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Scientific Progress, Verisimilitude, and Evidence

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ABSTRACT. The verisimilitudinarian approach to scientific progress (VS) is the view that progress can be accounted for in terms of the increasing verisimilitude or, equivalently, truthlikeness, or approximation to the truth, of our theories. In this paper, I defend VS against the criticism, levelled by Bird (2007), that it exhibits an unacceptable lack of interest in the issue of the grounding of scientific beliefs in the evidence.

1. Introduction

In a recent paper, Alexander Bird has mounted a sustained attack against the semantic approach (S) to scientific progress, which he defines as the claim that "progress is the accumulation of true scientific beliefs", or as the related view that it is "a matter of increasing verisimilitude" (2007, p. 65). One of his main arguments against S is that it exhibits an unacceptable lack of interest in the grounding of scientific beliefs in the evidence – a point illustrated by means of a hypothetical example of progress that, Bird claims, S cannot adequately account for (Section 2). In this note, I shall argue that such a criticism does not apply to the view of progress as increasing verisimilitude, which will be referred to here as the "verisimilitudinarian approach" (VS) to progress.[1] After briefly illustrating how VS handles the problem of theory-choice on the basis of the available

[1] See Cevolani and Tambolo (2012) for an extended discussion of Bird's criticism of VS.

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evidence, I shall contend that it can deal quite well with Bird's hypothetical example (Section 3). Finally, I shall suggest that Bird's criticism of VS depends on the fact that he fails to appreciate the distinction, drawn by the champions of VS, between real progress and estimated progress (Section 4).

2. A recent attack against the verisimilitudinarian approach

Bird (2007, pp. 65–67) criticizes S by deploying a hypothetical example of progress in which, he claims, our intuitions concerning the nature of progress are at variance with S.

Suppose that a scientific community has formed its beliefs by using a very weak, or even irrational, method *M* (e.g., astrology), and that by sheer luck *M* has yielded a sequence of true (or increasingly verisimilar) beliefs.[2] Suppose, moreover, that these beliefs are embraced by the community only because they were generated by the use of *M*, and that they do not have any independent confirmation. Now imagine that, at time *t*, some researcher realizes that *M* is flawed, and that this researcher manages to persuade the other scientists to start using a different, reliable method M_1 for the generation of true (or increasingly verisimilar) beliefs. As a consequence, the beliefs generated before *t* are immediately dropped.

Our intuitions, Bird claims, say that in this scenario the scientific community starts to make progress exactly at *t*. In fact, although the beliefs generated by *M* before *t* are true (or increasingly verisimilar), they lack appropriate grounding in the evidence: there is no good epistemic reason to embrace these beliefs, which therefore cannot qualify as a contribution to progress. Bird argues that, since according to S progress is the accumulation of true beliefs, or a matter of increasing verisimilitude, the supporters of S are forced to propose a wrong interpretation of the situation before *t*. In fact, the beliefs generated by *M* before *t* are *ex hypothesi* true (or increasingly verisimilar), regardless of how they were generated. From this, it follows that, according to S, the scientific community *did* make progress before *t*. In Bird's view, the fact that S leads to such a counter-intuitive, unacceptable conclusion shows that it cannot be the right account of progress.

The champions of VS, on their part, see the situation under a different light. In fact, to anticipate a distinction that will be introduced in the next sec-

[2] In Bird's view, "whether one prefers to couch [this] argument in terms of accumulating truth or increasing verisimilitude is immaterial" (2007, pp. 65–66).

tion, Bird's hypothetical example can be quite naturally characterized, within VS, as an instance of real progress in which, however, no estimated progress is achieved.

3. The verisimilitudinarian approach defended

Bird contends that his preferred theory of progress – the epistemic approach (E), which views progress as the accumulation of knowledge (see especially Bird 2007; 2010) – provides a reconstruction of the above example which perfectly matches the verdict of our intuitions. Here, however, I shall not be concerned with the merits of E,[3] or with the inadequacies of the theory of progress as the accumulation of true scientific beliefs: my main aim will be to belie the claim that, within VS, the issue of the grounding of scientific beliefs in the evidence is not adequately dealt with, if not plainly ignored.

In a nutshell, VS is the view that progress can be accounted for in terms of the increasing verisimilitude or, equivalently, truthlikeness, or approximation to the truth, of our theories. Within VS, such theory-changes as the transition from Newton to Einstein's theory are considered as progressive because, although the new theory is, strictly speaking, presumably false, it is estimated to be closer to the truth than the superseded one: increasing verisimilitude is the key ingredient for progress. Developed by such authors as Ilkka Niiniluoto (1987; 1999) and Theo Kuipers (2000), VS revolves around explications of the notion of verisimilitude that succeed in avoiding the well-known logical problems encountered by Karl Popper's (1963) original definition of the concept. For my present purposes, it will suffice to say that, within VS, a theory *T* is regarded as highly verisimilar if *T* says many things about a target domain, and many of these things are (almost exactly) true. Consequently, the verisimilitude of *T* depends on both its content (how much *T* says) and its accuracy (how much of what *T* says is in fact true). In Popper's words, aiming at highly verisimilar theories means aiming at "approaching comprehensive truth" (1963, p. 237), that is, an appropriate combination of truth and content.

The champions of VS are well aware that, in most interesting cases, "the truth" about a target domain is simply unknown, so that the *estimated* verisimilitude of competing theories, and not their verisimilitude, is the crucial point of interest for an adequate account of progress. Accordingly, they have

[3] For a sustained critical analysis of E, see Rowbottom (2010). I shall briefly return to E in Section 4, note 6.

proposed some solutions to the so-called "epistemic problem of verisimilitude", which consists in defining a notion of estimated verisimilitude such that the estimated closeness to the (supposedly unknown) truth of any two theories can be compared on the basis of the available evidence. Thanks to the notion of estimated verisimilitude, it is possible to say that a theory *T'* *seems* more verisimilar than a theory *T*, i.e., that it is reasonable to claim that *T'* is more verisimilar than *T* on the basis of available evidence. Consequently, within VS progress can be characterized both as *real progress*, construed as increasing verisimilitude, and as *estimated progress*, construed as increasing estimated verisimilitude.

To mention just one example of the methods for the estimation of verisimilitude devised by the champions of VS, Kuipers advocates a methodological rule, the "Rule of Success" (2000, p. 114), which can be phrased as follows: "If a theory *T'* has so far proven to be more successful than a theory *T*, then eliminate *T* in favor of *T'*, at least for the time being". This rule is the core of Kuipers' "HD-evaluation" of theories, i.e., a sophisticated version of the hypothetico-deductive method characterized by the recommendation to "take falsified theories seriously" (2000, p. 95). According to Kuipers, the fact that a certain theory is false is "irrelevant for approaching the truth" (2000, p. 124). In fact, a conclusively falsified theory can still be the best at our disposal, i.e., it can be closer to the truth than the available alternatives. Consequently, if a false theory *T* has so far proven to be the most successful (the best) among the available alternatives, one may make an "Inference to the Best Theory" (2000, p. 171) – that is, one is justified in concluding, at least for the time being, that *T* is the closest to the truth among the available alternatives. Indeed, although the Rule of Success is claimed to be functional for truth approximation, Kuipers hastens to add that its use cannot guarantee that the chosen theory will automatically turn out to be closer to the truth. However, for my present purposes, what matters is that, contrary to what Bird claims, (not only Kuipers' version of) VS provides us with an "*evidence dependent* partial ordering" (Kuipers 2000, p. 113, emphasis added) of theories w.r.t. their estimated verisimilitude.[4]

Coming now back to Bird's hypothetical example, it must be admitted that it may prima facie seem a cause of embarrassment for VS; nevertheless, VS has the necessary resources to deal quite well with it.

[4] Kuipers (2000, pp. 107–110) provides an in-depth discussion of the factors that complicate the HD-evaluation of theories. For Niiniluoto's solution to the epistemic problem of verisimilitude, see especially his (1987, p. 416).

Consider again the distinction between real and estimated progress. Such a distinction is motivated by the fact that there is no way to ascertain whether a given belief exhibits a genuine correspondence to "the real world": progress, construed as real progress, is something to which we have no epistemic access. On the other hand progress, construed as estimated progress, is something to which we do have epistemic access. However, since the estimates of the verisimilitude of theories are subject to revision in the light of new evidence, the champions of VS recommend caution in the acceptance of theories. In other words we may say that, contrary to what Bird seems to believe, VS has a well-developed "epistemic side", aimed at exerting control over the beliefs that the scientific community embraces; and that the epistemic side of VS works as a kind of filter, which minimizes cases of acceptance of beliefs lacking appropriate grounding in the evidence. In order to appreciate this, one only needs to elaborate a bit on what has been said above concerning Kuipers' Inference to the Best Theory.

According to Kuipers, if a given theory *T'* has, so far, proven to be the best among the available alternatives, one is justified in concluding, tentatively, that *T'* is the closest to the truth among the available alternatives. Of course, it may happen that the scientific community comes to accept *T'* as an instance of progress for what later turn out to be entirely wrong reasons. For instance, *T'* may have been generated by a flawed method and lack independent confirmation, or it may have been wrongly estimated as more verisimilar than its predecessors (or competitors) only because, at a certain point in time, all the available evidence accidentally favored it. However, VS is well equipped to deal with this kind of cases. For instance, Kuipers warns against the perils of "instant rationality" (2000, p. 113) by suggesting that, when the estimated verisimilitude of a theory *T'* is higher than that of a theory *T*, one should not just rest content with the hypothesis that *T'* is more verisimilar than *T*. Rather, one ought to further test this hypothesis, by producing as much evidence as possible in favor of *T*. Only if, after serious testing, the estimated verisimilitude of *T'* remains higher than that of *T*, then one is justified in considering *T'* as an instance of estimated progress and concluding, at least for the time being, that *T'* is the closest to the truth among the available alternatives.

4. Concluding remarks

Underlying what I dubbed the "epistemic side" of VS there is the idea that the view of progress as increasing verisimilitude becomes more credible if one

has reasons to believe that, at least occasionally, science has achieved this aim – in other words, if "we have *evidential* reason to think that progress has been made" (Niiniluoto 1999, p. 202, emphasis added). When speaking of "evidence", the champions of VS refer to the grounds that the scientists have for choosing among competing theories: the observations, the results of the experiments, as well as such factors as "background theories, regularity assumptions, conceptual frameworks, exemplars from early research, and axiological principles" (1999, p. 177).

Evidence, so conceived, certainly plays a key role in the theory-choices made by scientific communities, and such a role is fully acknowledged within VS. Moreover this notion of evidence, together with the distinction between real and estimated progress, allows the champions of VS to diagnose that, in Bird's hypothetical example, real progress is achieved even before *t*, although there is no good epistemic reason to embrace the beliefs generated before *t* by the flawed method *M*, and consequently, no estimated progress is achieved before *t*. Probably due to his allegiance to a different notion of evidence,[5] Bird seems unable to appreciate that real and estimated progress do not necessarily go hand in hand, and dismisses VS far too quickly.

In this paper I refrained from commenting on the respective merits of VS and E. Nevertheless, I briefly illustrated how VS handles the problem of theory-choice on the basis of the available evidence, and contended that it can deal quite well with Bird's hypothetical example; this should be more than enough to show that Bird's claim concerning the insensitivity of VS with regard to the issue of the grounding of scientific beliefs in the evidence is off the mark.

[5] Bird's theory of progress as the accumulation of knowledge (E) is wholeheartedly in the spirit of Williamson's (2000) attempt to reshape epistemology in such a way that the concept of knowledge is assigned a central role. Famously, Williamson treats knowledge as the primitive epistemic concept, such that it cannot be analysed as a combination of truth and justification, and defends the principle (called "*E = K*") that equates a subject's evidence with that subject's knowledge (2000, p. 185; see Greenough and Pritchard 2009 for a discussion of Williamson's theory). Within this framework, if a given belief is a genuine piece of knowledge, then it will also possess what Bird calls "an appropriate grounding in the evidence" (2007, p. 71). Therefore, Bird argues, if a subject *X* acquires a belief that is piece of knowledge, then *X* will acquire a belief that counts as a contribution to progress. Consequently, according to E the beliefs embraced by the scientific community before *t* in Bird's hypothetical example do not count as progress; and, Bird concludes, given the perfect match between E and our intuitions, E must be the correct account of progress.

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