaphysical assumptions of factual and propositional grounding as well as a substantive fragment of truth theory.

Fine points out that one need not either abandon wholesale the logical principles or reject all of the grounding principles. A compromise is available. He suggest to weaken the principle of disjunctive grounding

$$\phi \rightarrow \phi < (\phi \vee \psi)$$

The underlying idea, Fine submits, is that a true disjunction is grounded in *one* of its disjuncts. The axiom, however, requires that if  $\phi$  as well as  $\psi$ , *both* facts ground the fact that  $\phi$  or  $\psi$ . It may therefore be replaced by the weaker principle

$$(\phi \vee \psi) \rightarrow [\phi < (\phi \vee \psi) \vee [\psi < (\phi \vee \psi)]]$$

Similar considerations motivate *weak existential grounding*:

$$\exists x\phi(x) \rightarrow \exists x[\phi(y) < \exists\phi(x)]$$

This modest weakening of the system prevents the Particular Arguments from going through. These weakened principles of ground are compatible with the axioms of particular existence and particular middle. However, they still do not allow for the assumption of universal existence and middle, and no similar move is available to suppress the Universal Argument.

In sum, Fine lists four responses to the puzzle of ground, none of which is fully satisfactory but each has its own advantages and disadvantages.

- Predicativism: Endorse all logical and ground-theoretic assumptions but reject factual and propositional existence.

- Compromise impredicativism: Weaken disjunctive and existential grounding and reject universal existence and middle.
- Extremist, logic-sceptical impredicativism: Reject principles of classical logic but endorse ground-theoretic assumptions.
- Extremist, ground-sceptical impredicativism: Reject ground-theoretic assumptions but endorse principles of classical logic.

In the final section of his paper, Fine draws an intriguing analogy between the three latter, impredicativist solution routes, and the truth theories of Kripke’s fixed point models based on strong and weak Kleene as well as supervaluationist logic. Fine proposes the following interpretation.

For any sentence  $\phi$  in the given fixed point, there is the fact that  $\phi$ . This fact now is taken to be grounded on the fact that  $\psi$  if the sentence ‘ $\phi$ ’ is derived from ‘ $\psi$ ’ by the respective rules *in an efficient manner*. This efficiency requirement says that the derivation must not involve repetitions or detours.

Thus, the grounding relation of a fixed point model depends on the rules sanctioned by the background logic. This is why truth theories based on weak Kleene, strong Kleene and supervaluationist logic validate different grounding principles, and correspond to different solution routes.

Fine explains that on this interpretation, the strong Kleene theory validates just those principles which are endorsed by the compromise impredicativist (pp. 113n).<sup>7</sup> Similar correspondence is found between the truth theory of weak Kleene logic and what I have dubbed the logic-sceptical impredicativist, and between the supervaluationist approach and the ground-sceptic.

## 5.1 Questions

Fine’s (2010) paper raises a pressing difficulty. If grounding itself is an incoherent notion, or at least incompatible with classical logic, it surely will not do the work I intend the notion to do: justifying classical responses to paradox.

- Does Fine’s notion of efficient derivation relate to mine of “calculation” without detour?

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<sup>7</sup>That is, all logical principles except for universal middle and universal existence, and the ground-theoretic assumptions except for disjunctive and existential grounding.



## 6 Future Work

The above survey is not comprehensive. More papers by other authors need to be considered.

- [Schaffer, 2009, Schaffer, ] Schaffer is said to have abandoned this project.
- [Horsten, 2009] According to Audi, Hofweber challenges the intelligibility of grounding notions.
- [Rosen, 2010]: This paper touches on many issues found in the literature above. In addition, Rosen considers in more detail the connection between grounding and reduction, and relates the notion to the problem of determination.

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