Morality and Mathematics: The Evolutionary Challenge*

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The Evolutionary Challenge for moral realism is, roughly, the challenge to explain our having many true moral beliefs, given that those beliefs are the products of evolutionary forces that would be indifferent to the moral truth. This challenge is widely thought not to apply to mathematical realism. In this article, I argue that it does. Along the way, I substantially clarify the Evolutionary Challenge, discuss its relation to more familiar epistemological challenges, and broach the problem of moral disagreement. I conclude that there may be no epistemological ground on which to be a moral antirealist and a mathematical realist.

It is commonly suggested that evolutionary considerations generate an epistemological challenge for moral realism. At first approximation, the challenge for the moral realist is to explain our having many true moral beliefs, given that those beliefs are the products of evolutionary forces that would be indifferent to the moral truth. An important question surrounding this challenge is the extent to which it generalizes. In particular, it is of interest whether the Evolutionary Challenge for moral realism is equally a challenge for mathematical realism. It is widely thought not to be. For example, Richard Joyce, one of the most prominent advocates of the Evolutionary Challenge, goes so far as to write, "the dialectic within which I am working here assumes that if an argument that moral beliefs are unjustified or false

* Thanks to Hartry Field, Thomas Nagel, Derek Parfit, Stephen Schiffer, and Sharon Street for extensive comments on multiple drafts of this article. Thanks to referees and editors at *Ethics* for generous and incisive criticism. Thanks to Ralf Bader, Max Barkhausen, David James Barnett, David Chalmers, Kit Fine, Laura Franklin-Hall, Don Garrett, Dale Jamieson, Brian Leiter, Matthew Liao, Colin Marshall, Japa Pallikkathayil, Elliot Paul, Jim Pryor, Jeff Sebo, Ted Sider, Jon Simon, Knut Olav Skarsaune, Folke Tersman, David Velleman, and audiences at Oxford and the 2011 Rutgers/NYU Epistemology Symposium for thoughtful feedback.

Ethics 122 (January 2012): 313–340

would by the same logic show that believing that 1 + 1 = 2 is unjustified or false, this would count as a *reductio ad absurdum*."[1] He assures the reader, "There is . . . evidence that the distinct genealogy of [mathematical] beliefs can be pushed right back into evolutionary history. Would the fact that we have such a genealogical explanation of . . . '1 + 1 = 2' serve to demonstrate that we are unjustified in holding it? Surely not, for we have no grasp of how this belief might have enhanced reproductive fitness independent of assuming its truth."[2] Similarly, Walter Sinnott-Armstrong writes, "The evolutionary explanations [of our having the moral beliefs that we have] work even if there are no moral facts at all. The same point could *not* be made about mathematical beliefs. People evolved to believe that 2 + 3 = 5, because they would not have survived if they had believed that 2 + 3 = 4, but the reason why they would not have survived then is that it is true that 2 + 3 = 5."[3] Finally, Roger Crisp writes, "In the case of mathematics, what is central is the contrast between practices or beliefs which develop because that is the way things are, and those that do not. The calculating rules developed as they did because [they] reflect mathematical truth. The functions of . . . morality, however, are to be understood in terms of well-being, and there seems no reason to think that had human nature involved, say, different motivations then different practices would not have emerged."[4]

In this article, I argue that such sentiments are mistaken. I argue that the Evolutionary Challenge for moral realism is equally a challenge for mathematical realism. Along the way, I substantially clarify the Evolutionary Challenge, discuss its relation to more familiar epistemological challenges, and broach the problem of moral disagreement. The article should be of interest to ethicists because it places pressure on anyone who rejects moral realism on the basis of the Evolutionary Challenge to reject mathematical realism as well. And the article should be of interest to philosophers of mathematics because it presents a new epistemological challenge for mathematical

1. Richard Joyce, *The Evolution of Morality* (Cambridge, MA: MIT Press, 2007), 182 n. 5.

2. Ibid., 182.

3. Walter Sinnott-Armstrong, *Moral Skepticisms* (Oxford: Oxford University Press, 2006), 46.

4. Roger Crisp, *Reasons and the Good* (Oxford: Clarendon, 2006), 17. In addition to Joyce, Sinnott-Armstrong, and Crisp, Gibbard, Pinker, and Sosa express sympathy for the view that we were evolutionarily selected to have true mathematical beliefs in Allan Gibbard, *Thinking How to Live* (Cambridge, MA: Harvard University Press, 2003); Stephen Pinker, *The Blank Slate: The Modern Denial of Human Nature* (New York: Penguin, 2002); and Ernest Sosa, "Reliability and the A Priori," in *Conceivability and Possibility*, ed. Tamar Szabo Gendler and John Hawthorne (Oxford: Oxford University Press, 2002), 369–84, respectively.

realism that bears no simple relation to Paul Benacerraf's familiar challenge.[5]

The article is organized as follows. In Section I, I clarify the target of the Evolutionary Challenge for moral realism and its mathematical analog, exposing parallels between realist and antirealist views in the two areas. In Section II, I substantially clarify the Evolutionary Challenge. I argue that the Evolutionary Challenge does not depend on the genealogical speculation that our moral beliefs actually are the products of evolutionary forces, though it does presuppose the intelligibility of the moral truths being very different. In Section III, I argue that the Evolutionary Challenge for moral realism is equally a challenge for mathematical realism under the assumption that it is intelligible to imagine the mathematical truths being very different. In Section IV, I argue that the (non-question-begging) reason to think that it is intelligible to imagine the moral truths being different serves equally to show that it is intelligible to imagine the mathematical truths being different. I conclude with the suggestion that there may be no epistemological ground on which to be a moral antirealist and a mathematical realist.

I. PRELIMINARIES: MORAL REALISM AND MATHEMATICAL REALISM

The Evolutionary Challenge for moral realism is, roughly, the challenge to explain our having many true moral beliefs, given that those beliefs are the products of evolutionary forces that would be indifferent to the moral truth. Before clarifying this challenge, I need to say a word about its target and the target of its mathematical analog. Intuitively, the target of the Evolutionary Challenge for moral realism or the Evolutionary Challenge for mathematical realism is the view that there is a mind-and-language-independent array of truths of the relevant sort to which our corresponding discourse answers when interpreted literally. In detail, where D is an area of discourse, the target of the Evolutionary Challenge for moral or mathematical realism is the conjunction of the moral or mathematical instances, respectively, of four schemas.

[D-TRUTH-APTNESS] Typical D-sentences are truth-apt.

If D is morality, then this implies the falsity of Ayer's emotivism, according to which moral sentences are used merely to express emo-

5. For more on the complicated relationship between what has come to be known as the "Benacerraf-Field Challenge" for mathematical realism and the Evolutionary Challenge, see chap. 3 of Justin Clarke-Doane, "Morality and Mathematics" (PhD diss., New York University, 2011).

tions.[6] Similarly, if D is mathematics, then this implies the falsity of Hilbert's formalism, according to which (nonfinitary) mathematical sentences are used merely to make moves in a game.[7] It does not imply the falsity of subtle forms of these views that incorporate a deflationary theory of truth.[8]

> [D-TRUTH] Some atomic or existentially quantified D-sentences are true.

If D is morality, then this implies the falsity of Mackie's error theory, and if D is mathematics, then this implies the falsity of Field's fictionalism.[9] Mackie's error theory is consistent with conditional claims about what is the case given that there are good things, bad things, obligatory things, and so forth. Similarly, Field's fictionalism is consistent with conditional claims about what is the case given that there are numbers, sets, tensors, and so on. Mackie's error theory and Field's fictionalism are inconsistent with claims that entail that there are any of these entities. Given that the relevant sentences should be interpreted literally, as Mackie and Field hold, it follows from D-TRUTH that there are good things, bad things, obligatory things, and so on in the case of morality, and numbers, sets, tensors, and so on in the case of mathematics. I will call a D-sentence *substantive* if, interpreted literally, it entails an existentially quantified D-sentence (for more on literal interpretation in the relevant sense, see D-LITERALNESS below).

> [D-INDEPENDENCE] The truth-values of D-sentences are relevantly independent of minds and languages.

If D is morality, then this implies the falsity of Korsgaard's constructivism, according to which (on one reading) the moral truths depend constitutively on what follows from a rational agent's practical point of view.[10] Similarly, if D is mathematics, then this implies the falsity of Brouwer's intuitionism, according to which (on one reading) the mathematical truths depend counterfactually on what mental con-

6. See A. J. Ayer, *Language, Truth, and Logic* (New York: Dover, 1936).

7. See David Hilbert, "Neubegründung der Mathematik: Erste Mitteilung," *Abhandlungen aus dem Seminar der Hamburgischen Universität* 1 (1922): 157–77, or "Die logischen Grundlagen der Mathematik," *Mathematische Annalen* 88 (1923): 151–65.

8. Examples of such views in the moral case include Simon Blackburn, *Ruling Passions* (Oxford: Oxford University Press, 1998); and Gibbard, *Thinking How to Live*.

9. See J. L. Mackie, *Ethics: Inventing Right and Wrong* (Harmondsworth: Penguin, 1977); or Hartry Field, *Science without Numbers* (Princeton, NJ: Princeton University Press, 1980), and *Realism, Mathematics, and Modality* (Oxford: Clarendon, 1989), respectively.

10. See Christine Korsgaard, *The Sources of Normativity* (New York: Cambridge University Press, 1996).

structions we could perform.[11] The qualifier "relevantly" covers any interesting causal, counterfactual, or constitutive dependence of the D-truths on minds or languages. For instance, whether a typical concrete particular person, action, or event satisfies a moral predicate obviously depends counterfactually on the existence of at least one mind (namely, the mind of at least one of the agents involved in the object predicated). But that is an uninteresting dependence. By contrast, it would be interesting if the truth of a typical substantive moral sentence depended on whether some person or group believed that sentence to be true. Whether a view is consistent with D-INDEPENDENCE will be clear in practice.

It is sometimes suggested by expounders of the Evolutionary Challenge for moral realism that the (moral instances of the) above three schemas suffice to generate that challenge.[12] But this is incorrect. The moral instance of at least one more schema must also be added.[13]

[D-LITERALNESS] D-sentences should be interpreted literally.

The key idea to D-LITERALNESS is that the truth conditions of D-sentences should be assumed to (roughly) mirror the syntax of D-sentences—that is, that reinterpretationist accounts of D-discourse are systematically false. For example, if D is morality, then this implies the falsity of (one reading of) Harman's relativism, according to which a typical moral sentence, 's', is really just shorthand for the claim that according to moral framework, M, s.[14] Similarly, if D is mathematics, then D-LITERALNESS implies the falsity of austere forms of if-thenism, according to which a typical mathematical sentence, 's', is really just shorthand for the claim that according to mathematical theory, M, s. (It is also inconsistent with any other view according to which all apparent talk of numbers, functions, sets, tensors, and so on is regarded

11. See L. E. J. Brouwer, *Intuitionisme en formalism* (Gronigen: Noordhoof, 1912).

12. See, e.g., Sharon Street, "A Darwinian Dilemma for Realist Theories of Value," *Philosophical Studies* 127 (2006): 109–66, and "Objectivity and Truth: You'd Better Rethink It," accessed July 29, 2011, http://homepages.nyu.edu/jrs477/Sharon%20Street%20-%20Objectivity%20and%20Truth.pdf.

13. Arguably, even one more schema must be added, according to which D-truths are "unique." This condition is hard to make precise and may turn out to be redundant. But it is meant to rule out views such as Mark Balaguer, "A Platonist Epistemology," *Synthese* 103 (1995): 303–25, and "Non-Uniqueness as a Non-Problem," *Philosophia Mathematica* 6 (1998): 63–84, according to which the D-universe is rich enough, and the semantics of D-discourse cooperative enough, that any "intuitively consistent" D-theory is automatically about the segment of the D-universe of which it is true (and there is always such a segment). This complication will be irrelevant in what follows.

14. See Gilbert Harman and Judith Jarvis Thomson, *Moral Relativism and Moral Objectivity* (Oxford: Blackwell, 1996).

as a systematically misleading way of speaking.)[15] Importantly, D-LITERALNESS is neutral as to the characteristic properties or objects of D-discourse. For instance, D-LITERALNESS is neutral as to the nature of moral properties (e.g., as to whether they are natural) and mathematical objects (e.g., as to whether they are all sets). Indeed, as far as D-LITERALNESS is concerned, the property of goodness could just be the property of being what one desires, and the number 2 could just be the left half of the earth. D-LITERALNESS is the minimal thesis that D-sentences should not be systematically reinterpreted as being, for example, only conditional claims about what follows from a given framework or theory.

D-LITERALNESS is not redundant in the presence of the earlier conditions because the truth values of reinterpreted D-sentences may be relevantly independent of minds and languages. For example, the truth values of sentences about what is true according to a given theory are presumably relevantly independent of minds and languages (given that the truth values sentences about what follows from what are so independent).

Let us call the conjunction of the above four schemas *D-realism*, and one who embraces it a *D-realist*. Then the target of the Evolutionary Challenge for moral realism is the conjunction of the moral instances of the above four schemas, and the target of the Evolutionary Challenge for mathematical realism is the conjunction of the mathematical instances of the above four schemas. In what follows, I will use "moral realism" and "mathematical realism" to mean the first conjunction and the second, respectively.

II. THE EVOLUTIONARY CHALLENGE FOR MORAL REALISM

Having clarified the target of the Evolutionary Challenge for moral realism and its mathematical analog, let me turn to the challenge itself. The Evolutionary Challenge for moral realism derives from the premise that our moral beliefs are the products of "non-truth-tracking" evolutionary forces. This is to say two things. First, it is to say that our moral beliefs are somehow the products of evolutionary forces. At one extreme, one might hold that we were actually selected to have certain moral beliefs. But this view is hard to take seriously. Among other things, moral beliefs seem to have too recent an origin to have been selected for. A more credible view is that we were selected to have cognitive mechanisms that entail dispositions to form certain primitive belief-like representations in certain environments. However

15. See Charles Chihara, *Constructability and Mathematical Existence* (Oxford: Oxford University Press, 1990); or Geoffrey Hellman, *Mathematics without Numbers* (Oxford: Oxford University Press, 1989).

exactly the credible view ought to be spelled out, the differences between it and the extreme view will be irrelevant for my purposes here.[16] I will, thus, mostly speak loosely of selection for belief in what follows.

The second claim that falls out of the premise that our moral beliefs are the products of "non-truth-tracking" evolutionary forces is that we were not selected to have true moral beliefs (or selected to have cognitive mechanisms that entail dispositions to form reliable primitive belief-like representations of moral states of affairs). But what does it mean to say that we were selected to have true moral beliefs? It does not merely mean that we were selected to have certain moral beliefs, and those beliefs are (actually) true. The latter claim could be true even if evolutionary forces were "indifferent" to the moral truths but "just happened to land" us on them "by chance."[17] The claim that we were selected to have true moral beliefs has counterfactual force. It implies that had the moral truths been very different, our moral beliefs would have been correspondingly different—that it would have benefited our ancestors to have correspondingly different moral beliefs. Accordingly, the key implication of the claim that we were not selected to have true moral beliefs is the negation of this counterfactual. If we were not selected to have true moral beliefs, then had the moral truths been very different, our moral beliefs would have been the same.[18] It still would have benefited our ancestors to have the same moral beliefs.[19]

It might be thought that the significance of the premise that our moral beliefs are the products of "non-truth-tracking" evolutionary forces could be expressed by a counterfactual that did not conditionalize on the moral truths being very different. Perhaps the significance of that premise is just Darwin's worry that had our lineage evolved to

16. See Street, "A Darwinian Dilemma for Realist Theories of Value"; or Joyce, *The Evolution of Morality*, for a discussion of these complications and their irrelevance to the epistemological issue to follow.

17. See the quote from Street below for this kind of metaphor.

18. Note that one way that the moral truths could be very different is by there being no substantive moral truths at all. In that case, "Torturing Mother Teresa for fun is wrong" would be false, and "It is not the case that torturing Mother Teresa for fun is wrong" would be true. See again the quote from Sinnott-Armstrong at n. 3 above. (Strictly speaking, the negation of the counterfactual that had the moral truths been very different, our moral beliefs would have been correspondingly different is weaker than the counterfactual that had the moral truths been very different, our moral beliefs would have been the same. But, as will be seen in the next section, the argument for the former depends on the latter. So, I ignore this complication here.)

19. For more on the connection between selection claims and counterfactuals, see Hartry Field, "Recent Debates about the A Priori," *Oxford Studies in Epistemology* 1 (2005): 69–88.

have a different social system, we would have come to have different moral beliefs. In particular, had "men [been] reared under precisely the same conditions as hive-bees" we would have come to believe that it is permissible for "unmarried females . . . to kill their brothers."[20] But unlike the counterfactual that had the moral truths been very different, our moral beliefs would have been the same, this counterfactual presents no obvious epistemological challenge. What matters is whether there is a possible scenario in which we come to have moral beliefs that are false in that scenario. Perhaps in the scenario that Darwin imagines it would have been permissible for unmarried females to kill their brothers. In order to argue that there is a possible scenario in which we come to have moral beliefs that are false in that scenario by means of a counterfactual that leaves the moral truths fixed, one would have to argue that we could have come to have very different explanatorily basic moral beliefs, such as that pain is good or that pleasure is bad. But such an argument would not be plausible. Prima facie, creatures who believed that pain is good and that pleasure is bad would be less successful at passing on their genes than creatures that believed the opposite.[21]

Before discussing how the above two claims might generate an epistemological challenge for moral realism, I need to discuss a complication regarding the second (the claim that we were not selected to have true moral beliefs). Moral realists typically allege that truths that link moral properties to "descriptive" ones are metaphysically necessary. If so, then it is not metaphysically possible for the moral truths to be very different while the descriptive truths are held fixed. But if the descriptive truths are not held fixed, then it is simply not true that had the moral truths been very different, our moral beliefs would have been the same—as the second of the above two claims implies.[22] Does not this show that the claim that our moral beliefs are the products of "non-truth-tracking" evolutionary forces is simply unintelligible given standard moral realism?

What it shows is that, if the Evolutionary Challenge is to have any interest, the modality invoked in the counterfactual that had the moral truths been very different, our moral beliefs would have been

20. Charles Darwin, *The Descent of Man* (New York: Appleton, 1871), 70.

21. Of course, in saying this, I am holding fixed the assumption that (something like) the "belief-desire" model of action is true. A very different—and self-consciously completely general—evolutionary challenge results from imagining scenarios in which this model fails in a radical way. See Alvin Plantinga, *Warrant and Proper Function* (New York: Oxford University Press, 1993), chap. 12.

22. For a canonical exposition of this point, see Nicholas Sturgeon, "Moral Explanations," in *Morality, Reason, and Truth: New Essays on the Foundations of Ethics*, ed. David Copp and David Zimmerman (Totowa, NJ: Rowman & Allanheld, 1985), 49–78.

the same, cannot be taken to be metaphysical possibility but must rather be taken to be something along the lines of conceptual possibility.[23] The claim must be that had—for all that we can intelligibly imagine—the moral truths been very different, our moral beliefs would have been the same. This kind of counterfactual does seem to have epistemological significance, even granted the metaphysical impossibility of the relevant antecedent. To illustrate, imagine a young child guessing the truth of recondite mathematical conjectures at random. Imagine, moreover, that her guesses turn out to be systematically correct. There is an obvious sense in which the forces generating the child's beliefs in this scenario were "non-truth-tracking," even given that her guesses were correct and that the relevant truths were metaphysically necessary. Even if it is not metaphysically possible that the relevant conjectures are false, it is intelligible to imagine that they are. And if—for all that we can intelligibly imagine—the relevant conjectures had been false, the child's beliefs would have been the same. This raises a prima facie puzzle: what is the explanation for the child's having so many true corresponding beliefs? It would be no answer to this puzzle to simply observe that the relevant conjectures are metaphysically necessary.[24]

With these clarifications in place, let me turn to the question of how the premise that our moral beliefs are the products of "non-truth-tracking" evolutionary forces might generate an epistemological challenge for moral realism. It is commonly suggested that this premise shows directly that the moral realist is committed to an "inexplicable coincidence."[25] Given that our moral beliefs concern a relevantly

23. Among advocates of the Evolutionary Challenge, only Sharon Street seems clearly to recognize this—if not in "A Darwinian Dilemma," at least in "Reply to Copp: Naturalism, Normativity, and the Varieties of Realism Worth Worrying About," *Philosophical Issues* 18 (2008): 207–28. See the first sentence in the quotation from "Reply to Copp" below. Apparently recognizing that the relevant counterfactual, construed metaphysically, would be problematic given the supervenience of moral properties on "natural" properties, Richard Joyce claims that the Evolutionary Challenge is a challenge for those moral realists who deny that moral properties supervene on "natural" properties (see chap. 6 of *The Evolution of Morality*). But there are virtually no such moral realists.

24. For arguments for the irrelevance of metaphysical possibility to epistemological questions like those to be considered here, see Field, "Realism, Mathematics, and Modality," in *Realism, Mathematics, and Modality* (Oxford: Blackwell, 1989), 227–39; Michael Huemer, *Ethical Intuitionism* (New York: Palgrave Macmillan, 2005), sec. 5.7; and Joshua Schechter, "The Reliability Challenge and the Epistemology of Logic," *Philosophical Perspectives* 24 (2010): 437–64. Of course, as Quine argued, the notion of conceptual possibility is obscure in important ways. But it is arguably indispensable.

25. For presentations of something like the Evolutionary Challenge thus conceived, see Gibbard, *Thinking How to Live*, sec. 13; Joshua Greene, "The Secret Joke of Kant's Soul," in *Moral Psychology*, vol. 3, *The Neuroscience of Morality: Emotion, Brain Disorders, and Development*, ed. Walter Sinnott-Armstrong (Cambridge, MA: MIT Press, 2008), 35–80; Paul

mind-and-language independent array of truths, and given that those beliefs are the products of "non-truth-tracking" forces, it is supposed to simply follow that it must be an inexplicable coincidence that many of those beliefs are true. Sharon Street is explicit: "As a purely conceptual matter . . . normative truths might be anything. . . . Noting this sense in which the normative truth might be anything, and noting the role of evolutionary forces in shaping the content of our basic evaluative tendencies, we may wonder whether . . . it somehow promoted reproductive success to grasp the independent normative truth, and so creatures with an ability to do so were selected for. Unfortunately for the realist . . . to explain why human beings tend to make the normative judgments that we do, we do not need to suppose that these judgments are *true*."[26] According to Street, it follows, "the realist must hold that an astonishing [inexplicable] coincidence took place—claiming that as a matter of sheer luck, evolutionary pressures affected our evaluative attitudes in such a way that they just happened to land on or near the true normative views among all the conceptually possible ones."[27]

Note that this conclusion is strictly consistent with moral realism. It is conceivable that there is no explanation of our having many true moral beliefs, though there is a relevantly mind-and-language independent array of truths to which those beliefs answer. Nevertheless, the conjunction of these positions is unstable. Any moral realist who is not agnostic about typical first-order moral questions believes that many of our moral beliefs are true. But a coincidence between many of our moral beliefs and an array of mind-and-language independent moral truths would be too striking to take as brute. Given moral realism, it should be possible, at least in principle, to explain our having

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Griffiths and John Wilkins, "When Do Evolutionary Explanations of Belief Debunk Belief?" (paper presented at Darwin in the 21st Century, South Bend, IN, November 2009); Huemer, *Ethical Intuitionism*, chap. 5 and sec. 8.6; Richard Joyce, *The Myth of Morality* (Cambridge: Cambridge University Press, 2002), and *The Evolution of Morality*; Guy Kahane, "Evolutionary Debunking Arguments," *Noûs* 45 (2011): 102–25; Neil Levy, "Cognitive Scientific Challenges to Morality," *Philosophical Psychology* 19 (2006): 567–87; Hallvard Lillehammer, "Debunking Morality: Evolutionary Naturalism and Moral Error Theory," *Biology and Philosophy* 18 (2003): 567–81; Michael Ruse, *Taking Darwin Seriously* (Oxford: Blackwell, 1986); Street, "A Darwinian Dilemma," and "Reply to Copp"; Folke Tersman, "The Reliability of Moral Intuitions: A Challenge from Neuroscience," *Australasian Journal of Philosophy* 86 (2008): 389–405; or Erik Wielenberg, "On the Evolutionary Debunking of Morality," *Ethics* 120 (2010): 441–64. See also Mackie, *Ethics*; and Robert Nozick, *Invariances: The Structure of the Objective World* (Cambridge, MA: Belknap Press, 2001).

26. Street, "Reply to Copp," 208.

27. Ibid. Street uses the word "coincidence" merely to mean *co-instance*. The substance of her conclusion is that there is no explanation of our having many true moral beliefs, given moral realism. See Street, "Objectivity and Truth." I have kept with Street's practice and use "coincidence" in this deflationary way.

many true moral beliefs. Our belief in moral realism would arguably be undermined to the extent that this seemed in principle impossible.[28]

Street's argument is doubtful. It seems to boil down to this. Even if it is not metaphysically possible for the moral truths to be very different, we can intelligibly imagine them being so different. But had—for all that we can intelligibly imagine—the moral truths been so different, it still would have benefited our ancestors to have the same moral beliefs. Thus, it could only be an "inexplicable coincidence" that the evolutionary forces which shaped our moral beliefs led us to the moral truth. But this seems too quick. It is commonly supposed to be intelligible to imagine relevantly uncontroversial truths being very different. For example, it is commonly supposed to be intelligible to imagine "common sense" object truths—that is, truths that link microscopic properties to macroscopic properties—being very different. But it seems that had—for all that we can intelligibly imagine—those truths been so different, it still would have benefited our ancestors to have the same common sense object beliefs. As Daniel Korman writes, "We would have believed that there were baseballs even if it were false that atoms arranged baseballwise compose baseballs."[29] And, yet, Street explicitly rejects the conclusion that there could be no explanation of our having many true common sense object beliefs.[30]

28. Note also that the conclusion that there is no explanation of our having many true moral beliefs is different from the conclusion that there is no explanation of our having many justified moral beliefs. In order to explain our having many justified moral beliefs, one might simply argue that our epistemically basic moral beliefs are obvious, or empirically supported, or "maximally coherent" with our overall worldview and then argue that our other moral beliefs mostly "follow" from those. However, such an argument would not suffice to explain our having many true moral beliefs. In order to use this argument to explain our having many true moral beliefs, one would need to explain the correlation between a moral belief's being obvious, empirically supported, or "maximally coherent" with our overall worldview, and that belief's being independently true. See "Introduction: Fictionalism, Epistemology and Modality," in Field, *Realism, Mathematics, and Modality*, 1–52, for an application of this distinction.

29. Daniel Korman, "Ordinary Objects," forthcoming in *Stanford Encyclopedia of Philosophy*, ed. Edward Zalta, http://plato.stanford.edu/entries/ordinary-objects/, accessed December 8, 2011. Korman is discussing Trenton Merricks, *Objects and Persons* (Oxford: Clarendon, 2001). See also Peter van Inwagen, *Material Beings* (Ithaca, NY: Cornell University Press, 1990).

30. See, e.g., Street, "Reply to Copp," 217. (Thanks to an anonymous referee for suggesting something like this example.) Another way to argue against Street is to simply point to an explanation of our having many true moral beliefs which the premise that our moral beliefs are the products of "non-truth-tracking" forces fails to rule out. For example, the premise that our moral beliefs are the products of "non-truth-tracking" evolutionary forces at least prima facie fails to rule out an explanation of our having many

However, while the premise that our moral beliefs are the products of "non-truth-tracking" evolutionary forces fails to establish, by itself, the conclusion that there is no explanation of our having many true moral beliefs, that premise does have two significant upshots that are relevant to this conclusion. First, it establishes that the moral realist cannot explain our having many true moral beliefs in terms of the hypothesis that we were selected to have true moral beliefs (or selected to have cognitive mechanisms that entail dispositions to form reliable representations of moral states of affairs). The relevant premise straightforwardly implies the negation of this hypothesis (since it amounts to the conjunction that we were selected to have certain moral beliefs but were not selected to have true such beliefs). Second, it at least prima facie establishes that the moral realist cannot explain our having many true moral beliefs in terms of the hypothesis that it is unintelligible to imagine the moral truths being very different. If it were unintelligible to imagine the moral truths being very different, then one could not argue that had the moral truths been very different, our moral beliefs would have been the same. This would not show that our moral beliefs are the products of "truth-tracking" evolutionary forces after all. In order to argue for that conclusion one would need to argue that had the moral truths been very different, our moral beliefs would have been correspondingly different. What it would seem to show is that there was simply no intelligible question as to whether our moral beliefs are the products of "truth-tracking" forces —be those forces evolutionary or otherwise.[31]

It is reasonably clear how the hypothesis that we were selected to have true moral beliefs would generate an explanation of our having many true moral beliefs. It would undercut the worry that had the moral truths been very different, our moral beliefs would have been the same. It would show that many of our moral beliefs would have been true in any intelligible moral circumstance. But how would the hypothesis that it is unintelligible to imagine the moral truths being very different generate an explanation of our having many true moral beliefs? Prima facie it would do this in a similar way—by undercutting the worry that had the moral truths been very different, our moral

true moral beliefs in the spirit of Christopher Peacocke, "How Are A Priori Truths Possible?" *European Journal of Philosophy* 1 (1993): 175–99. Such an explanation would contend that moral truths are a priori, and that, roughly, our a priori concepts are individuated in such a way as to make true our core beliefs involving those concepts.

31. It might be thought that the moral antirealist could simply argue that we need not assume the truth of our moral beliefs in the best evolutionary explanation of our coming to have them (and that this does not presuppose that it is intelligible to imagine those truths being very different). But this thought is confused, as I explain in Sec III.

beliefs would have been the same.[32] But whereas the hypothesis that we were selected to have true moral beliefs allows that there are very different intelligible moral circumstances, the hypothesis that it is unintelligible to imagine the moral truths being very different does not allow this. It says that the only intelligible moral circumstance is (more or less) the actual one. It, thus, reduces the task of showing that we would have had many true moral beliefs in any intelligible moral circumstance to the task of showing that we would have many true moral beliefs in the actual moral circumstance. And this task seems trivial given a (perhaps evolutionary) explanation of our having the moral beliefs that we have.

Let us call an explanation of our having many true D-beliefs in terms of the hypothesis that we were selected to have true D-beliefs an *evolutionary* explanation. And let us call an explanation of our having many true D-beliefs in terms of the hypothesis that it is unintelligible to imagine the D-truths being very different a *trivial* explanation. Then note that the conclusion that the moral realist cannot offer an evolutionary or a trivial explanation of our having many true moral beliefs does not after all depend on the genealogical speculation that our moral beliefs actually are the products of evolutionary forces. This conclusion follows from the mere conditional that if our moral beliefs were the products of evolutionary forces, then those forces would be "non-truth-tracking"—that is, that if we were selected to have certain moral beliefs at all, then we would not be selected to have true moral beliefs. The latter conditional shows that we were not selected to have true moral beliefs just as surely as the claim that our moral beliefs actually are the products of "non-truth-tracking" evolutionary forces. It also carries with it the conclusion that it is intelligible to imagine the moral truths being very different because it intuitively implies the counterfactual that if we were selected to have certain moral beliefs at all, and if the moral truths were very different, we still would have

32. In noting that these two explanations of our having many true moral beliefs block the worry that had the moral truths been very different, our moral beliefs would have been the same, I am not suggesting that any genuine explanation of our having many true moral beliefs would block this worry. For all that I have said, the "pre-established harmony" explanation that David Enoch puts forth in "The Epistemological Challenge to Metanormative Realism: How Best to Understand It, and How to Cope with It," *Philosophical Studies* 148 (2010): 413–38, should count as genuine (see also Karl Schafer, "Evolution and Normative Skepticism," *Australasian Journal of Philosophy* 88 [2010]: 471–88). As it happens, I am dubious of such explanations, but not because they fail to rule out the conceptual possibility of our moral beliefs being very different while our moral beliefs remain the same.

had the same moral beliefs.[33] The significance of this for what follows is that in order to argue that the mathematical realist cannot offer an evolutionary or a trivial explanation of our having many true mathematical beliefs, I will not need to argue that our mathematical beliefs actually are the products of evolutionary forces. I will merely need to argue that if they were the products of evolutionary forces, then those forces would be "non-truth-tracking."[34]

To sum up: the premise that our moral beliefs are the products of "non-truth-tracking" evolutionary forces establishes that there is no evolutionary or trivial explanation of our having many true moral beliefs—not that there is no explanation of this at all. Moreover, this premise can be weakened. The same thing follows from the merely conditional premise that if our moral beliefs were the products of evolutionary forces, then those forces would be "non-truth-tracking"—in tandem with what this premise intuitively presupposes, that it is intelligible to imagine the moral truths being very different. In what follows, I turn first to the question of whether the reasons to think that we would not be selected to have true moral beliefs show equally that we would not be selected to have true mathematical beliefs—under the assumption that it is intelligible to imagine the relevant

33. Indeed, even the conclusion that Street purports to establish—namely, that the moral realist cannot explain our having many true moral beliefs in any way—does not depend on the genealogical speculation that our moral beliefs actually are the products of evolutionary forces. In order to make her argument valid, Street would have to add the premise that there is no nonevolutionary and nontrivial explanation of our having many true moral beliefs. However, given this premise, the relevant conclusion follows from the mere conditional that if our moral beliefs were the products of evolutionary forces, then those forces would be "non-truth-tracking"—in tandem with what this conditional premise intuitively presupposes, that it is intelligible to imagine the moral truths being very different. (Of course, strictly speaking, the genealogical speculation puts additional constraints on any conceivable explanation of our having many true moral beliefs. But I know of no remotely plausible explanation of our having many true moral beliefs that is ruled out by the speculation that our moral beliefs actually are the products of "non-truth-tracking" evolutionary forces and that is not equally ruled out by the mere conditional that if our moral beliefs were the products of evolutionary forces, then those forces would be "non-truth-tracking.") This point is widely missed. See, e.g., William FitzPatrick, "Morality and Evolutionary Biology," forthcoming in *Stanford Encyclopedia of Philosophy*, http://plato.stanford.edu, accessed December 1, 2011; Huemer, *Ethical Intuitionism*, sec. 8.6; or Joyce, *The Evolution of Morality*.

34. I should note that I know of no advocate of the Evolutionary Challenge for moral realism who denies that our mathematical beliefs actually are the products of evolutionary forces. Indeed, as we will see in Sec. III, the standard argument that the Evolutionary Challenge for moral realism is not equally a challenge for mathematical realism explicitly depends on the assumption that our mathematical beliefs actually are the products of such forces. For relevant biological literature, see Brian Butterworth, *What Counts? How Every Brain Is Hardwired for Math* (New York: Free Press, 1999); or Stanislas Dehaene, *The Number Sense: How the Mind Creates Mathematics* (Oxford: Oxford University Press, 1997).

truths being very different. I then turn to the question of whether the reasons to think that it is intelligible to imagine the moral truths being very different show equally that it is intelligible to imagine the mathematical truths being very different.

III. THE MATHEMATICAL INDIFFERENCE OF EVOLUTION

What is the argument that we would not be selected to have true moral beliefs? It is that creatures with moral beliefs roughly like ours would have been more successful at passing on their genes even if the moral truths were very different (or, what comes to the same thing, even if their beliefs were mostly false). For instance, even if killing our offspring were morally good, it still seems that our ancestors who believed that killing our offspring is bad would have been more successful at passing on their genes. Their gene carriers would be less likely to die before passing on their genes in turn. Given that moral beliefs (or the relevant cognitive mechanisms) are heritable, it follows that had the moral truths been very different, our moral beliefs would have been the same. And, yet, if we had been selected to have true moral beliefs, then, had the moral truths been very different, our moral beliefs would have been correspondingly different.

It is widely held that this argument does not work equally to show that we would not have been evolutionarily selected to have true mathematical beliefs. Roger Crisp, Allan Gibbard, Richard Joyce, Stephen Pinker, Walter Sinnott-Armstrong, and Ernest Sosa all suggest as much.[35] Joyce states the reason explicitly. Again, Joyce writes, "There is . . . evidence that the distinct genealogy of [mathematical] beliefs can be pushed right back into evolutionary history. Would the fact that we have such a genealogical explanation of . . . '1 + 1 = 2' serve to demonstrate that we are unjustified in holding it? Surely not, for we have no grasp of how this belief might have enhanced reproductive fitness independent of assuming its truth."[36] Joyce's reasoning can be illustrated with a concrete example as follows.

> Suppose that there is a lion behind bush A and a lion behind bush B. Ancestor P and ancestor Q are hiding behind bush C.

35. See, again, Crisp, *Reasons and the Good*; Gibbard, *Thinking How to Live*; Joyce, *The Evolution of Morality*; Pinker, *The Blank Slate*; Sinnott-Armstrong, *Moral Skepticisms*; and Sosa, "Reliability and the A Priori."

36. Joyce, *The Evolution of Morality*, 182. It is clear from the context that Crisp, Gibbard, Joyce, Pinker, Sinnott-Armstrong, and Sosa are talking about mathematical truths realistically construed. They are trying to draw a disanalogy between the case against moral realism and the case against mathematical realism. Crisp, Gibbard, and Pinker are explicit that they are talking about mathematical truths, realistically—indeed "Platonistically"—construed.

> Ancestor P believes that the one lion and another lion make two lions in all, while ancestor Q believes that one lion and another lion make zero lions in all. Then, ceteris paribus, ancestor P is less likely to die, and so more likely to pass on its genes, than ancestor Q. In particular, ancestor P is less likely to walk out from behind bush C and get eaten by two lions than ancestor Q. However, any explanation for this will presuppose that one lion and another lion really do make two, and not zero, lions in all.

There is more than one problem with this example. But the immediate problem is that it seeks to establish the wrong conclusion.[37] Joyce intends to show that we must presuppose the contents of our mathematical beliefs in any evolutionary explanation of our having them. He assumes that if we must presuppose the contents of beliefs of a kind, D, in any evolutionary explanation of our having those beliefs, then we were selected to have true D-beliefs. Street seems to make a similar assumption when she writes, "To explain why human beings tend to make the normative judgments that we do, we do not need to suppose that these judgments are *true*."[38] But this assumption is doubtful and skews the apparent scope of the Evolutionary Challenge. Prima facie we may have to assume the contents of our D-beliefs in any evolutionary explanation of our having those beliefs, even though we were not selected to have true D-beliefs. For example, we almost certainly must assume the contents of our elementary logical beliefs in any evolutionary explanation of our having those beliefs. Of course, we may not need to state the contents of our elementary logical beliefs in any such explanation. But we almost certainly must assume those contents at the level of inference in any such explanation. Even so, the question of whether we were selected to have true elementary logical beliefs seems to be very much open.[39]

If it is true that we must assume the contents of our mathematical beliefs in any evolutionary explanation of our having those beliefs, then it plausibly follows that we have (defeasible) empirical evidence for those mathematical beliefs. The contents of our mathematical be-

37. That Joyce's argument fails even to establish the conclusion that it purports to establish will become apparent below.

38. Street, "Reply to Copp," 208.

39. See Schechter, "The Reliability Challenge and the Epistemology of Logic," for arguments for and against the view that we were selected to have true logical beliefs. Thanks to an editor at *Ethics* for helpful commentary on this section.

liefs would form part of an empirically confirmed theory.[40] But the claim that we must presuppose the contents of our mathematical beliefs in any evolutionary explanation of our having those beliefs is different from the claim that we were selected to have true mathematical beliefs.

In order to argue that we would be evolutionarily selected to have true mathematical beliefs, one must argue, on the basis of evolutionary considerations, that had the mathematical truths been very different, our mathematical beliefs would have been correspondingly different. In terms of the above example, one might argue as follows.

> Suppose that one lion and another lion really did make zero lions in all. Then ancestor P, who believes that one lion and another lion make two lions in all, would not be more likely to pass on its genes than ancestor Q, who believes that one lion and another lion make zero lions in all. In particular, ancestor Q would not be more likely, ceteris paribus, to walk into a meadow and get eaten by two lions. However, this suggests that what benefited ancestor P relative to ancestor Q in the aforementioned scenario was the truth of ancestor P's belief that $1 + 1 = 2$. Thus, had the mathematical truths been very different, our mathematical beliefs would have been correspondingly different.

Assume for the sake of argument that the counterfactual, "Suppose that one lion and another lion really did make zero lions in all" is intelligible. (If it is not, then the argument on behalf of Joyce et al. fails anyway.) Still, the argument is unsound. It trades on an equivocation between mathematical truths, realistically construed, and (first-order) logical truths. Suppose that what is being imagined is that *if there is exactly one lion behind bush A, and there is exactly one behind bush B, and no lion behind bush A is a lion behind bush B, then there are no lions behind bush A or B.* Then it may be true that ancestor Q would not be more likely to get eaten than ancestor P. There would not be any lions behind bush A or B, so it seems that ancestor Q could not be eaten by any. However, to imagine the proposition expressed by the italicized sentence is not to imagine that $1 + 1 = 0$, realistically construed. It is to imagine a bizarre variation on the (first-order) logical truth that if there is exactly one lion behind bush A, and there is

40. Note that this is plausible on independent grounds. There is the Quine-Putnam indispensability argument for mathematical realism, whose plausibility depends largely on the role that mathematics, realistically construed, seems to play in physics. See W. V. O. Quine, "Two Dogmas of Empiricism," *Philosophical Review* 60 (1951): 20–43; and Hilary Putnam, *Philosophy of Logic* (New York: Harper & Row, 1971). I discuss this argument in Sec. V, Conclusions.

exactly one lion behind bush B, and no lion behind bush A is a lion behind bush B, then there are exactly two lions behind bush A or B (where the phrases "exactly one" and "exactly two" here are abbreviations for constructions out of ordinary quantifiers plus identity).[41]

Realistically construed, the claim that $1 + 1 = 0$ speaks of numbers.[42] It says, roughly, that the number 1 bears the plus relation to itself and to 0. What if we imagine that the number 1 bears the plus relation to itself and to 0 and maintain the (first-order) logical truth that if there is exactly one lion behind bush A, and there is exactly one lion behind bush B, and no lion behind bush A is a lion behind bush B, then there are exactly two lions behind bush A or B? Then, given that ancestor Q's belief that $1 + 1 = 0$ would have any evolutionary effect on Q's behavior at all, it seems that ancestor Q would be more likely to get eaten than ancestor P.[43] There would be two lions behind bush A or B,[44] and ancestor Q would be disposed to behave as if there were no lions there. For example, ancestor Q might walk out from behind bush C rather than staying hidden behind it for fear of being eaten. Given that the relevant (first-order) logical truth held fixed, it seems that ancestor Q would have been more likely to die than ancestor P.

The point can be stated intuitively thus. If our ancestors who believed that $1 + 1 = 2$ had an advantage over our ancestors who believed that $1 + 1 = 0$, the reason that they did is that corresponding (first-order) logical truths obtained. In particular, ancestor P, who believed that $1 + 1 = 2$, had an advantage over ancestor Q, who believed that $1 + 1 = 0$, in the above scenario intuitively because if there is exactly one lion behind bush A, and there is exactly one lion behind

41. Such constructions do not refer to numbers. For example, "there are exactly two lions behind bush A or B" abbreviates "there is an x and a y such that x is a lion behind bush A or B and y is a lion behind bush A or B and, $x \neq y$, and for all z, if z is a lion behind bush A or B, then $z = x$ or $z = y$." (Though it should become clear in light of the objections considered below, it is worth emphasizing that whether a statement counts as a first-order logical truth as opposed to a mathematical one is not a remotely terminological issue. Though many have claimed that mathematics reduces to "logic" in some sense, nobody—of which I am aware, at least—has ever claimed that it reduces to first-order logic. The claim has been that mathematics in some sense reduces to second-order logic or set theory. These reductive theses are perfectly consistent with mathematical realism as I have defined it in Sec. I.)

42. This follows from the mathematical instance of D-LITERALNESS.

43. If Q's belief that $1 + 1 = 0$ would not have had an evolutionary effect on Q's behavior, then one could not argue on the basis of the relevant example that we were selected to have certain mathematical beliefs. Thus, one certainly could not argue on that basis that we were selected to have true mathematical beliefs.

44. That is, there would be an x and a y such that x is a lion and y is a lion, and $x \neq y$, and for all z, if z is a lion, then $z = x$ or $z = y$.

bush B, and no lion behind bush A is a lion behind bush B, then there are exactly two lions behind bush A or B.[45] In other words, ancestor P did not have an advantage over ancestor Q because its belief that $1 + 1 = 2$ was true. Ancestor P had an advantage over ancestor Q because its belief appropriately aligned with (first-order) logical truths about its surroundings.

Even if this picture is right as far as it goes, one might worry that it could not be correct in general. Suppose that rather than considering the proposition that $1 + 1 = 2$, we consider a more abstract arithmetic proposition, such as the axiom of mathematical induction. This axiom states that if the number, 0, has a property, F, and if the number, $n + 1$, has the property, F, whenever n has it, then all natural numbers have the property, F. Given that this axiom is presupposed by practically all of scientifically applied mathematics, it is conceivable that creatures who believed it would have been more likely to pass on their genes than creatures who did not. However, there is no corresponding (first-order) logical truth that might capture the intuitive reason for this.

But it is crazy to think that our ancestors believed the axiom of mathematical induction. This axiom was not even formulated until the seventeenth century! If we were selected to have certain mathematical beliefs (or corresponding cognitive mechanisms), then we were selected to have beliefs (mechanisms) that correspond to the elementary core of the subject—which we have, in our scientific age, systematized under abstract axioms. In this respect, the situation is like the moral one. Street et al. do not argue that we were selected to believe the abstruse moral principles that philosophers have postulated to systematize our concrete moral intuitions. They argue, roughly, that we were selected to have certain concrete moral intuitions themselves.

It is true that the details of the above picture are not plausible in general. Consider elementary geometrical hypotheses, such as that the shortest distance between two points is a straight line (SD). It is not crazy to think that our ancestors believed something like SD, and it is possible that belief in something like SD even engendered an evolutionary advantage. But there is, again, no corresponding (first-order) logical truth that might capture the intuitive reason for this.

45. Note that I am not assuming that it is metaphysically possible that the number 1 bears the plus relation to itself and to 0, while the standard (first-order) logical truths hold fixed. Again, if the Evolutionary Challenge is to have any interest, the relevant counterfactuals must involve conceptual possibility (and, obviously, we hold first-order logic fixed when assessing "countermathematicals"). I take up the defensibility of the view that the relevant antecedents are conceptually possible in the next section.

The picture cannot, then, be that for any mathematical hypothesis that we were evolutionarily selected to believe, H, there is a (first-order) logical truth corresponding to H that captures the intuitive reason that belief in H was evolutionarily advantageous.

Nevertheless, the basic idea that for any mathematical hypothesis that we were selected to believe, H, there is a nonmathematical truth corresponding to H that captures the intuitive reason that belief in H was advantageous is plausible. By *nonmathematical truth* I mean a truth that does not imply a substantive mathematical sentence, interpreted in accord with the schemas in Section I—that is, roughly, a truth that does not imply the existence of a relevantly mind-and-language independent realm of mathematical objects. When H is an elementary arithmetic proposition, such as that $1 + 1 = 2$, the relevant truths will typically be (first-order) logical truths regarding objects in our environments (it is conceivable that they would also sometimes be mereological or impure set-theoretic truths regarding such objects). But when H is a geometrical proposition, such as SD, the relevant truths will be different. They will concern the structure of our environments—rather than the structure of a mathematical object (such as Euclidean space). For example, given that belief in SD was advantageous, the reason that this is so is, roughly, that the shortest distance between two points in space-time approximates a straight line. Perhaps creatures who believed some alternative to SD would be less likely to pass on their genes in worlds like ours in which the corresponding hypothesis about points in space-time was true. But such creatures would be no more likely to pass on their genes in worlds in which the latter hypothesis about points in space-time was true, but SD was false. What matters, as in the case of elementary arithmetic, is how such creatures' mathematical beliefs "line up with" truths about their environments. If the physical world appropriately aligns with their mathematical beliefs, it does not matter whether the mathematical world does too. If our ancestors who believed SD had an advantage over our ancestors who believed alternatives to it, the intuitive reason that they did is that a corresponding hypothesis about the structure of our environments was true.

I conclude that the argument that we would not be selected to have true moral beliefs shows equally that we would not be selected to have true mathematical beliefs. Creatures with mathematical beliefs roughly like ours would have been more successful at passing on their genes than creatures with very different mathematical beliefs even if the mathematical truths were very different. I have not taken a stand on whether we were selected to have true beliefs regarding the intuitive reasons that our ancestors who believed the likes of $1 + 1 = 2$ would have enjoyed a reproductive advantage. For example, given that

our ancestors who believed that $1 + 1 = 2$ would have enjoyed an advantage over our ancestors who believed that $1 + 1 = 0$ intuitively because there are (first-order) logical truths corresponding to $1 + 1 = 2$, but not to $1 + 1 = 0$, would it have been advantageous to have true beliefs regarding those (first-order) logical truths themselves?

This question is beyond the scope of this article, but let me briefly mention a reason to think that the answer is "no." First-order logical truths corresponding to elementary arithmetic truths become wildly complicated already at the likes of $5 + 7 = 12$. Given that belief in elementary arithmetic truths carried with it similar behavioral dispositions as belief in corresponding (first-order) logical truths, perhaps evolution would have preferred belief in easy arithmetic to belief in arithmetic in tandem with belief in highly complicated corresponding logical truths. If so, then, had the (first-order) logical truths been very different, our mathematical beliefs would have been correspondingly different (though no more true for that). The case of geometry may be similar. The actual structure of our environments is quite complicated. But SD may have afforded an easy and reliable guide to it. It is conceivable that evolution would have preferred belief in simple SD over belief in SD in tandem with belief in the truth about spacetime.[46]

IV. THE INTELLIGIBILITY OF DIFFERENT MATHEMATICS

I have argued that the Evolutionary Challenge for moral realism is equally a challenge for mathematical realism under the assumption that it is intelligible to imagine the mathematical truths being very different. But it might be thought that the view that it is intelligible to imagine the mathematical truths being very different is less defensible than the view that it is intelligible to imagine the moral truths being very different. If this were so, then there would arguably be no intelligible question as to whether our mathematical—as opposed to moral—beliefs were the products of "truth-tracking" forces, and our having many true such beliefs might admit of a trivial explanation.[47]

46. Another reason to think that we would not have been selected to have true (first-order) logical beliefs is that it is simply unintelligible to imagine the (first-order) logical truths being very different. Thus, one cannot argue that had those truths been so different, our (first-order) logical beliefs would have been correspondingly different (because it would have benefited our ancestors to have correspondingly different (first-order) logical beliefs). See Field, "Recent Debates." Of course, if it is so unintelligible, then the logical realist might instead offer a trivial explanation of our having many true logical beliefs.

47. David Wiggins may have something like a trivial explanation of our having many true mathematical beliefs in mind when he describes a "vindicatory explanation" of this in "Moral Cognitivism, Moral Relativism, and Motivating Moral Beliefs," *Proceedings of the Aristotelian Society* 91 (1991): 61–85. With reference to Wiggins, Crisp writes, "In the case

In the moral case, it can seem obvious that it is intelligible to imagine the relevant truths being very different. Indeed, Street simply declares, "as a purely conceptual matter, the normative truths might be anything." But it is not so obvious to analytic moral realists who hold that, even if it is not apparent, the moral truths are largely, if not wholly, fixed by what "follows" from our moral concepts.[48] Is there no (non-question-begging) argument that it is intelligible to imagine the moral truths being very different?[49]

There is such an argument. Philosophers have long suggested that the existence of (actual) moral disagreement poses a problem for moral realism. But typical statements of how it does have not been compelling. For instance, it is often argued that the "best explanation" of moral disagreement is that moral realism is false.[50] But, first, if this just means that our having the moral beliefs that we have is best explained without reference to moral truths, realistically construed, then it is hard to see what work disagreement is doing. The argument looks like an application of Harman's of "Ethics and Observation," according to which we ought not believe in substantive moral truths, realistically construed, because their assumption does not figure into the best explanation of any observable phenomena.[51] This argument would work equally even if there were moral consensus. Second, many moral realists would deny that whether we ought to believe in moral realism depends on whether moral truths best

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of 7 + 5 = 12 we may . . . claim that there is nothing else to think. There is almost complete consensus and the views of . . . those who disagree will be either explicable . . . or incomprehensible" (*Reasons and the Good*, 92). If Wiggins and Crisp are suggesting that our having many true mathematical beliefs admits of a trivial explanation, then they apparently fail to notice the prima facie tension in holding both that there is an evolutionary explanation of our having many true mathematical beliefs, and that there is a trivial one.

48. Street, "Reply to Copp," 208. See, e.g., Frank Jackson, *From Metaphysics to Ethics* (Oxford: Oxford University Press, 1998). I am not suggesting that one could only deny the intelligibility of, say, pain's being good as an analytic moral realist. Some moral intuitionists appear to deny this, despite not being analytic moral realists.

49. Obviously, to simply declare, as Street does in "Reply to Copp" with respect to normative truths in general, that we can intelligibly imagine that, say, pain is good would be blatantly question-begging (in a context in which the intelligibility of the moral truths being very different was in doubt).

50. For the classic statement, see chap. 1 of Mackie, *Ethics*. For similar arguments, see John Burgess, "Against Ethics," *Ethical Theory and Moral Practice* 10 (2007): 427–39; and Brian Leiter, "Moral Skepticism and Moral Disagreement in Nietzsche," Public Law Working Paper no. 257 (University of Chicago, 2009, http://ssrn.com/abstract=1315061).

51. "Ethics and Observation" appears as sec. 1 of Gilbert Harman, *The Nature of Morality: An Introduction to Ethics* (New York: Oxford University Press, 1977). I return to Harman's argument in Sec. V, Conclusions.

explain any observable phenomena.[52] So, an "argument from disagreement" of this sort would appear question-begging to many. However, there is a more straightforward sense in which moral disagreement might pose a problem for moral realism. Disagreement among apparently conceptually competent people over many moral claims affords defeasible evidence that it is intelligible to imagine the moral truths being very different. Hence, the existence of such disagreement suggests that if the moral realist can explain our having many true moral beliefs at all, she cannot do so via a trivial explanation.

Note two things about this argument. First, it is irrelevant to it whether the pertinent disagreement is reasonable. So long as it appears to be coherent by the realist's own lights, this affords (non-question-begging) evidence that it is intelligible to imagine the moral truths being very different. Second, it is irrelevant how many people participate in the disagreement. It does not even matter whether the parties to it are alive. As long as there has been some disagreement among apparently conceptually competent people with respect to a moral sentence, 's', this affords evidence that it is intelligible to imagine both that s and that not-s.

Is there any plausibility to an analogous argument in the case of mathematics? It might be thought that an analogous argument is easy to come by. One need merely argue that there is apparently coherent disagreement over whether there are any (substantive) mathematical truths at all.[53] Such disagreement easily translates into disagreement over "first-order" mathematical claims, such as $1 + 1 = 2$. However, there may be reasons to doubt that such intuitively "philosophical" disagreement is genuine that are not equally reasons to doubt that straightforward "first-order" disagreement is genuine.[54] In the moral case, one can cite disagreement over a wide variety of moral claims that does not seem to bottom out in disagreement over whether there are any (substantive) moral truths at all. Has there been analogous disagreement over a wide variety of mathematical claims?

It might be thought that there has been negligible such disagreement. As James Rachels writes, "in mathematics, we have proof," and, arguably, there has been negligible disagreement as to whether a pur-

52. See, e.g., Huemer, *Ethical Intuitionism*; Thomas Nagel, *The View from Nowhere* (New York: Oxford University Press, 1989); or Derek Parfit, *On What Matters* (Oxford: Oxford University Press, 2011).

53. See, e.g., Field, *Science without Numbers*, or *Realism, Mathematics, and Modality*.

54. Of course, it is doubtful that disagreement over claims from any area is ever thoroughly "first-order." At least insofar as we are reasonable, we aspire to bring our beliefs from an area into coherence with our other beliefs, be they semantic, epistemological, or metaphysical.

ported proof is veridical.[55] But one must distinguish two senses of "proof." In the logical sense of "proof," a proof merely shows that a conjecture follows from the relevant axioms. It does not show that the conjecture is true (in a context in which the axioms are in doubt), since it does not show that the axioms are true. In a justificatory sense, a "proof" shows that a conjecture is true. Insofar as the relevant axioms are in doubt, a justificatory proof thus shows that those axioms are true.

Let us grant that there has been negligible disagreement over what has been proved in the logical sense of "proof."[56] It is irrelevant whether there has been negligible disagreement as to what follows from various mathematical axioms. If we were to regiment the various moral theories—that is, if we were to lay down a formal moral language and deem a certain set of statements in the language "axioms"—we could achieve comparable consensus as to what follows from them. Questions of what follows from what are just questions of logic.[57] What is relevant is whether there has been negligible disagreement in the justificatory sense of "proof"—that is, whether there is negligible disagreement as to what mathematical axioms are true. There has certainly not been negligible disagreement over this. There have been notorious disagreements—disagreements that do not result from disagreements over whether there are any (substantive) mathematical truths at all—surrounding the standard axioms of all of our mathematical theories, from recondite axioms of higher set theory, to the characteristic axiom of the calculus, to such apparent trivialities of arithmetic as that every natural number has a successor. As John Bell and Geoffrey Hellman write, "Contrary to the popular (mis)conception of mathematics as a cut-and-dried body of universally agreed upon truths . . . as soon as one examines the foundations of mathematics [the question of what axioms are true] one encounters

55. James Rachels, "Introduction," in *Ethical Theory 1: The Question of Objectivity*, ed. James Rachels (Oxford: Oxford University Press, 1998), 3.

56. Even this is arguable. In particular, apparent disagreement between intuitionists and classicists, if genuine, is considerable. See Joan Moschovakis, "Intuitionistic Logic," forthcoming in *Stanford Encyclopedia of Philosophy*, http://plato.stanford.edu, accessed December 1, 2011.

57. Michael Gill seems to miss this in his "Moral Rationalism vs. Moral Sentimentalism: Is Morality More Like Math or Beauty?" *Philosophy Compass* 2 (2007): 16–30, 19, when he writes: "No one disagrees about or is perplexed by basic arithmetic equations. But disagreement and perplexity do characterize our responses to many aspects of high-level mathematics. What, after all, is the job of a mathematician if not to try to prove or disprove theorems about which there is disagreement and perplexity? So the analogy between morality and mathematics continues to hold after all." "Mathematical" disagreement that can be simply resolved by proof or disproof is not mathematical disagreement at all. It is logical disagreement (disagreement about what follows from what).

divergences of viewpoint . . . that can easily remind one of religious, schismatic controversy."[58]

I do not claim that this shows, by itself, that it is intelligible to imagine that such rudimentary claims as that $1 + 1 = 2$ are false—or, more exactly, that given that there are any substantive mathematical truths at all, such claims as that $1 + 1 = 2$ are false.[59] I know of no disagreement over such claims as that $1 + 1 = 2$ that does not turn on disagreement over whether there are any (substantive) mathematical truths. However, I know of no disagreement over certain rudimentary moral claims that does not turn on disagreement over whether there are any (substantive) moral truths at all either. For example, I know of no one who holds that there are (substantive) moral truths but denies that it is sometimes morally permissible for some people to stand up.[60] In both the moral and the mathematical case, the (non-question-begging) argument that it is intelligible to imagine the relevant truths being very different does not establish, by itself, the sweeping claim that Street makes regarding normative truths in general—namely, that it is intelligible to imagine the rele-

58. John Bell and Geoffrey Hellman, "Pluralism and the Foundations of Mathematics," in *Scientific Pluralism: Minnesota Studies in the Philosophy of Science, XIX*, ed. Stephen Kellert, Helen Longino, and C. Kenneth Waters (Minneapolis: University of Minnesota Press, 2006), 64–79, 64. See also Thomas Forster, *The Axioms of Set Theory* (Cambridge: Cambridge University Press, forthcoming); Abraham Fraenkel, Yehoshua Bar-Hillel, and Azriel Levy, *Foundations of Set Theory: Studies in Logic and the Foundations of Mathematics*, vol. 67 (New York: Elsevier Science, 1973); Penelope Maddy, "Believing the Axioms: I," *Journal of Symbolic Logic* 53 (1988): 481–511, and "Believing the Axioms: II," *Journal of Symbolic Logic* 53 (1988): 736–64; W. V. O. Quine, *Set Theory and Its Logic* (Cambridge, MA: Harvard University Press, 1969); and Stewart Shapiro, "We Hold These Truths to Be Self-Evident: But What Do We Mean By That?" *Review of Symbolic Logic* 2 (2009): 175–207. Harvey Friedman writes, "I have seen some . . . go so far as to challenge the existence of 2^100" ("Philosophical Problems in Logic," Princeton University, lecture notes, 1992, 4), http://www.math.osu.edu/friedman/pdf/Princeton532.pdf.

59. I made use of the example of "$1 + 1 = 2$" in Sec. III because this was Joyce's own example (and, again, the argument on his behalf presupposes that it is intelligible to imagine that this claim is false just as surely as the argument that I made).

60. Or, to take a well-worn example, there does not seem to be disagreement over whether it is morally permissible to torture one's children just for the fun of it. Do such examples show that there may be a trivial explanation of our having at least certain (quite uninteresting) true moral beliefs? It at least allows for this. Note, however, that in both the moral and the mathematical case, this helps little with the task of explaining our having many—i.e., a significant array of—true beliefs of the relevant sort. In both cases, the range of claims over which there seems to be no disagreement strongly underdetermines our theories. (For instance, in the mathematical case, the likes of $1 + 1 = 2$ are perfectly consistent with a theory of arithmetic like Edward Nelson's, which fails to validate even such fundamentals as the axiom of mathematical induction or the successor axiom. See Nelson, *Predicative Arithmetic*, Princeton Mathematical Notes no. 32 [Princeton, NJ: Princeton University Press, 1986].)

vant truths being anything. That argument merely establishes that it is intelligible to imagine the relevant truths being very different.

Nevertheless, it is worth repeating that to say that it is intelligible to imagine that, say, $1 + 1 = 0$, realistically construed, is not to say that it is intelligible to imagine that a marble on the table and a marble on the floor make no marbles in all. Again, the latter claim is a (first-order) logical truth (or, perhaps, an impure set-theoretic or mereological truth). To say that it is intelligible to imagine that $1 + 1 = 0$ is to say that it is intelligible to imagine that the number 1 bears the plus relation to itself and to 0—or, more exactly, in the present context, that it is intelligible to imagine that, given that there are substantive mathematical truths at all, the number 1 bears the plus relation to itself and to 0. Arguably, the latter claim is at least suggested by the existence of disagreement among apparently conceptually competent people—people who concede that there are (substantive) mathematical truths—over such fundamentals of arithmetic as that every natural number has a successor.

I conclude that the (non-question-begging) argument that it is intelligible to imagine the moral truths being very different shows equally that it is intelligible to imagine the mathematical truths being very different.

V. CONCLUSIONS

I have argued for the following.

(1) The argument that we would not be selected to have true moral beliefs works equally to show that we would not be selected to have true mathematical beliefs, given that it is intelligible to imagine the mathematical truths being very different.

(2) The (non-question-begging) argument that it is intelligible to imagine the moral truths being very different works equally to show that it is intelligible to imagine the mathematical truths being very different.

It follows that the Evolutionary Challenge for moral realism is equally a challenge for mathematical realism in the strong sense that the very same arguments that show that the moral realist is unable to offer an evolutionary or a trivial explanation of our having many true moral beliefs show equally that the mathematical realist is unable to offer an evolutionary or trivial explanation of our having many true mathematical beliefs.

The discussion has two additional upshots. The first is that the Evolutionary Challenge for moral realism is widely misconceived.

First, it does not establish, on its own, that the moral realist cannot offer any explanation of our having many true moral beliefs. It establishes that the moral realist cannot offer an evolutionary or trivial explanation of our having many true moral beliefs. Second, contrary to what expounders of the Evolutionary Challenge for moral realism commonly suggest, that challenge does not depend on the genealogical speculation that our moral beliefs actually are the products of evolutionary forces. This speculation is redundant given the premise that if our moral beliefs were the products of such forces, then those forces would be "non-truth-tracking." Finally, whether we were selected to have true moral beliefs cannot be determined by simply checking to see whether we must presuppose the contents of our moral beliefs in the best evolutionary explanation of our having those beliefs. One must determine what moral beliefs we would have had had the moral truths been very different.

The second upshot of the discussion is that there may be no epistemological ground on which to be a moral antirealist and a mathematical realist. There certainly is an epistemological challenge for moral realism that seems not to be equally a challenge for mathematical realism. That is Harman's challenge to empirically justify our belief in moral realism.[61] As Quine and Putnam argued, our mathematical theories, realistically construed, seem to figure indispensably into our best empirical scientific theories.[62] Anyone who wishes to endorse the latter seems committed, on pain of incoherence, to endorsing the former. But there appears to be no comparably strong empirical argument for moral realism. Certainly moral theories do not appear indispensable to our best empirical theories.

Nevertheless, it is doubtful that Harman's argument any longer affords a stable way to be a moral antirealist and a mathematical realist. First, there are now arguments that, despite appearances, mathematical theories (realistically construed) are not indispensable to our best empirical scientific theories. It has been argued both that we can reinterpret the mathematics that is present in those theories in antirealist terms without loss and that we can show that all apparent talk of numbers, sets, tensors, and so on is redundant anyway.[63] Second, there are now arguments that, despite appearances, our moral theo-

61. Again, see Harman, *The Nature of Morality*.

62. Again, see Quine, "Two Dogmas of Empiricism"; and Putnam, *Philosophy of Logic*.

63. See, again, Chihara, *Constructability and Mathematical Existence*; and Hellman, *Mathematics without Numbers*; or Field, *Science without Numbers*, and *Realism, Mathematics, and Modality*, respectively.

ries are indispensable to our best empirical scientific theories.[64] For instance, some have argued that the best explanation of our having the moral beliefs that we have will presuppose the contents of those beliefs.[65] Finally, even if mathematics, but not morality, is indispensable to our best empirical scientific theories, epistemological considerations threaten to undermine whatever empirical justification for belief in mathematical realism this affords. There are general reasons—famously advanced in Benacerraf's "Mathematical Truth" and Field's *Realism, Mathematics, and Modality*—for thinking that it is in principle impossible to explain our having many true mathematical beliefs in a way that is consistent with mathematical realism.[66] To the extent that these reasons are compelling, our justification for believing in mathematical realism seems undermined—no matter what its source. If any of the above scenarios obtains, there would seem to be no epistemological ground on which to be a moral antirealist and a mathematical realist.

64. See Richard Boyd, "Finite Beings, Finite Goods: The Semantics, Metaphysics and Ethics of Naturalist Consequentialism, Part I," *Philosophy and Phenomenological Research* 66 (2003): 505–53, and "Finite Beings, Finite Goods: The Semantics, Metaphysics and Ethics of Naturalist Consequentialism, Part II," *Philosophy and Phenomenological Research* 67 (2003): 24–47; David Brink, *Moral Realism and the Foundations of Ethics* (New York: Cambridge University Press, 1989); or Sturgeon, "Moral Explanations."

65. For a survey, see Brad Majors, "Moral Explanation," *Philosophy Compass* 2 (2007): 1–15.

66. It is often suggested that the same considerations that Benacerraf and Field advance serve equally to cast doubt on the possibility of explaining our having many true moral beliefs. See, e.g., chap. 1 of Mackie, *Ethics*; chap. 6 of Huemer, *Ethical Intuitionism*; Street, "Objectivity and Truth"; Enoch, "The Epistemological Challenge"; or Schechter, "The Reliability Challenge." But the Benacerraf-Field problem is importantly different from whatever epistemological problems arise in the case of morality. In particular, that problem is importantly different from the Evolutionary Challenge. For discussion of this issue, see chap. 3 of Clarke-Doane, "Morality and Mathematics."