SCIENTIFIC PROGRESS AS ACCUMULATION OF KNOWLEDGE —A REPLY TO ROWBOTTOM

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Abstract

I defend my view that scientific progress is constituted by the accumulation of knowledge against a challenge from Rowbottom in favour of the semantic view that it is only truth that is relevant to progress.

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My aim in (Bird 2007b) is to rehabilitate the much derided view of scientific progress as the accumulation of knowledge:

> (E) An episode constitutes scientific progress precisely when it shows the accumulation of scientific knowledge.

This epistemic conception of scientific progress contrasts with, on the one hand, the semantic conception of progress:

> (S) An episode constitutes scientific progress precisely when it either (a) shows the accumulation of true scientific belief, or (b) shows increasing approximation to true scientific belief.

and, on the other hand, the functional-internalist:

> (FI) An episode shows scientific progress precisely when it achieves a specific goal of science, where that goal is such that its achievement can be
> determined by scientists at that time (e.g. solving scientific puzzles).

Darrell Rowbottom (2008) seeks to defend the semantic account against a particular example, based on René Blondlot's non-discovery of N-rays. In order to show that our intuitions support (E) over (S) I imagined that there were indeed entities answering to Blondlot's theory of N-rays, but these rays and their effects played no significant part in explaining Blondlot's own belief in N-Rays, which I take it was largely the result of self-deception. I suggested that even if Blondlot had been correct, the mere truth of his belief would not have amounted to scientific progress. This is because he held his belief for the wrong reasons, reasons that are unrelated to its truth. His belief was merely accidentally true. If that is correct, then Blondlot's belief would not have amounted to knowledge, but would have been a true belief nonetheless. Consequently the intuition that Blondlot's accidentally true belief does not contribute to scientific progress constitutes a counterexample to (S) and is best explained by the

failure of Blondlot's belief to amount to knowledge, vindicating (E).

Rowbottom presents three reasons why the defender of (S) need not accept that their account holds that Blondlot's accidentally true belief would constitute progress. Rowbottom thus agrees with my intuition in this case but hold that the semantic account can accommodate the intuition. Here, according to Rowbottom, are the reasons why accommodation is possible:

> (i) Blondlot had many false beliefs about N-Rays, and so we need not take his beliefs overall as being progressive.
>
> (ii) What is relevant for scientific progress is the community's collective beliefs, not the beliefs of the individual scientist Blondlot.
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> (iii) It might be that the degree of belief held by French scientists was quite low, and so only counted as 'belief' in a colloquial sense, whereas (S) requires a higher standard for belief.

Points (ii) and (iii) are easily answered by assuming for the sake of the example that belief in N-Rays was widespread and held to a high degree, for reasons similar to Blondlot's reasons. Indeed as a matter of fact there was quite strong and widely distributed belief in N-Rays. Robert T. Lagemann (1977) reports that in the period 1903–6 120 scientists published almost 300 articles on the nature and origin of N-Rays. We can imagine that the belief was strong and not limited to French scientists (and indeed some Irish and English scientists also reported seeing N-Rays). The idea that strong belief in N-Rays could become universal for spurious reasons is not so far fetched. The power of self-deception, prejudice, and other forms of irrational belief formation is to be felt in science as it is elsewhere, both individually and collectively. One need only cite research on intelligence among non-white populations and the working classes in the US and the UK to see how bad science can become widely credited, even in recent times.

Rowbottom's response (i) suggests that the supporter of (S) need not regard the Blondlot episode as progressive even if Blondlot's theory is true, because it will be accompanied by a large number of false beliefs. I have two replies. First, for this response to rehabilitate (S) it needs to be the case that appreciation of the false beliefs held by Blondlot is playing a part in my thought experiment—as Rowbottom thinks it might be. But I disagree. It takes a certain amount of reflection to see that Blondlot must have had some false beliefs, even if his theory is true, and to see what those false beliefs must be. I do not think that this reflection is in fact present when we carry out the thought experiment. It seems to me that simply knowing that Blondlot's theory had no justification is sufficient to show that it could not constitute progress, independently of whether any of his other, related beliefs are true or false. Secondly, to accommodate Rowbottom's response (i), the defender of the semantic view will

have to make changes to (S). This is because (S) says nothing about false belief; it does not yet say that an episode is not progressive if it involves a considerable quantity of false beliefs. All it says is that there is progress when there is an increase in true beliefs—which there is in my hypothetical example, even if the additional true beliefs are accompanied by false ones. Thus (S) would have to be amended to something such as:

> (S*) An episode constitutes scientific progress when it either (a) yields new beliefs with a preponderance of true beliefs over false beliefs, or (b) shows increasing (average) approximation to true scientific belief.

The problem with the revised clause (a), of course, is that it is difficult to count beliefs. If we consider an episode that has both true content and false content, then if we adopt the logical fiction that the belief set includes all of its own logical consequences, then such an episode will have infinitely many true beliefs and infinitely many false beliefs. Even if we drop the logical idealisation, it still remains difficult to count beliefs, especially when, presumably, we need to give additional weight to the more significant ones. Note that almost any scientific episode will have some false content, and so we cannot restrict ourselves to those instances where there is an addition of true belief with no addition of false belief.

Rowbottom attempts to recast my example in a different way in order to avoid the problems he raises, imagining that the whole scientific community wakes up to true beliefs about N-Rays, held with a high degree of confidence, implanted overnight. (S) says that this constitutes progress, and Rowbottom says that it does because their new beliefs would have lead to these scientists to investigate N-Rays, and on the assumption that N-Rays actually exist, that might indeed have lead to their proper discovery.

Rowbottom anticipates my response that the implanted beliefs would have *caused* progress but not *constituted* it. Note that (S) would still have to regard the episode as progressive even if the scientists had not bothered to carry out further investigation into N-Rays, but had just continued to take their beliefs for granted. Contrary to (S), such a case would clearly not be progressive.

Rowbottom then supposes that in addition to the implanted firm beliefs the *malin genie* invents lots of apparent evidence in favour of N-Rays (e.g. lab reports, journal articles etc.). Thus the scientists now have beliefs in N-Rays that are not only true but justified. This would count as knowledge if knowledge is justified true belief. However, Rowbottom contends, this scenario is worse (presumably in terms of progress) than the previous scenario in which the scientists had the same beliefs but without apparent evidence. As suggested, if they lack evidence for their beliefs they might then look for it—if they find it, so much the better, and if they don't then they might give up the

beliefs that had been implanted. But the existence of (justification providing) apparent evidence would leave the scientists with no need to carry our further investigation.

The objection is, presumably, that the provision of justification in addition to truth yields knowledge, and so constitutes progress according to (E), but may be regarded as regressive for the reasons just given. Note that Rowbottom has not answered my previous response that we must distinguish what constitutes progress from what promotes it. In an earlier case I maintained that a true belief that failed to be knowledge could not constitute progress but might promote it. Here, I *could* hold (but I don't) that this case is the reverse, one which constitutes progress even if it promotes subsequent lack of progress. (This would be analogous to the attitude of nineteenth century revolutionaries who held that while limited democratic reforms were *ipso facto* slightly progressive, they nonetheless were regressive in their *effects* since they delayed the revolution that would lead to the greatest political progress.)

The simple and obvious response is that this scenario just does not amount to knowledge since it is a clear Gettier case. The justification for the belief and its truth are unrelated, and so their combination does not provide knowledge. Even so, Rowbottom suggests that the epistemic view is disadvantaged, since an epistemic good, justification, leads to a negative outcome in terms of progress. Two replies. The first is just a repetition of the previous one: an epistemic good can *cause* harm in terms of progress; nothing in (E) is inconsistent with this. The second reply rejects Rowbottom's imputation to me of a commitment to the view that since knowledge is an epistemic good, justification is an epistemic good of the same kind. If one takes a justified true belief view of knowledge, then one might think that justification is an epistemic good in that it is a step on the way to knowledge; indeed one might think that it possesses all the epistemic good of knowledge since the additional component, truth, is not epistemic at all. However, if one rejects the attempt to analyse knowledge in terms of truth, justification, and other conditions, but takes knowledge to be the primary epistemic state, as Williamson (2000) does, then matters may look rather different. For then justification is to be understood as a certain kind of approximation to knowledge, an approximation that holds when one's belief forming mental states are of the kind that *could* have led to knowledge, had external circumstances been more propitious (cf. Bird 2007a). In figurative terms, a belief is justified when it is formed with the best possible epistemic intentions. But as we know, the road to hell is paved with good intentions. That is, a good intention doesn't guarantee a good moral outcome, only the right action does that. Likewise, justification doesn't guarantee a good epistemic outcome, only knowledge does that. (E) is framed in terms of knowledge; it says knowledge constitutes progress, and nothing short of knowledge. It does not imply that justification constitutes progress (or some weaker progress-like

good); even less does (E) imply that justification (or even knowledge) will cause future progress.

In summary, justification is a necessary condition for a belief to be scientifically progressive. Justification is not merely instrumental. The epistemic view is committed to the view that justification is necessary *not* because knowledge is a justified belief that is true; it is so committed simply because knowledge entails justification. (Note that knowledge can entail justification without its being the case that knowledge is justification plus something else.) As Rowbottom and I both remark, this question relates to that concerning the aim of belief and so the goal of inquiry. I take the arguments for (E) to vindicate the view that the aim of belief is knowledge. Supporting (S), Rowbottom prefers the view that the aim of belief is truth. This is too large a question to pursue here. But, as I indicated above, (S) and the view that belief aims at truth say nothing about false belief. As such they advocate guessing, at least for cases where we have no evidence either way; and if it is possible to hold both of a pair of contradictory beliefs, one should do that as much as possible too. For if one has a belief, even if only a wild uninformed guess, then at least it stands a chance of being true. And, better, if one can believe both of a pair of contradictory propositions, then one is guaranteed to have a true belief. Such guessing and contradictory believing would maximise one's chances of making progress according to (S). The problem is that (S) and 'belief aims at truth' say nothing about the false belief being bad. So one has to complicate matters by saying that belief aims at truth *and* at avoiding falsehood, and likewise amend (S) to (S*****). The epistemic view of the aim of belief and of progress can avoid all this, since uninformed guessing, even if luckily true, can never amount to knowledge. As Aristotle tells us in the first line of the *Metaphysics*, "All men by nature desire to know". Science is the institutional embodiment of this desire, and as such make progress precisely when that desire is achieved.

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