Scientific Progress: Normative, but Aimless

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Abstract: Does science have any aim(s)? If not, does it follow that the debate about scientific progress is somehow misguided or problematically non-objective? These are two of the central questions posed in Rowbottom's *Scientific Progress*. In this paper, I argue that we should answer both questions in the negative. Science probably has no aims, certainly not a single aim; but it does not follow from this that the debate about scientific progress is somehow misguided or problematically non-objective.

1. Introduction

A longstanding philosophical debate about scientific progress, dating back to influential work by Popper (1963), Kuhn (1962/1996), and Lakatos (1978), has in recent years been revitalized as various new accounts (and new defenses of old accounts) have come onto the scene. For example, Bird (2022; see also 2007) defends an *epistemic* account of progress, on which progress consists in the accumulation of scientific knowledge. Dellsén (2021; see also 2016) defends what he calls the *noetic* account of progress, on which progress consists in enabling people to increase their understanding. And Rowbottom (2019; see also 2015) defends what I would describe as an *instrumentalist* account of progress, on which progress consists in equipping scientists with better tools for, *inter alia*, conceptualizing empirical information and making empirical predictions.

But what exactly are we talking about when we debate the nature of scientific progress? Is it a descriptive or normative issue? If it's descriptive, what exactly are we trying to describe? Some aspect of the actual history of science thus far? Or some aspect of current scientific practice? Or some aspect of scientists' own beliefs, behaviour, intentions, or 'aims'? If, by contrast, the issue is normative, what sort of normativity is at issue – epistemic, practical, or even moral? And in what sense, if any, is scientific progress then an objective matter? If it's not objective, or if it's objective only in some watered-down sense, does this imply that the debate about scientific progress is somehow confused or misguided?

These ‘meta questions’ about the scientific progress debate are important and timely. Rowbottom’s *Scientific Progress* (2023) is the first philosophical work of which I am aware that directly addresses them in a systematic way, treating them as the central focus of the work rather than as preliminaries or afterthoughts in discussions of related topics. To be sure, Rowbottom’s book also contains, in the first of its three full chapters, an overview of the contemporary debate about scientific progress. But the main focus of Rowbottom’s *Scientific Progress* is on arguing for several related theses that pertain to the questions raised in the previous paragraph.

Of these I find two theses most interesting and central to what I take to be Rowbottom’s overall project. First, contrary to an apparently widespread assumption, Rowbottom argues that it is simply misguided to say that science has any particular aim(s), such as ‘accumulating knowledge’ or ‘enabling understanding’. Thus, if what constitues scientific progress is determined by the aim of science, then our accounts of scientific progress are also misguided. Second, in part because science does not have any aim(s), there are no objective standards which determine whether a given episode is progressive or not (or to what extent it is progressive). Accordingly, claims about scientific progress, e.g. what it consists in and when it occurs, can only be true when they really merely express something like the speaker’s own preferences (or the preferences of a group of which the speaker is a member).

In what follows, I will provide another perspective on the underlying ‘meta questions’ to which these theses are answers. Let me foreshadow a little by relating my discussion to Rowbottom’s theses. While I am broadly sympathetic to Rowbottom’s first thesis, i.e. that science has no aim(s) in the relevant sense, I will suggest that this conclusion is not as relevant to the debate about scientific progress as Rowbottom makes it out to be. In particular, I will argue that what constitutes scientific progress is not determined by what science aims for, so it doesn’t matter to the scientific progress debate whether science aims for anything at all. With regard to the second thesis, I will argue that there is no special reason – i.e., no reason specific to the issue of scientific progress as opposed to other normative issues – that should lead us to think that there are no objective standards for scientific progress. If there is something problematically non-objective about claims concerning scientific progress, then the same is true for all normative claims.

2. Do the Aims of Science Determine Its Progress?

Rowbottom (2023: 32) correctly notes that a number of the most prominent contributions to the debate about scientific progress have explicitly assumed a tight

connection between scientific progress and the aim(s) of science.[1] Roughly speaking, the idea has been that the following conditional holds:

(A) If the (or an)[2] aim of science is X, then scientific progress occurs in so far as science achieves, or gets closer to achieving, X.

Indeed, it seems to me that an even stronger connection between scientific progress and the aim(s) of science is often assumed. For example, Bird (2022) seems to hold that it is in virtue of the fact that knowledge is the aim of science that progress consists in accumulation of knowledge. The idea, then, is that the aim of science explains or determines what constitutes scientific progress (see also Laudan 1984):

(A+) Because the aim of science is X, scientific progress occurs in so far as science achieves, or gets closer to achieving, X.[3]

As I'll explain below, I think both (A) and (A+) are false on any reasonable interpretation of what it would be for something to be the aim of science. If one does not reject these claims, however, then one's account of progress in terms of achieving, or getting closer to achieving, X would seem to be at most as plausible as the claim that X is the aim of science. It follows that if no good sense can be made of X being the aim of science, i.e. if such claims are misguided for any X, then no good sense can be made of progress consisting in achieving, or getting closer to achieving, X – for any X. All extant accounts of scientific progress would thus be misguided; likewise for the debate about which of these accounts best captures the nature of scientific progress.

But why think that claims about X being the aim of science are misguided, for any X? This question occupies Rowbottom in most of chapter 2, where he largely follows Resnik (1993) in considering, and rejecting, various proposals for what it might mean for something to be the aim of science. Importantly, this is not to deny that there is a perfectly good sense in which *indvidual scientists* have aims: they have desires, goals, or utilities, which guide their behaviour. These individual aims, however, are clearly not the aim of science referred to in (A) and (A+), for it is clearly not the case that science makes progress when these individual aims are satisfied, or in virtue of the satisfaction of such aims. For example, individual scientists may be aiming to publish in Nature, win

[1] For example, Dellsén (2016: 73) explicitly endorses a biconditional according to which "X is the aim of science just in case science makes progress when X increases or accumulates.". In more recent and thorough discussions of the topic, however, Dellsén (2021, 2022) does not connect scientific progress to the aim(s) of science at all.

[2] As this parenthetical qualification indicates, one might want to replace '*the* aim of science' with '*an* aim of science' if one thinks that science has more than one aim. My discussion in what follows would apply either way, so for simplicity I'll omit the parenthetical qualification henceforth.

[3] One might think that different scientific disciplines or subdisciplines have different aims, perhaps even that each (sub)discipline has several aims. My discussion also applies to views on which sciences have 'local' aims of this sort (see, e.g. Lusk and Elliot 2024) in so far as they are thought to determine what scientific progress in the relevant (sub)discipline consists in.

a Nobel prize, or negotiate a higher salary, but science does not progress with, or in virtue of, such achievements.

So, in order to make sense of something being the aim of science in the context of claims like (A) and (A+), it seems that what potentially possesses the aim in question is not individual scientists, but rather something these scientists collectively comprise or contribute to, such as the *community* or *institution* of science. So the aim of science must be the aim of a community or institution, rather than the aim of any individual scientist.[4] I will not go through the various options for spelling this out in more detail; I'll rather just note that I agree with Rowbottom (and Resnik) that it is far-fetched to attribute a specific aim to the community or institution of science in so far as this is supposed to be something over and above the aims of individual scientists.[5]

Suppose, however, that we go along with the idea that science, conceived of as community or institution in its own right, has a particular aim X. My contention is that, contrary to (A) and (A+), we should not take this aim to imply that, let alone explain why, scientific progress consists in increasing or accumulating X. In setting up my argument for this, let me start by making a couple of conceptual points about the term 'progress'. First, to say that something has progressed, i.e. that there has been progress in or of that thing, is to say that it has *improved* in some respect. Second, such improvements need not be due to the improved thing achieving, or getting closer to achieving, its own aims. This is obvious in cases where the thing in question clearly has no aims at all. For example, inanimate objects can clearly improve in various ways even though (*pace* Aristotle, perhaps) such objects do not have any aims in the relevant sense. For example, by sharpening a knife one improves it – at least with respect to its ability to cut.

[4] A reasonable objection to this is that there is no single community or institution of which all scientists are members; rather, there are many different (but perhaps partially overlapping) scientific communities or institutions. If so, it seems unlikely that all there is a single aim possessed by all these different communities or institutions. This is one of the reasons why it may be wrong to think that science has a single aim (see footnote 2). While I think this point is probably correct, as I explain below I also think that it ultimately doesn't matter for understanding scientific progress because the aim(s) of scientific communities/institutions do not determine what it is for scientific progress to occur in those communities/institutions. Thus, to simplify the prose in what follows, I will write as if there is a single scientific community or institution that possesses the aim(s) of science.

[5] Rowbottom's objections to such proposals are partly epistemological, having to do with how difficult it would be to tell what the aim(s) of science are on these views about what it is to be an aim of science, and partly dialectical, having to do with how they would imply that the aim(s) of science have features that its proponents explicitly or implicitly reject. My concerns, by contrast, are more metaphysical, having to do with what the world would have to be like in order for there to be an additional (group) agent, science, which is capable of having aims that cannot be reduced to the aims of the individual scientists that comprise or contribute to it. The standard response to such concerns is that positing non-reducible group agents of this sort does important explanatory work – in this case, I suppose, because attributing aim(s) to science would explain how scientific progress is possible. But as I argue in detail below, I don't think that attributing aim(s) to science does any real explanatory work in this regard (nor do I think it does any explanatory work in any other regard, although of course I cannot argue for that here).

Slightly less obvious, perhaps, are cases where something has aims, but it improves not in virtue of achieving or getting closer to achieving those aims.

Suppose, for instance, that your friend has absolutely no interest in leading a healthy life. Indeed, for dramatic effect, let's suppose that your friend is actively aiming to undermine their own health, and that they promote this aim by smoking cigarettes, eating poorly, and avoiding exercise. Out of concern for your friend's health, you intervene to change their behavior, e.g. by hiding their cigarettes, bringing them delicious healthy food, and taking them out for walks. After some time, let's say that your friend's health has improved, albeit not because of – indeed, in opposition to – your friend's own aim in this regard. Now, it would be entirely appropriate for you to say that your friend's health has improved, and indeed that they've made progress with respect to their health. If, by contrast, your friend's health deteriorates, it would be absurd to say without qualification that your friend made progress with respect to their health, even though this would have been in accordance with your friend's own aim.

Now, these conceptual points do not by themselves show that (A) and (A+) are false. After all, it *could* still be that scientific progress is a special kind of improvement the nature of which is determined by the aims of the thing that makes it, viz. science itself. As Daniel Stoljar (private communication) has pointed out, there is a perfectly legitimate sense in which an opponent of Russia's invasion of Ukraine might say that the Russian army has made progress in its military advance into Ukrainian terroritories. In making such a claim, one is in effect saying that there has been an improvement relative to the aim of the Russian army, setting aside whether this aim is a legitimate one. Similarly, returning to your friend whose aim is to undermine their own health, one might describe a period in which their health deteriorates as progress relative to their aim of undermining their own health. It would be folly to deny that the term 'progress' can be used in this sense, i.e. as progress relative to the aim of the thing in or by which progress is made. Let us call the type of progress referred to in these usages *internal-aim progress*.

The question, however, is whether it is really the internal-aim progress of science that we who have been debating the nature of scientific progress are – and, more importantly, *should be* – concerned with. Or are we – and *should we be* – rather concerned with the type of progress that occurs when your friend's health improves, regardless of whether this is in line with your friend's own aim?

Once these options have been clearly distinguished, as I hope I have now done, this seems to me to be the sort of question that answers itself. We are, or at any rate should be, concerned with the latter type of progress, i.e. the type of progress that is not relative to some aim had by the thing in or by which progress is made. After all, the point of debating the nature of scientific progress must ultimately be to enable us to better judge what sort of scientific research is most worth doing – and, moreover, sufficiently

worth doing to devote a substantial fraction of most nations' total public spending to it. It is surely not, by contrast, to figure out what counts as progress relative to the aims of science itself (whatever this may mean), since this by itself simply invites the follow-up question of whether – and, if so, why – this type of progress is worth having (and worth spending our shared resources on).[6] Put differently, we are – or at any rate should be – concerned with what counts as progress not just from the internal perspective of science itself but from the perspective of a clearheaded view of what science ought to be in the business of achieving. It follows, then, whether or not science itself aims for X (whatever this may mean), is not directly relevant to whether we should say that science makes progress in so far as it achieves, or gets closer to achieving, X.

To drive home this point, consider a mostly-hypothetical scenario in which science as a whole, or some scientific discipline, adopts an aim that we would find highly objectionable (and, for simplicity, let's suppose it discards all other aims). For example, let's suppose that this science adopted the aim of making the vast majority of humans subordinate to the will of a select group of supposedly-superior individuals. As a means to this end, the relevant scientists publish fraudulent articles detailing how the biological essences of humans with observable characteristics different from their own are inferior in various ways. And let's say this science is successful with respect to its aim, in that it succeeds in subordinating these other individuals to their own will. There is a type of progress that this science can be said to have made, viz. internal-aim progress (progress relative to its own aim). But this, I take it, is not the type of progress that those debating the nature of scientific progress have been concerned with. More importantly, it is not the type of progress that we should be trying to capture in our accounts of scientific progress. After all, this is clearly not the type of progress that is worth making – and certainly not the type of progress that we should spend any of our shared resources on attempting to achieve.

At this point, someone might object that my mostly-hypothetical scenario is in fact impossible in a subtle way. For once the enterprise in question adopts its highly objectionable aim, so the objection goes, it ceases to be a science and becomes something else. Perhaps, for example, this enterprise is now a sort of propaganda machine instead. More generally, one might think, nothing can be a science unless its aim is genuinely *scientific*, and the aim of the enterprise described above falls well short of this standard.

There is a sense in which this objection must concede the main point of the above argument, viz. that in debating the nature of scientific progress it is not enough to

[6] Dellsén, Firing, Lawler, and Norton (2024: 671) formulate and defend a desideratum for accounts of philosophical progress, *Progress Worth Making*, according to which "[a]n account of philosophical progress must identify progress with achievements we have independent reasons to think are genuinely valuable, regardless of whether, or the extent to which, philosophers are in fact making such achievements". This desideratum applies, *mutatis mutandis*, to scientific progress as well.

look to the aim of the enterprise we happen to call 'science'. After all, according to this objection, we would have to first determine whether the aim of a given enterprise is genuinely scientific, before we could say whether the enterprise really is a science (as opposed to merely being called a 'science'). If (and only if) the answer is 'yes' could we then say that achieving, or getting closer to achieving, the enterprise's own aim constitutes scientific progress. But note that we have now already moved away from the idea that it's possible to read off the nature of scientific progress from the internal aim of the enterprise we call 'science'. After all, according to the current objection, it might well be that the enterprise that is called 'science' in the entirely non-hypothetical actual world does not in fact have genuinely scientitific aims. If so, no amount of investigation into the aims of the enterprise that we call 'science' would settle the question of what scientific progress consists in. Since this is the main mistake that I wish to warn against in this section, I would not be too unhappy to simply concede the objector's point.

With that said, one reason not to concede the objector's point is that it seems to assume a sharp separation between science and non-science, i.e. that it is possible to solve the notoriously difficult demarcation problem (Popper 1959). There are good reasons, both theoretical and inductive, for thinking that this problem is not just unsolved but also unsolvable (Quine 1957; Laudan 1983). If so, it does not seem plausible that it is possible, even in principle, to separate genuinely scientific from non-scientific aims. After all, if this were possible, then this separation of aims could itself ground a sharp distinction between science and non-science.[7] Moreover, this separation of scientific and non-scientific aims would presumably lead to a sharp separation between scientific and non-scientific progress, e.g. between scientific and philosophical progress. However, as Dellsén, Lawler and Norton (2022) argue, there are good reasons to think that there is no such sharp distinction, e.g. because philosophical improvements are often the basis for scientific improvements, and *vice versa* (see also Stoljar forthcoming).

Let us take stock. I have argued that it is a mistake to take the nature of scientific progress to be determined by the aim of science. In doing so, I distinguished between a type of progress that is relative to the aim of the thing in or by which progress is made, viz. internal-aim progress, from the type of progress that is not relative to any such aim. And I've argued that debates about the nature of scientific progress are not – and certainly should not be – concerned with the former, i.e. internal-aim progress, since this type of progress need not be worth pursuing in the first place, let alone of sufficient worth that we ought to spend our limited resources on its pursuit. Thus, any sensible

[7] Another reason not to concede the objector's point is that it relies on the idea that science, and other enterprises, institutions, activities of this sort, have specific aims. As noted above, I agree with Rowbottom (and Resnik and others) that there is probably no good sense in which this is so, but I've also granted this idea for the sake of my argument against (A+). So to press this rejoinder against the current objection is, in effect, to argue that even if (A+) holds true, the objector might still be wrong about why there is not scientific progress in the mostly-hypothetical scenario.

debate about scientific progress – any debate worth having – must ultimately be concerned with the latter type of progress. If this is right, then it is mistake to think that accounts of, and debates about, scientific progress are somehow misguided if it turns out that science does not have any aim in the relevant sense. So, even if Rowbottom is right on the latter score, as I tend to think he is, those debates about scientific progress that are worth having at all may proceed more or less as before – albeit now with the useful reminder that these debates should *not* be concerned with what I have called internal-aim progress.

3. The Normativity of Scientific Progress

As noted earlier, to say that something has progressed, i.e. that there has been progress in or of that thing, is to say that it has *improved* in some respect. This is in part a normative judgment, and in part a descriptive one. The content of the descriptive part is that the thing in question has *changed*. The content of the normative part is that the state in which it ended up is *better*, in the relevant respect, than the one in which it started out. This normativity inherent in the concept of scientific progress might seem problematic, especially once it has become clear that it cannot be reduced to, or grounded in, supposedly objective facts about the aim(s) of the thing in or by which progress is made.

Rowbottom's approach to this allegedly problematic normativity is a kind of meta-normative anti-realism about claims containing the terms 'scientific progress'. Rowbottom formulates what I would describe as a hybrid between an error theory – according to which all normative claims are false – and a cognitivist subjectivism – according to which normative claims express that the speaker approves or disapproves of something. Specifically, Rowbottom (2023: 51) argues that claims such as 'scientific progress consists in X' are variously false or true depending on whether the speakers themselves assume that this is determined by "objective or intersubjectively privileged standards" (in which case they are false) or instead assume that this is determined by "cognitive standards [...] imposed by individuals or groups" (in which case they are true).[8] This semantic form of anti-realism is undergirded by a metaphysical form of anti-

[8] Although I won't press the issue much here, I find this thesis problematic in so far as it implies that the truth conditions of 'scientific progress consists in X' are in large part determined by the speaker's own assumptions. This, however, seems to me to attribute far too much semantic power to the speaker in these cases, and not enough to their audience and the rest of the linguistic community more generally. The speaker, and perhaps their assumptions, may determine what proposition they *intend* to express with a given utterance, but what they *in fact* express with that utterance is normally not determined in this way. (The reason I won't press this issue further is that I do not think the debate about scientific progress is, or should be, about the actual meaning of the terms 'scientific progress', or about the actual truth-conditions of sentences containing these terms; for discussion, see Dellsén 2021: 11250-11251; 2022: 64-65.)

realism on which there are no objective (or intersubjectively privileged)[9] standards determining what scientific progress consists in, or which scientific changes are progressive. Finally, Rowbottom (2023: 51) also claims that we would "typically be better off not using 'progress'"; instead we should talk of "imposed standards or values".

I will focus mostly on the second of these three claims, i.e. the claim that there are no objective standards for scientific progress. One of the reasons Rowbottom gives for this claim is that "the standard route to claiming that there are such standards, via appeal to objective aims of science, fails" (Rowbottom 2023: 52). I have already argued that scientific progress should not be taken to be determined by the aim(s) of science; from which it follows, I suggest, that the objectivity (or otherwise) of standards for scientific progress is not determined by the objectivity (or otherwise) of science's aim(s).

Another reason Rowbottom gives for the claim that there are no objective standards for progress is inspired by Mackie's (1977) 'argument from queerness'. In short, the very idea of there being such standards raises metaphysical and epistemological puzzles, e.g. regarding how these standards came into existence and how we could come to know about them. On this point, Rowbottom is surely right. But the problem here is of course much more general, reaching far beyond the issue of scientific progress to any normative issue whatsoever. Put differently, there is no special problem about the objectivity of standards for judgments about scientific progress that isn't also a problem for the objectivity of standards for normative judgments more generally. Moreover, I daresay that we seem to be quite capable of having fairly productive conversations about normative issues generally, and indeed about scientific progress in particular. This suggests that there must be some way in which such normative standards are sufficiently widely shared that they may count as 'objective' in some useful sense of the term.

Perhaps because Mackie's 'argument from queerness' concerns normative judgments generally, as opposed to judgments about scientific progress in particular, Rowbottom bolsters this argument with what he calls *the argument from the lack of explanatory significance*. According to this argument, to posit objective standards for scientific progress is even less plausible than positing objective standards for moral judgments, because while the latter would at least explain our intense feeling that there really is something wrong with flagrantly violating moral standards, there are no corresponding feelings about scientific progress to be explained by positing objective standards for progress. For example, objective moral standards at least serve to explain our intense feeling that there *really* is something wrong with torturing kittens for fun. By

[9] The distinction between *objective* and *intersubjectively privileged* standards is not one that will be important in what follows, so I'll drop the parenthetical qualification in what follows.

contrast, positing objective standards for scientific progress would do no explanatory work, argues Rowbottom, because there are no similar feelings to be explained in cases where scientists fail to make scientific progress. Rowbottom illustrates the point with an example: "it is dubious, for instance, that scientists who uncritically accept dominant flawed theories and try to refine minor aspects of these are *really* doing anything wrong" (Rowbottom 2023: 53, emphasis in original).

I have two worries about this argument. First, the argument seems to assume that the existence of objective standards for scientific progress should explain the exact same type of intense feelings as the existence of objective moral standards allegedly does. Just as objective moral standards supposedly explain why it feels *really* wrong to torture kittens, the argument seems to assume that objective standards for scientific progress should explain why it also feels *really* wrong, seemingly in the same sense of 'wrong', to uncritically accept dominant flawed theories. I don't see why this would be. Given that standards for scientific progress are clearly not moral standards, we should expect these standards to pertain to, and thus explain, quite different sorts of things. In so far as these standards are supposed to explain our various mental states – e.g. about someone torturing kittens, on the one hand, and about scientists forgoing opportunities to make progress, on the other – we should expect these mental states to be quite different. In particular, in so far as we should expect standards of scientific progress to explain our mental states at all,[10] it seems that it should explain, for instance, why we believe that a scientist who dogmaticaly accepts obviously flawed theories is *doing their job less well* than an otherwise identical scientists who critically examines these theories and formulated better alternatives. This is, admittedly, a less dramatic explanandum than the feeling that some scientist is '*really* doing something wrong', but I see no reason why objective standards for scientific progress would have to explain sentiments that are so strong and categorical.

My second worry stems from the fact that the argument seems to restrict the sorts of facts that objective standards for scientific progress could explain to a certain subset of our mental states, viz. our *feelings* about various scientific episodes. However, there seems to me to be a whole range of other sorts of facts, e.g. concerning the actual practice of science and its role in society, that an account of scientific progress might well help explain, and which might be better explained if the standards for progress are assumed to be 'objective' in a natural sense of the term.

Consider, for instance, the fact that there are various mechanisms in science, some formal and some informal, for preventing scientific fraud. If a scientific article turns out to contain fabricated or manipulated data, an absolutely standard practice is for the article to be retracted by the journal. Why is that? Well, one way (although

[10] As I'll explain below, I don't think objective standards need to explain our *feelings* about anything in order to earn their keep, explanatorily speaking.

certainly not the only way) to explain this standard practice starts from the thought that it is in general *better* (or, if you will, *less bad*) for an article containing fabricated or manipulated data to be marked as retracted, e.g. because other scientists will then not be misled into relying on that data in their practice. Different accounts of scientific progress will then give different follow-up explanations of why this is better, e.g. by spelling out how scientists being misled in this way would in turn lead them to have less knowledge (the epistemic account), contribute less to putting people in a position to understand (the noetic account), and so forth. In any case, it seem to me that such explanations would be inadequate if these accounts are assumed not to provide standards for progress that are, in some natural sense of the term, 'objective'.

To see why, suppose these explanations were explicit about the standards in question not being objective. I take this to mean that the standards would be explicitly imposed by a specific group, presumably a group of which the person who proposes the explanation is themselves a member, and that these standards would explicitly be said not to be shared by everyone to whom the explanation is provided. So an explanation of why it is better for scientists not to be misled into relying on fabricated or manipulated data provided by a proponent of the epistemic account, for example, would have to say that this is because scientists being misled in this way would lead them to have less knowledge *according to the standards for scientific progress accepted by me and likeminded people*. This, however, is not an adequate explanation, for the explanans would not really explain why it is better, *tout court*, for scientists not to be mislead into relying on fabricated or manipulated data; it only explains why this is better *according to the standards for scientific progress accepted by me and likeminded people*.

In summary, then, once it is made explicit that a standard for scientific progress is not objective in any natural sense of the term, these standards do not seem to offer even potential explanations of certain commonplace normative phenomena, such as why it is better, *tout court*, for scientists not to be misled into relying on fabricated or manipulated data. Moreover, these normative phenomena may well play an important role in explaining non-normative facts, such as why it is standard practice to retract journal articles that contain fabricated or manipulated data.

Now, admittedly, if you already believe there are no objective standards for scientific progress, you may well also believe that there are no objective standards undergirding other normative claims, such as the normative claim that it is better, *tout court*, for scientists not to be mislead into relying on fabricated or manipulated data. Moreover, you might further be convinced (e.g., by Harman 1977) that even if normative claims of this sort were objectively correct, they would still not explain non-normative facts, such as the fact that journals retract articles containing fabricated and manipulated data. In that case, you will not think that the proposed explanations for normative phenomena that I have suggested can only be adequately provided if we

assume that standards for progress are objective have true explananda; nor will you think that the explanations for non-normative facts in terms of normative facts have true explanantia. These explanations will thus be inadequate by your lights.

But the reasons these explanations are indequate by your lights would be perfectly general reasons, having to do with the objectivity (or otherwise) of normative claims generally. These reasons would not, by contrast, have anything specifically to do with scientific progress, or the normative content of claims about when scientific progress occurs and what scientific progress consists in. So I do not see here any specific problem for the objectivity (or otherwise) of the normative content of claims concerning scientific progress that doesn't generalize to all normative claims.

This brings me, finally, to Rowbottom's suggestion that it would typically be better to replace the term 'progress' with something like 'imposed standards and values'. This seems to me to be premature and potentially misleading. It would be premature, in my view, because the jury is still out on whether the standards that determine progress really are imposed by a particular speaker or group, rather than being 'objective' in a natural sense of the term. And it would be misleading, in my view, because it would suggest that there is some specific reason to think that judgments about scientific progress are problematically subjective, whereas I have argued that any such reason generalizes into a reason for taking all normative judgments to be equally problematic. So, as long as we are clear about the fact that the issue of scientific progress is a normative one (with the metanormative burden that comes along with this), we should feel free use the term 'scientific progress' as a convenient label for the cognitive improvements that scientific research brings about when all goes well.[11]

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