Discussion

Pierre Duhem's epistemic aims and the intellectual virtue of humility: a reply to Ivanova

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A B S T R A C T

David Stump (2007) has recently argued that Pierre Duhem can be interpreted as a virtue epistemologist. Stump's claims have been challenged by Milena Ivanova (2010) on the grounds that Duhem's 'epistemic aims' are more modest than those of virtue epistemologists. I challenge Ivanova's criticism of Stump by arguing that she not distinguish between 'reliabilist' and 'responsibilist' virtue epistemologies. Once this distinction is drawn, Duhem clearly emerges as a 'virtue-responsibilist' in a way that complements Ivanova's positive proposal that Duhem's 'good sense' reflects a conception of the 'ideal scientist'. I support my proposal that Duhem is a 'virtue-responsibilist' by arguing that his rejection of the possibility of our producing a 'perfect theory' reflects the key responsibilist virtue of 'intellectual humility'.

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When citing this paper, please use the full journal title *Studies in History and Philosophy of Science*

1. Introduction

David Stump (2007) has recently argued that Pierre Duhem can be interpreted as a virtue epistemologist. This reflects a recent and welcome interaction between virtue epistemology and the history and philosophy of science, which promises new and fruitful tools for our understanding—and appreciation—of science and its practitioners (see, for instance, Daston & Galison, 2007 and Shapin, 2008). Stump argues that Duhem's account of 'good sense' is best interpreted as a form of virtue epistemology, in which certain 'intellectual virtues' can aid scientists in their choices between competing theories. Ivanova (2010) rejects Stump's account on the grounds that Duhem is committed to 'epistemic aims' which are more modest than that of virtue epistemology. I challenge Ivanova's criticism of Stump by arguing that she does not distinguish between 'reliabilist' and 'responsibilist' virtue epistemologies. Her argument that Duhem is not a virtue epistemologist applies only to 'virtue-reliabilism', and by introducing this distinction, I demonstrate that Duhem can in fact be interpreted as a 'virtue-responsibilist'. Virtue-responsibilism does not share the strong epistemic aims which Duhem explicitly rejects and so he can be profitably interpreted

within their ranks. Furthermore, interpreting Duhem as a virtue-responsibilist strengthens Ivanova's positive proposal that Duhem's 'good sense' reflects a conception of the 'ideal scientist'. I support my proposal that Duhem is a 'virtue-responsibilist' by arguing that his rejection of the possibility of our producing a 'perfect theory' reflects the key responsibilist virtue of 'intellectual humility'.

2. Stump's account of Duhem's virtue epistemology

Virtue epistemology is a relatively novel form of epistemology, which asserts the essential role of 'intellectual virtues' sin human epistemic activities. Despite various historical precursors, it has only become a distinct sub-discipline within epistemology during the last twenty or so years (see Greco & Turri (2009) for an overview). A virtue epistemologist maintains that the performance and assessment of our epistemic activities must reflect a proper consideration of various 'intellectual virtues', in an analogous way to the virtue ethicists' claim that our moral activities should reflect our successful cultivation and exercise of the ethical virtues. Indeed, the 'ethical' aspect is evident in the virtue epistemologists' twin basic commitments: firstly, that epistemology is a normative

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discipline, and second, that 'intellectual agents and communities are the primary source of epistemic value and the primary focus of epistemic evaluation' (Greco & Turri, 2009, §1). These two basic commitments become especially important to my remarks in the later sections of this paper. A guiding aim of virtue epistemology, then, is the creation—and praise—of intellectually-virtuous agents, those who develop those intellectually-virtuous 'characters' which are most amenable to successful epistemic activity.

Stump's appeal to virtue epistemology comes from his focus on Duhem's concept of 'good sense'. He argues that, for Duhem, 'good sense' is what allows scientists to 'decide between competing theories', since it introduces further means of arbitration. This is especially useful in the case of underdetermined, empirically adequate theories. Central to Stump's discussion is the claim that Duhem's 'good sense' is, first, 'an ethical term', and, second, that the 'intellectual and moral virtues of the scientist determine scientific knowledge' (Stump, 2007, p. 150). Such virtues have this 'determining' role because, for Duhem, the 'pursuit of truth' requires a whole cluster of 'intellectual abilities', many of which—like 'rectitude' and 'probity'—are also moral qualities. The interaction of ethical and epistemic qualities provides Stump's point of entry into virtue epistemology.

Stump uses virtue epistemology to illuminate the role of intellectual virtues in scientific theory choice. Indeed, he notes that 'Duhem's main reason for advocating good sense is the complexity of theory choice in experimental science' (Stump, 2007, p. 156). Invocation of virtues allows us to mediate between complex cases of theory choice. Such choices can arise between scientific theories, or ethical norms. Stump invokes the work of Linda Zagzebski (1996) to make this point. Zagzebski's virtue epistemology reflects 'her desire to eschew rules in developing a theory of epistemic choice', and this connects her to Duhem's philosophy of science (Stump, 2007, p. 152). Both appeal to virtues to resolve choice between competing theories, whether ethical or scientific.

Both Zagzebski and Duhem want to use virtues to resolve cases of 'epistemic choice', between ethical norms and scientific theories, respectively. Duhem, for instance, argues that when faced with 'negative evidence' a scientist can respond with 'timidity' or 'boldness', modifying the existing theory to accommodate the new facts, or replacing it with something radically new. Stump argues that since 'both choices are rational and that we need 'good sense' to make a judgment about which path to take yet there is no formal method by which to make a decision' (Stump, 2007, pp. 154–155). Intellectual virtues fulfil this role—in the guise of 'good reason'—because they provide further means of arbitration, other than reason or evidence, and, crucially, without providing a decision procedure.[1] Stump concludes that Duhem therefore entertains a virtue epistemology in which certain 'intellectual virtues' play an essential role in scientific theory choice.

3. Ivanova criticisms of Stump

Milena Ivanova has challenged Stump's 'virtue epistemological' interpretation of Duhem. In her paper 'Pierre Duhem's concept of good sense as a guide to theory choice' (Ivanova, 2010), she raises two objections to Stump's argument that Duhem can be interpreted as a virtue epistemologist. These objections rest on two alleged 'essential differences' between Duhem and virtue epistemologists, pertaining to their 'epistemic aims' and motivation. I will outline these objections, and then respond to them. I argue that Ivanova is mistaken in her identification of these 'essential differences' and propose that, by modifying her claims, her own positive account of Duhem's virtue-epistemological credentials can be strengthened.

First, Duhem and virtue epistemologists 'differ as to their epistemic aim'. The epistemic aim of virtue epistemologists is, argues Ivanova, to 'try to define how we acquire justified true beliefs and theories'. By contrast, Duhem denies that this is an attainable epistemic aim: we cannot have 'justified true belief', if these are understood as descriptions of an 'underlying reality'. Ivanova cites many instances in which Duhem explicitly denies the possibility of our ever producing a 'perfect theory', that is, one which 'will reflect the true ontological order'. Such a perfect theory is 'not achievable' (Ivanova, 2010, p. 62). The first 'essential difference' between Duhem and virtue epistemologists is, therefore, that 'Duhem believes, contrary to virtue epistemologists, that we are epistemically restricted and thus can never reach the true order of nature' (Ivanova, 2010, p. 62).

Duhem's remarks on the possibility of a 'perfect theory' make this 'restrictedness' clear. A perfect theory is one which reflects the true ontological order of reality. In *Aim and Structure of Physical Theory*, Duhem argues that 'we do not possess this perfect theory, and mankind will never possess it': 'what we possess and what mankind will always possess is an imperfect and provisional theory, which by its innumerable groupings, hesitations and repentances proceeds slowly toward that ideal form which would be a natural classification' (Duhem, 1954, p. 302). Ivanova concludes that because Duhem rejects the possibility of a 'perfect theory' he entertains a very modest 'epistemic ambition'—one, at the least, too modest for his to count as a virtue epistemologist.

The second 'essential difference' that Ivanova identifies between virtue epistemologists and Duhem pertains to their 'motivation'. Virtue epistemologists, she argues, 'try to justify what it is to have a true belief', and so are 'in the business of justification'. Duhem, by contrast, does not 'invoke the concept of good sense to justify the scientists' belief in a theory', and so, by contrast, 'is not is the business of justification' (Ivanova, 2010, p. 62). Since these two 'essential differences' reflect important philosophical points of disagreement between Duhem and virtue epistemologists, Ivanova conclude that Duhem cannot, *pace* Stump, be easily identified as a virtue epistemologist.

Ivanova maintains that virtue epistemologists are committed to the strong epistemic aim of 'justified, true' knowledge. This, in turn, commits them to the possibility and attainability of a 'perfect theory' of just the sort that Duhem denies. Virtue epistemologists, on Ivanova's characterisation, aspire for a perfect theory which, as Duhem puts it, 'would be a complete and adequate metaphysical explanation of material things' (Ivanova, 2010, p. 63). Duhem, of course, denies that we can attain any such perfect theory, although he concedes that it may be preserved as a 'ideal' to motivate and guide scientific inquiries (on these terms, his account of 'perfect theory' may function as a sort of 'normative realism'). Duhem is therefore not a virtue epistemologist because he cannot tolerate the strong 'epistemic aim' of knowledge of the 'objective ontological order of reality'.

4. 'Reliabilist' and 'responsibilist' virtue epistemologies

Ivanova's objections relies upon the claim that virtue epistemology is actually committed to this strong epistemic aim. However, there is no reason to suppose that it is—or, better, there is no reason to suppose that virtue epistemology *tout court* is committed to this strong epistemic aim. Ivanova here fails to properly distinguish between the two main 'schools' of virtue epistemology,

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[1] Virtues also of course affect the scientists' intellectual activities in general, as well as specific cases of theory choice. As Stump says, 'Duhem thinks that scientists are able to weigh evidence and to make decisions, and that the decisions they make depend on the intellectual and moral virtues of the scientist as a cognitive agent' (Stump, 2007, p. 151).

namely, 'reliabilism' and 'responsibilism'. Virtue-reliabilists do maintain that the value of intellectual virtues is that they contribute to the acquisition of justified true beliefs about the world. 'Reliabilist' virtues therefore have a cognitive flavour, and include memory, concentration, attentiveness, and so on.

Ernest Sosa (2007) is a good representative of a virtue-reliabilist who does defend this strong epistemic aim. Indeed, he was perhaps the first figure to introduce 'virtue epistemology' in his seminal paper 'The Raft and the Pyramid' (Sosa, 1980) explicitly as a response to the challenges posed to the definition of knowledge as 'justified true belief' problematised by Gettier problems (Gettier, 1963). However, the last decade or so has also seen the emergence of a second 'school' of virtue epistemology, namely, 'virtue-responsibilism'. A virtue-responsibilist focuses identifies the value of intellectual virtues as their contribution to the formation of a 'virtuous' intellectual character. Their virtues, accordingly, have a more overtly moral tone, and include intellectual patience, intellectual generosity, intellectual humility, and so on (for a sophisticated exposition, see Robert & Wood, 2007, II).

Virtue-reliabilists may well entertain the strong epistemic aim of 'justified, true' knowledge of the world. There is, however, no reason to suppose that virtue-responsibilists also subscribe to this strong epistemic aim. Indeed, as a rule of thumb, reliabilists focus upon knowledge, whereas responsibilists focus upon the knower. As Jason Baehr (2006) remarks, whilst virtue epistemologists 'agree that the concept of an intellectual virtue deserves an important and fundamental role in epistemology', they are 'divided ... about which traits count as intellectual virtues'. Their divisions reflect competing accounts of the ends to which intellectual virtues contribute: reliabilists 'conceive of an intellectual virtue as (roughly) any reliable or truth-conducive property of a person, whereas responsibilists 'by contrast, conceive of intellectual virtues as good intellectual character traits, or the traits of a successful knower or inquirer' (Baehr, 2006, p. 479).

Using Baehr's account, one can clarify the 'epistemic aims' of the two schools of virtue epistemology. Ivanova's discussion pertains exclusively to virtue-reliabilism, hence her claim that virtue epistemology is committed to the strong epistemic aim of 'justified, true' knowledge of the world. For instance, this is evident in her remark that 'virtue epistemology focuses on the agent's intellectual virtues in order to evaluate her beliefs' (Ivanova, 2010, p. 61). This is true enough for virtue-reliabilism, but not for virtue-responsibilism. Considered in the light of virtue-reliabilism, Duhem clearly is not a virtue epistemologist, since, as Ivanova rightly notes, he rejects this strong epistemic aim. However, Ivanova does not consider virtue-responsibilism, which does not entertain this strong epistemic aim. Interpreted using the terms of virtue-responsibilism, one can make a much stronger case for Duhem being engaged in virtue epistemology.[2] After all, a virtue-responsibilist is not primarily concerned with knowledge *per se*, but with the 'intellectual character' of the inquirer—with whether they are intellectually-generous, -humble, and so on.

Interpreting Duhem as a virtue-responsibilist promises to strengthen Ivanova's proposal that one can interpret his 'good sense' in the light of the idea of the 'ideal scientist'. She suggests that one can 'idealise the properties and virtues of actual scientists into the properties and virtues of an ideal one. By omitting some of the properties of the actual scientists and by adding others that are not fully present in them, we can produce the perfect scientist, who, compared to the actual scientists, possess some extra properties and lacks others' (Ivanova, 2010, p. 63). This proposal does not sound like virtue-epistemology, if virtue epistemology is construed

only in its 'reliabilist' forms; however, it most certainly does sound like virtue epistemology, when the scope of virtue-epistemology is expanded to include responsibilism. Indeed, one could make the strong claim that the 'ideal scientist' described by Ivanova is what a virtue epistemologist would call an 'intellectually virtuous' scientist.

Ivanova suggests that one profitable way to develop Stump's virtue-epistemological interpretation of Duhem is to appeal to the idea of a 'perfect scientist'. Recall that, for Duhem, a 'perfect theory' cannot be attained. Ivanova proposes that, true as this may be, one can draw a parallel between perfect theories and 'perfect scientists'. An ideal scientists, argues Ivanova, 'possess[es] various characteristics of virtues such as impartiality, intellectual sobriety, rectitude, probity, and moral courage' (and note that there are all quite clearly the intellectual virtues of a responsibilist). Ivanova continues that, 'We can idealise the properties and virtues of ideal scientists into the properties and virtues of an ideal one. By omitting some of the properties of the actual scientists and by adding others that are not fully present in them, we can produce the perfect scientist' (Ivanova, 2010, p. 63). Of course, this 'perfect scientist' does not exist, any more than does the perfect theory; however, the idea does serve as an exemplar of 'an ideal agent capable of performing ideal operations', and as 'a model that should be followed' (Ivanova, 2010, p. 63).

Ivanova's account of a 'perfect scientist' is perfectly intelligible as a form of virtue-responsibilism. The idealised scientific inquirer she describes possesses responsibilist intellectual virtues, such as 'courage' and 'impartiality', and it is these virtues which, when 'sharpened' and applied, contribute to the success of their scientific inquiries. When Ivanova writes that the 'good sense' of a scientist consists in 'a cluster of dispositions that are developed through experience', which are 'sharpened' through practice, and therefore constitute 'a collection of virtues that an ideal scientist possesses', the virtue-responsibilist tone of her own proposal is obvious. Consider, for instance, her account in comparison with Roberts and Wood's remark that 'a good scientist is likely to exemplify patience, perseverance, industriousness, [and] courage', such that their virtuous characters 'foster the delivery of epistemic goods' (that is, scientific knowledge) (Robert & Wood, 2007, pp. 143–144). Roberts and Wood also offer case studies of scientists, including Jane Goodall, Francis Watson and James Crick, and Rosalind Franklin, which illustrate the virtues, or vices, they exhibited in the course of their scientific researches.

I suggest that Ivanova's criticisms of Stump's interpretation of Duhem are muted when one draws the distinction between virtue reliabilism and responsibilism. As long as the distinction between virtue-reliabilism and virtue-responsibilism remains unclear, Ivanova is correct to judge that 'literally interpreting Duhem as a virtue epistemologist does not fully capture his motivations and views on scientist method' (Ivanova, 2010, p. 62). However, once the distinction is introduced, Duhem's position relative to virtue epistemology becomes much clearer: his account of 'good sense', and, happily, the positive interpretation of it offered by Ivanova, strongly emerge as a form of 'virtue-responsibilism'. Indeed, Ivanova's 'ideal scientist' works well as a species of intellectually-virtuous inquirer. So, Duhem is not a reliabilist, because his interest is, unlike them, not with justified true belief (in the form of a 'perfect theory'), but with the intellectual character of the scientist. His account of 'good sense' is intended as a set of prescriptions for a virtuous intellectual character, in the form of the 'idealised scientist' of Ivanova's account.

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[2] Ivanova in fact notes that virtue epistemologists are 'generally criticised for being unable to explain what exactly differentiates them from reliabilism' (Ivanova, 2010, p. 62fn8), but does not suggest that such criticisms can be met by introducing the distinction between reliabilism and responsibilism. See Code (1987) for an early example of this distinction.

5. 'Intellectual humility' and the aims of inquiry

I have argued so far that Duhem can be profitably interpreted as engaging in virtue epistemology. My proposal is that Duhem is a 'virtue-responsibilist', and in this last section I would like to develop this claim by considering the possibility that his rejection of the possibility of our producing a 'perfect theory' reflects the key responsibilist virtue of 'intellectual humility'. This is important for two reasons. First, it helps to secure my general point that Duhem is engaged in virtue epistemology. Recall that Ivanova's criticisms of Stump relied upon the charge that Duhem cannot be a virtue epistemologist because he rejects the strong epistemic aim of knowledge of the 'objective ontological order of reality'. As I argued earlier, Duhem's claim here—a rejection of 'perfect theories'—may disqualify him from being a virtue-reliabilist, but it does not necessarily preclude his being a virtue-responsibilist. My second aim, then, is to reinforce my claim that Duhem is a virtue-responsibilist by demonstrating that his hostility towards 'perfect theories' in fact reflects his concern to manifest a key responsibilist virtue, namely, 'intellectual humility'.

Ivanova's criticism depends upon the claim that virtue epistemology is committed to the strong epistemic aim of knowledge of the 'true ontological order of reality'. Duhem rejects the possibility of a 'perfect theory' because human beings only ever 'possess ... an imperfect and provisional theory'. Indeed, Duhem explicitly states that 'we do not possess this perfect theory, and mankind will never possess it' (Duhem, 1954, p. 302). Now, Duhem's claim here may initially seem rather *un*virtuous. The bald statement that mankind 'will never possess' this perfect theory may seem like dogmatism of the first order, especially when one considers that Duhem clearly intends his claim to apply to all future inquirers.[3] At the least, it might seem to indicate a striking lack of humility, since Duhem seems to be legislating for future generations of scientists who, presumably, will enjoy technological and theoretical developments utterly unknowable to him. (Consider, for instance, other examples of confident statements of alleged insurmountable cognitive obstacles offered by previous scientists, such as Lord Kelvin's proclamation that heavier-than-air flight was impossible). How can Duhem's flat rejection of the possibility of 'perfect theories' be reclaimed as a reflection of the virtue of intellectual humility?

'Intellectual humility' is a complex virtue. It has recently received sophisticated discussion by Robert and Wood (2007, Chapter 9), although its pedigree as an ethical and a theological virtue is, of course, much older.[4] Intellectual humility is perhaps best described in contrast to its corresponding vices, 'arrogance', 'vanity', or 'hubris'. According to Roberts and Woods, a person lacks humility when their assessments of their own merit, worth, or significance exceeds its proper bounds—for instance, it may take the form of 'dispositions' to exaggerate one's own importance, to claim 'higher merit than one possesses', or to 'approve uncritically of one's own abilities and accomplishments' (Robert & Wood, 2007, pp. 236–237). A person is intellectually humble, by contrast, when they have an accurate and mature assessment of their cognitive capacities, and the epistemic potential legitimately available to them. For David E. Cooper, the 'intellectual vice' corresponding to humility is 'hubris',

which consists of one's claim to enjoy an 'exalted cognitive capacity' (Cooper, 2002, p. 174ff). This does not mean that certain persons cannot be cognitively-excellent—a chess grandmaster, say; rather, it only entails that the person has a proper perspective upon their excellence. One can be excellent and humble, just as long as one knows, as it were, just how brilliant they are, and does not, deliberately or not, under- or overestimate their brilliance. In both cases, intellectual humility indicates that one enjoys a proper, appropriate assessment of one's cognitive capacities, especially in relation to the 'epistemic ambitions' one entertains (see Cooper, 2002, p. 164ff).

Duhem's rejection of the possibility of our possessing a 'perfect theory' arguably reflects his commitment to the virtue of intellectual humility. It is worth recapping on Duhem's claim: a 'perfect theory' would reflect the 'true ontological order' of reality, but such a theory can never be produced by human inquirers, since we are 'epistemically restricted' and can therefore 'never reach the true order of nature' (Ivanova, 2010, p. 62). Duhem discusses these 'epistemic restrictions' in his autobiographical essay 'Physics of a Believer', where he argues that the mind, to avoid 'get[ting] lost in very complicated details', has 'neglected certain modalities, restricted the conditions of inquiry, and reduced the field of observation and experiment' (Duhem, 1954, p. 295).[5] Recognition of these 'restrictions' would be an important step towards intellectual humility, since one would therefore have the means by which to determine the proper scope of one's epistemic capacities. These restricted epistemic capacities are the reason that the 'hidden realities' underlying our empirical data 'cannot be grasped' or 'directly contemplate[d]', since the physicist, by inquiring into them, 'has already exceeded the limits of domain in which his methods can legitimately be exercised' (Duhem, 1954, pp. 296–297, 299).

Duhem in fact remarks that a 'perfect theory', 'like everything that is perfect, infinitely surpasses the scope of the human mind. The theories which our methods permit us to construct are no more than a pale reflection of it' (Duhem, 1996, p. 68). This is a classic statement of intellectual humility: a 'perfect theory' is unattainable because human cognitive capacities—the 'scope of the human mind'—are inadequate for the task—it 'infinitely surpasses' them. Translated in Cooper's terms, to aspire to provide a 'perfect theory', or to claim to have generated one, indicates a 'hubristic' overestimation of our cognitive capacity; or, in Roberts and Wood's terms, a 'disposition' to exaggerate our 'merit ... [,] abilities and accomplishments'.

Duhem's proscription against 'perfect theories' therefore reflects his intellectual humility. The 'scope of the human mind' is inadequate to the task of providing a 'complete and adequate metaphysical explanation of material things' (Duhem, 1996, p. 68). Again, our cognitive capacities do not permit us to 'strip reality of the appearances covering it like a veil, in order to see the bare reality itself' (Duhem, 1954, p. 70). These are the words of a virtue-responsibilist manifesting the virtue of 'humility': a proper acknowledgement of the cognitive capacities appropriate to human beings, and of the proper epistemic ambitions open to us.[6] Therefore, the reasons that we 'do not' and 'will never' possess a 'perfect theory' is because of the epistemic restrictions imposed by 'the scope of the human mind'.[7]

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[3] Consider, by way of illustration, Max Born's announcement, in 1928, that 'physics as we know it will be over in six months.' One might include the rhetoric of 'the end of science' within the class of intellectually-hubristic statements.

[4] The classic discussion is arguably Thomas Aquinas' 'On Humility' (*Summa Theologica*, Qu161). See also Richards (1992).

[5] It is worth adding that Duhem opens this essay with an affirmation of his Catholic faith, a point treated at length in Martin (1991). The virtue of humility is, of course, central to Catholic theology, and it is interesting to speculate as to what extent Duhem's account of 'intellectual humility' was influenced by his Catholic faith, and, perhaps, his studies of medieval science.

[6] Such negative conceptions of humility—as some kind of perverse praise of one's own limitations and faults—seems to owe much to Aquinas's treatment of humility. Judith Andre is, therefore, surely correct in her remark that '[i]f humility is a virtue it will be a richer object of study than the current philosophical discussion suggests' (2002, 279).

[7] Interestingly, Ivanova suggests that Duhem's remarks upon our 'aspiration towards unity in science, which cannot be justified but also cannot be stifled ... can be seen as similar to Kant's regulative principles of reason' (Ivanova, 2010, p. 59fn5). If this is so, then the account of 'intellectual humility' sketched here could be interpreted within a Kantian framework. I do not intend to take up this idea here, though for an excellent account of 'Kantian humility', see Langton (1998).

For Duhem, intellectual humility, as I have sketched it, consists in recognition and affirmation of this fact. In gnomic terms, human beings cannot provide a 'perfect theory' because we are not 'perfect inquirers'—that is, we cannot become the 'perfect scientists' that Ivanova describes, even if an actual scientist can, as she notes, 'approximate and resemble to a differing degree the action of the perfect one' (Ivanova, 2010, p. 63). And it is worth adding that the fact that certain features of the 'order of being' exceed 'all our competence' (Havel, 1989, p. 153) should not inspire pessimistic renderings, such as Nancy E. Snow's suggestion that '[c]entral to the role of humility is the acknowledgement of error or personal deficiency and its negative impact on others' (Snow, 1995, p. 205). There is, surely, no shame in our 'failure' to successfully achieve epistemic aims which were, 'always, already' unattainable by human beings. It is no criticism of a scientist, or even a community of scientists, to state that their knowledge of the world cannot be 'complete', 'final', or 'absolute'. Any disappointment arising would surely indicate a grossly exaggerated assessment of the epistemic capacities of human beings, an assessment which an intellectually-virtuous scientist should be keen to adjust.

Therefore, Ivanova's initial argument that Duhem cannot a virtue epistemologist because he entertains a 'modest' epistemic aim is, quite the contrary, the very reason that he does class as a virtue epistemologist—as long as it is emphasised that he is a 'virtue-responsibilist', and one, moreover, with a special sensitivity to the virtue of intellectual humility. An intellectually-virtuous inquirer could not assert that her theories were, in fact, 'perfect' or 'complete' in Duhem's sense, because in so doing that would fail to demonstrate 'intellectual humility'. Lest this conclusion seem to lapse into scientific anti-realism or intolerable epistemic pessimism, let me emphasise that the intellectually-virtuous inquirer—Ivanova's 'perfect scientist', perhaps—does not deny that knowledge can be generated about the world—only that a 'perfect theory' of the world can be provided.

6. Conclusions

I have argued that a good case can be made for Duhem's status as a virtue-responsibilist. I agree that Stump's account of Duhem's concept of 'good sense' is best interpreted using the resources of virtue epistemology. I challenged Ivanova's criticisms of Stump by arguing that she not distinguish between 'reliabilist' and 'responsibilist' virtue epistemologies. Her argument that Duhem is not a virtue epistemologist applies only to 'virtue-reliabilism', and by introducing this distinction, I demonstrate that Duhem can in fact be interpreted as a 'virtue-responsibilist'.

Ivanova is therefore correct that Duhem is not a virtue-reliabilist, but wrong to suggest that this negates his credentials as a virtue epistemologist. I suggested that her conclusion relied upon a failure to draw a distinction between 'reliabilist' and 'responsibilist' virtue epistemologies, and that, once this distinction is in place, Duhem clearly emerges as a virtue-responsibilist. Virtue-responsibilism does not share the strong epistemic aims which Duhem explicitly rejects and so he can be profitably interpreted within their ranks. Furthermore, interpreting Duhem as a virtue-responsibilist strengthens Ivanova's positive proposal that Duhem's 'good sense' reflects a conception of the 'ideal scientist'. I supported my proposal that Duhem is a 'virtue-responsibilist' by arguing that his rejection of the possibility of our producing a 'perfect theory' reflects the key responsibilist virtue of 'intellectual humility'. It should also demonstrate that what constitutes 'good science' depends importantly upon our ideas about what a 'good scientist'.

Acknowledgements

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