

The Proper Ambition of Science

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London and New York

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1 Introduction

Jonathan Wolff

We make our beginning with a change which set in at the turn of the past century in the general evaluation of the sciences. It concerns not the scientific character of the sciences but rather what they, or what science in general, had meant and could mean for human existence. The exclusiveness with which the total world-view of modern man, in the second half of the nineteenth century, let itself be determined by the positive sciences and be blinded by the 'prosperity' they produced, meant an indifferent turning-away from the questions which are decisive for a genuine humanity.... It excluded in principle precisely the questions which man, given over in our unhappy times to the most portentous upheavals, finds the most burning: questions of the meaning or meaninglessness of the whole of this human existence.... Scientific, objective truth is exclusively a matter of establishing what the world, the physical as well as the spiritual world, is in fact. But can the world, and human existence in it, truthfully have a meaning if the sciences recognize as true only what is objectively established in this fashion...?

(Husserl 1970:5–7)

In the Preface to his *The Crisis of European Sciences*, Husserl presents a picture in which science, having banished the most burning of human questions from its domain, comes increasingly to dominate culture and serious thought. The first decisive turn, it is suggested, was taken by Galileo, in the attempt to subject all of nature to mathematics. This, by stages, led eventually to the prejudice that the only things that truly exist are those that can be weighed, measured or counted in some way. Against this background, the 'lived world' is displaced and value and meaning can no longer find purchase. Philosophy, says Husserl, becomes a struggle for its own existence (Husserl 1970:13).

An enormous number of questions arise from this account, and the purpose of this collection is to pose and consider some of them. Is Husserl correct in his assessment of the scientific ambition since Galileo? Did earlier scientists or philosophers have the totalising ambitions for science, or a particular science, so tellingly set out by Quine in his response to Goodman's claim that science—and, in particular, physics—is only one version of the world, one 'way of worldmaking'? Quine remarks:

Why, Goodman asks, this special deference to physical theory? This is a good question, and part of its merit is that it admits of a good answer. The answer is not that everything worth saying can be translated into the technical vocabulary of physics; not even that all good science can be translated into that vocabulary. The answer is rather this: nothing happens in the world, not the flutter of an eyelid, not the flicker of a thought, without some redistribution of microphysical states. It is usually hopeless and pointless to determine just what microphysical states lapsed and what ones supervened in the event, but some reshuffling at that level there had to be; physics can settle for no less. If the physicist suspected there was any event that did not consist in a redistribution of elementary states allowed for by physical theory, he would seek a way of supplementing his theory. Full coverage in this sense is the very business of physics and only of physics.

(Quine 1981:98)

But can such a scientific worldview co-exist with other accounts, or does it in principle or by tendency eliminate them as illusions?

Most of the papers in this collection were presented at a seminar series organised by the Philosophy Programme of the University of London School of Advanced Study in 1996–7, as part of its annual *History of the Problems of Philosophy* seminars. The idea of the series is to trace a problem of philosophy, through its variation in formulation, approach and attempted solution, from the ancient world to the present day. 'The Proper Ambition of Science' may not (yet) be the name of a classic problem of philosophy, but it is a question that arises in many guises and at many times. While this collection may well be one of the most comprehensive attempts to explore these issues, complete coverage unfortunately is not possible and it is not surprising that the majority of the papers here are concerned with modern and contemporary accounts. Even there the treatment has to be partial and, for example, little in this volume concerns the work of Hume and Kant. This we regret, but there are always limits to what can be accomplished in a single volume.

The collection begins with R.W.Sharple's paper 'Science, Philosophy and Human Life in the Ancient World'. Sharple centres on the question of

whether any ancient thinker can be seen as proposing an eliminative understanding of science; that is to say, a vision of science which not only aims at universal understanding, but one which claims that non-scientific explanations are illusory and have no place in a fundamental account of the world. Although the philosophical concerns and doctrines of antiquity often seem very close to our own, they can also seem very distant. Among the ancients only certain Stoics imagined that any science could aim at complete coverage, and then only astrology. Interestingly, though, this doctrine was not based on any idea of the causal priority of the heavenly bodies, but on the causal inter-dependence of all things: by modern standards a view which deserves somewhat more respectful appraisal. However Sharples concludes that neither in astrology nor in medicine—his other leading example—did any ancient thinker rigorously propose an eliminative view even within the scope of its own sphere of application. Even ancient atomism appears not to be eliminative.

We move on the thirteenth century, and in order to bring out some of the major concerns of ‘high medieval science’ M.W.F.Stone concentrates on Albert the Great’s writings on the hierarchy of the sciences. Stone explains the nature and development of Albert’s subtly shifting views, situating his thought in the context of a revival of interest in all facets of Aristotelian philosophy, and the engagement of that tradition with Neoplatonism. One thing remains constant through the changes in Albert’s view: theology—the contemplation of the divine—stands fast at the top of the hierarchy, while the natural sciences, despite Albert’s immense regard and knowledge for his time, remain at the bottom. This does not entail that ‘science’ is essentially inferior to theology. Rather, the point for Albert is that all spheres of learning are essentially connected. Theology provides the individual sciences with their point and purpose.

G.A.J.Rogers continues the theme of the relation between the established teaching of the church and the growth of scientific knowledge as they increasingly came into tension in the seventeenth century. However just as central to Rogers’s account is the conflict between the new atomistic theories of matter and traditional epistemology once it is appreciated that on the atomistic theory we do not see things as they really are in themselves. This is the beginning, then, of the dislocation between the scientific world view and our intuitive accounts of the ‘lived world’ that so troubled Husserl. Rogers, however, reminds us of a point that complicates the picture. Few, if any major seventeenth century scientific philosophers thought that certainty could be achieved in the natural sciences. Thus any particular scientific world view is only, on this view, a theory.

J.R.Milton takes up another aspect of the thought of this period: the assault by both scientists and philosophers on the notion of a hierarchy of degrees

of perfection. Modern science is generally seen by both its advocates and critics as value-free: older concepts of perfection and nobility that appear to straddle the fact/value divide are firmly rejected. Milton describes the abandonment of hierarchical concepts in both physics and metaphysics during the course of the seventeenth century, and discusses the possible connections between these changes, arguing that neither change should be seen simply as a consequence of the other.

With Aaron Ridley's discussion of Nietzsche we move to more contemporary concerns. Husserl was not alone in his concern about increasing scientism (indeed many of Husserl's claims echo those of Nietzsche). As Ridley says, 'Nietzsche is acutely aware of the scientism of his contemporaries, and had he had us for his contemporaries his awareness would have been acuter still.' Yet as Ridley demonstrates, science for Nietzsche in its proper place—acknowledged as one perspective among others rather than as a privileged perspective-free vantage point—is in 'the service of life'. Scientism, by contrast, stunts life by forcing it into a single stultifying pattern.

Christopher Hookway considers how these themes are worked out in the writings of the pragmatists. The simple picture is that Peirce adopts some form of singular scientific method in philosophy, while James is a pluralist, privileging no version of the world above any other. Thus Hookway quotes Peirce in terms that would apparently make Husserl wince; as announcing his intention to bring 'modern mathematical exactitude to philosophy' and to 'rescue the good ship Philosophy for the service of Science from the lawless rovers of the sea of literature'. Yet even Husserl may agree with Peirce's underlying meaning; that philosophy should be conducted with an intense desire to discover the truth.

We must ask, though, whether science is to be characterised by a subject matter (Dewey) or a method (Peirce), which raises the further question of whether the same subject matter can be approached in both a scientific and non-scientific manner. But as Hookway shows, while there are important differences of emphasis among the pragmatists, attempts to line them up on one side or other of a 'scientific' and 'pluralist' divide leaves out much of interest in all views. Furthermore little Peirce says should provide any comfort for the modern day 'naturalist' who wishes to base philosophy on the results of the special sciences.

We began in this introduction by setting out some of Husserl's concerns about the increasing dominance of the scientific methodology upon European thought. Thus it is something of an initial surprise to see that, according to Dermot Moran, Husserl not only was not opposed to science but that he 'saw science as the only hope for the salvation of humanity', and, indeed, thought philosophy should live up to the ideal of itself as a rigorous science.

This scientific model of philosophy was proposed as a protective against irrationalism or relativism, yet it was equally important for Husserl to avoid naturalism and scientism. Moran points out that for Husserl ‘true objectivity is found not by excluding subjectivity but precisely by taking it into account’.

Thomas Uebel takes us into the world of logical empiricism and to a highly specific case study in the philosophy of social science. Both Popper and Hayek argued against what they saw as a massive misconception of the possible application of scientific ideas: the political reorganisation of society upon ‘scientific’ lines. Uebel suggests that, despite the differences between them, both Popper and Hayek also aimed their critiques at an unspecified enemy: the philosophy which they thought stood behind Otto Neurath’s proposals for rational economic planning. As Uebel maintains, on a reading of the texts it is far from clear that Neurath deserved such criticism. Nevertheless, in the process of examining Popper and Hayek’s charges we come to understand that many logically distinct positions can be called ‘scientism’ and if, indeed, they are all mistaken, then they are not all mistaken in the same way.

The collection ends with two papers arguing for different accounts of the proper ambition of science, or, again, at least of physics. David Papineau considers the doctrine of contemporary physicalism, which he defines as the claim that everything is physically constituted: an ontological doctrine. Like Quine he sharply distinguishes this from the methodological doctrine that everything should be studied by the methods of the physical sciences. Contemporary physicalism, Papineau argues, is motivated by a simple argument, based on a premise which, he claims, became available—or at least commonplace—only in the twentieth century: the premise of the completeness of physics. This is the thesis that all physical effects are due to physical causes rather than, say, that some are due to ‘vital motions’. (This is to be understood as to leave open questions about any sphere which may not have physical effects, such as the moral or mathematical.) Papineau traces the chequered history of the theory of the completeness of physics through post-Galilean mechanics. His conclusion is that, understood correctly, it has now been established, by any reasonable standard, by more than a hundred years of detailed empirical research.

Nancy Cartwright reads the empirical record another way. Her understanding of the thesis of the completeness of physics is phrased in slightly different terms—that the laws and theories of physics can in principle subsume everything—and she is highly sceptical. Not only does Cartwright dispute that physics can account for everything outside its immediate domain, she claims that ‘physics cannot account for everything that is in its domain’. The mistake can, at least in part, be attributed to our tendency to overlook the fact that physics enjoys its extraordinary predictive success only in those

areas where *ceteris paribus* laws frame the domain under consideration. Outside such ‘nomological machines’ causes which are not part of the system will exert disruptive effects. As an alternative to the ‘pyramid’ of reduction with physics at its tip, Cartwright offers the image of a patchwork of laws governing a ‘dappled world, a world rich in different things, with different natures, behaving in different ways’. But as Cartwright warns, this is simply a different image, and neither the image of a pyramid or a dappled world should be allowed to dominate our thinking.

What then may we conclude from these explorations? Perhaps only that the views of every major thinker are more subtle, more nuanced, and, perhaps, more reasonable, than we come to think if we attend only to the stark oppositions in which they are so often presented. But on further reflection, interesting conclusions can be drawn. From ancient times to the present day the question of how the body of knowledge demarcated ‘science’ relates to the nature and scope of philosophy has been of pressing concern. From ten particular case studies we see that how this concern presses differs from age to age and from thinker to thinker, but press it does. So while there is no unity on what, exactly, the problem is—still less on how it should be resolved—we see continuous engagement spurred on by the belief that there is something problematic in this area. But we should not expect cosy consensus on the nature of the problem and its solution to break out any time soon. For evidence one need only consult the final two papers in this collection.

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5 The end of hierarchy

Physics and metaphysics in the scientific revolution

J.R.Milton

I

At least among philosophers, one of the best-known arguments for the existence of God is the one set out by Descartes in the third Meditation. The argument is a causal one, starting from Descartes's own idea of God and proceeding to enquire into what the cause of this idea must be. Quite clearly some strong metaphysical principles are going to be needed if any such train of argument is to reach the desired conclusion, and Descartes showed no obvious reluctance in revealing at least one of them:

It is manifest by the natural light that there must be at least as much reality in the efficient and total cause as in the effect of that cause. For where, I ask, could the effect get its reality from, if not from the cause? And how could the cause give it to the effect unless it possessed it? It follows from this both that something cannot arise from nothing, and also that what is more perfect—that is, contains in itself more reality—cannot arise from what is less perfect.¹

Students reading Descartes for the first time often find that this is the point at which their patience finally snaps, and they cease giving him the benefit of the doubt. It is difficult not to sympathise with them: if there is one point at which—to the modern reader at least—the argument of the *Meditations* manifestly leaves the rails it is here.²

Several unflattering explanations can be given for Descartes's decision to proceed in this way, for example that he was incompetent in handling philosophical issues, or that he was less than wholly sincere when dealing with religious matters of any kind.³ The former can be rejected without further delay; the latter is less easy to dispose of. Several of Descartes's contemporaries regarded him as an unbeliever who for reasons of prudence chose to give public allegiance to doctrines which in private he

rejected.⁴ Fortunately the precise extent of Descartes's dissimulation need not be decided here. Metaphysical commitments like those expressed in the third Meditation can be found in other seventeenth-century philosophers whose sincerity there is no reason to doubt. In the *Cogitata Metaphysica* Spinoza offered a proof of the proposition that creatures are in God eminently by appealing to the principle that there must be at least as much perfection in the cause as there is in the effect, though it has to be said that from this thoroughly Cartesian principle he drew the very un-Cartesian conclusion that all the perfections of extension are in God (Spinoza 1972 I: 237). This particular argument does not reappear in the *Ethics*, but a metaphysical concept of perfection certainly does, and Spinoza made significant use of it.

No one has ever supposed that Spinoza was insincere about these matters, and there seems to be no need to assume that Descartes was either: I shall proceed on the assumption that he was not. If this is right then what we have is something very interesting, certainly to an intellectual historian, but I hope also to philosophers as well. The passages of the *Meditations* which we find alien and perhaps even only partially comprehensible are outcrops of an elaborate metaphysical system, now largely buried and requiring excavation if its structure is to be understood.

The system contains at least four elements:

- 1 There are degrees of reality, in the sense that some entities are more real, or more fully existent, than others.
- 2 The entities so distinguished can be ordered in a hierarchy, which has a highest (and in some versions also a lowest) member.
- 3 There is a fusion of the metaphysical and the ethical. Entities are graded in terms of *perfection*, and this is a concept that straddles what many modern philosophers would hold to be an absolutely fundamental distinction between facts and values.
- 4 Finally there is the principle that the cause must possess more perfection than its effect. I shall refer to this as the Causal Axiom.

Some comments on these seem appropriate:

- 1 The idea that there are degrees of reality, like so much else in this way of thinking, goes back to Plato; one thinks in particular of the analogy of the divided line in the *Republic*.
- 2 The idea that the degrees of reality can be ordered in a hierarchy could be seen merely as a corollary of the first principle, but is better listed separately. It is certainly possible for someone to hold a kind of unstructured pluralist view to the effect that there are many different

ontologically distinct types of entity, but no ordering of any kind among them; the Aristotelian categories, except substance, might be an example of this. This doctrine can of course be expressed without any use of the word *hierarchy*. Though evidently Greek in its etymology, the word is not itself classical. It is ancient however: if not coined by Pseudo-Dionysius, the Christian Neoplatonist who assumed the identity of Dionysius the Areopagite around 500 AD, it was certainly established as a technical term by him, and it is no doubt because of his immense—if fraudulently acquired—influence, as well as the term's undoubted usefulness, that it passed into the common vocabulary of scholastic—and subsequently post-scholastic—philosophy.⁵

- 3 One of the metaphysical notions in Descartes that causes most trouble for the modern reader is that of perfection. Superficially there are no translation problems here: the English word 'perfection' translates the Latin *perfectio*, which in turn corresponds to the Greek τελειότης. Understanding what these words once meant is however not quite so straightforward.

We may start with the Greek term. Τελειότης, like the adjective τέλειος from which it is derived, has connotations which the Latin *perfectio* lacks. Both words are derived from τέλος, *goal or end*, familiar to us from words like 'teleology'. The basic meaning is one of completion or fulfilment; a adult man can be described as τέλειος, meaning nothing more than that he is fully grown (Plato, *Laws*: 929C). None of these words is distinctively philosophical: all of them, even the abstract τελειότης, are to be found in the Greek New Testament (Heb. vi. 1, Col. iii. 14).

In Latin this semantic link is broken: there is no etymological connection between the word for end, *finis*, and *perfectio*, which comes from *perficere*, to complete, and ultimately from *facere*, to do or make. The severing of one connection merely results however in the establishment of another: the notion of perfection is now linked with that of making. Some of the implications of this new terminology are revealed in Aquinas' discussion of the perfections of God at the beginning of the *Summa Theologiae*. It might seem, he says, that God ought not to be described as perfect, because the perfect is, as it were, totally made (*quasi totaliter factum*), and God is not a being that is made at all. Clearly this is an argument founded on etymology of *perfectio*, and Aquinas saw no reason to be guided by such considerations. In philosophy the word needs to be given a different meaning: the perfect is *illud cui non deest esse in actu*, literally that which is lacking no being in act, and this description, unlike *quasi totaliter factum*, applies quite unproblematically to God.⁶

We have here in fact an interesting example of a not uncommon phenomenon. When the meaning of a term is fixed by its use in a tightly constructed intellectual system—whether scholastic theology, Newtonian mechanics, or whatever—its etymology largely ceases to matter; if the framework is loosened it regains, or at least can regain, its importance. An example is provided by the very different degree of attention that Locke and Spinoza give to the meanings of *sub* (under) and *stans* (standing) in their understanding of the term *substance*.

- 4 By the time that Descartes came to use it in *Meditations*, the Causal Axiom already had a long history. It appears as proposition 7 of Proclus' *Elements of Theology*. 'Every productive cause is superior to that which it produces', a proposition described by E.R.Dodds as 'the principle on which the whole structure of Neoplatonism is really founded' (Proclus 1963:7, 193). Nothing can owe its existence to an entity inferior, or indeed merely equal, to itself. The causal order is therefore necessarily a hierarchy of decreasing perfection: 'in all that multiplies itself by procession, those terms which arise first are more perfect than the second, and these than the next order, and so throughout the series' (ibid., prop. 36).⁷ If we were to imagine Proclus reading the *Meditations*, we could reasonably surmise that he would have been baffled by much that he found, but I am inclined to suspect that the argument for the existence of God in Meditation III would at any rate have appeared reassuringly familiar.

II

By no means all of Descartes's contemporaries found his line of thought persuasive. Hobbes found hierarchical metaphysics flatly unintelligible, and told Descartes so in an exchange that left each firmly persuaded of the metaphysical incompetence of the other. Hobbes announced his objection in a manner not calculated to calm Descartes's already mounting irritation:

Moreover, M.Descartes should consider afresh what 'more reality' (*plus realitatis*) means. Does reality admit of more or less? Or does he think that one thing can be more of a thing than another? If so, he should consider how this can be explained to us with that degree of clarity that every demonstration calls for, and which he himself has employed elsewhere.

(AT VII:185)

Descartes's reply shows his annoyance:

I have also made it quite clear how reality admits of more and less. A substance is more of a thing than a mode; if there are real qualities or incomplete substances, they are things to a greater extent than modes, but to a lesser extent than complete substances; and finally that if there is an infinite and independent substance, it is more of a thing than a finite and dependent substance. All this is completely self-evident [*Haecque omnia per se sunt notissima*].

(AT VII:185)

It was by no means completely self-evident to Hobbes.

This bad-tempered exchange between Hobbes and Descartes is interesting not only as a collision between two of the most self-confident, indeed arrogant, of the new philosophers, but also as one of the more easily visible manifestations of an intellectual revolution which has received relatively little attention.⁸ A way of thinking that was dominant from late antiquity until the seventeenth century has since fallen into disuse. Many questions could be asked about this, but two in particular concern us. In the first place, how was it that this whole way of thinking became both unacceptable and unintelligible?⁹ Secondly, what part if any did the natural sciences play in these events?

At first sight one might suppose the answer to the second question must be that the role of the natural sciences is unlikely to have been very great. The doctrine we are concerned with surely counts as a metaphysical one, if anything does, and quite manifestly is not open to empirical refutation. (One could add that many of its holders would not have regarded empirical refutation as having the requisite epistemic authority in any case.) Nevertheless the issue is well worth pursuing: metaphysical doctrines that become widely accepted and endure for centuries are seldom if ever adopted solely for their intrinsic merit. They appeal because they can be made use of, and are in turn discarded once they become useless or worse; in this respect they are like glue or cement, permeating structures composed of other materials and binding them together, or else failing to do so.

We can therefore quite reasonably presume that hierarchical metaphysics owed its enduring appeal to the fact that it stabilised and reinforced non-metaphysical doctrines. If we are seeking reasons for its decline we should certainly be prepared to look outside philosophy, though we should certainly still continue to look *inside* philosophy as well.

We may start however by looking outside. Even a cursory survey makes it clear that several quite distinct kinds of answer to the question of why hierarchical metaphysics declined have been proposed.

One is socio-political. Many twentieth-century thinkers, influenced

directly or indirectly by Marx or Durkheim, are inclined to assume from the outset that religious and metaphysical doctrines are to a substantial extent projections of social structures. At its crudest—and it is generally the crude versions of any system that are the most influential ones—we have the familiar idea that grossly inegalitarian social arrangements are defended by being represented as natural—reflections of a supposed external reality which is in fact nothing more than a projection of the social relations themselves. During the early modern period European society underwent a change from a hierarchically ordered feudal society to a bourgeois capitalist one, and the dominant conceptual framework changed with it.

Any unease that one might feel about this picture need not arise from a belief that philosophical systems are devised and propagated in total isolation from society, but rather from a recognition that the connections are far more complex and less rigid than any simple ‘ruling class: ruling ideas’ model can allow. Consider for example the emergence of Neoplatonism in the third century AD. The Roman Empire in which Plotinus lived was a highly inegalitarian society, but not a strikingly *hierarchical* one as compared, for example, with medieval Europe. Medieval Europe on the other hand saw a systematic assault on hierarchical metaphysics in the form of Ockhamist nominalism. Some Marxist historians have seen a link between the revival of Neoplatonism in late fifteenth-century Florence and the rise of the Medici, the change being brought about by the decay of the republican institutions that had underpinned the old civic humanism. This is an interesting suggestion, but any *general* link between hierarchical metaphysics and political absolutism seems difficult to sustain.

Consider for example two philosophers from the seventeenth century. One—we may call him *A*—came from a clerical background, and was dependent for the whole of his life on the patronage of one of his country’s wealthiest noble families. He was an unabashed supporter of political absolutism in its most extreme form, and when his country slid into civil war aligned himself unhesitatingly with the royalist side; albeit only with his pen, and at a safe distance, since he had fled abroad long before he himself could have been in any danger. He had a firm dislike of the republican values incorporated in the civic humanist tradition, which was exceeded only by his loathing of lower-class radicals and other disturbers of the traditional order.

Our second philosopher, *B*, came from one of the very few non-monarchical states in Europe, and the one with the most advanced, capitalist economy. In its political turmoils he was a firm and open supporter of the republican side, even at some risk to himself. By virtue of his own origin he was entirely detached from such remnants of the feudal hierarchy as remained in his country, and he earned the small income his modest tastes required

from his labours as a skilled artisan, the very class in which (it is said) social and religious radicalism are most likely to be found.

Who is likely to be well-disposed to hierarchical metaphysics, *A* or *B*? If social milieu determined ideology the answer would surely have to be *A*. In the present context one can reasonably suspect that few if any readers would give this answer, partly because the strategy of the trick question is known to us all, but mainly because no one familiar with the seventeenth century would have much difficulty in penetrating the not very opaque disguises hiding Hobbes and Spinoza.

Hobbes's curt dismissal of Descartes' hierarchical metaphysics has already been described; it is not at all surprising that he had equally little time for more traditional notions of perfection. This is made clear in some passages in his most sustained attack on scholastic physics, the examination of Thomas White's *De Mundo*. Hobbes did not deny that the world can be described as perfect, but all this meant was that God had finished making it; it certainly did not imply that the world was best in any moral sense:

The only person...who can deny that the world is made completely [*perfectissimum*] is he who at the same time wishes to deny that it was made as God wished it made. But could he have made a greater habitation, resplendent in more stars, or inhabited by more prudent and better animals, or resplendent in wiser or more pious persons who would have pleased God himself more? All this (unless the world is thought to be best on the grounds that God made it instead of another) is open to doubt.¹⁰

(Hobbes 1976:394, translation modified)

Such concepts as nobility also have no place in natural philosophy: 'Whether rest is nobler than motion is an absurd question, for nobility is the renown of men, [deriving] from lineage, riches, civil power, virtue and the like' (ibid.: 321). Hobbes did not insist that terms such as 'nobility' were to be eliminated from natural philosophy, but if they were to be retained they would need to be defined in a way that severed any link with human society—for example as special power of efficacy, or a potential to act (ibid.).

Hobbes never published his polemic against White, and Spinoza certainly never read it, but there can be little doubt that he would have agreed with Hobbes on one point at least. Nature is not to be regarded as imperfect because some aspects of it are uncongenial to human beings:

The perfection of things is to be judged solely from their nature and power; things are not more or less perfect because they please or offend

men's senses, or because they are of use to, or incompatible with, human nature.

(*Ethics* I Appendix)

Spinoza's own position is however quite unlike Hobbes's in one crucial respect: while the anthropocentric elements of the traditional picture are dropped, the metaphysical elements are retained. There is a hierarchy of perfection, with God at its head: 'That effect is most perfect [*perfectis-simus*] which is produced immediately by God, and the more something requires intermediate causes to produce it, the more imperfect it is' (*Ethics* I Appendix). Perfection can and should be defined in purely metaphysical terms: properly understood it is nothing other than reality.¹¹

As in Proclus perfection is linked with agency; this is made clear in a much later passage in the *Ethics*, near the end of Part V: 'The more perfection a thing a thing has, the more it acts and the less it is acted on; and conversely, the more it acts, the more perfect it is' (*Ethics* V prop. 40). This is not a proposition that Hobbes would have been prepared to accept, and one may doubt whether he would even have found it intelligible.

III

If the fall of hierarchical metaphysics is not a mere by-product of social change, can it be explained in other ways? In particular, is there a link with the revolutionary changes that occurred in the natural sciences?

At first sight there are strong grounds for supposing that there is such a link. From late antiquity until the end of the sixteenth century the generally accepted model of the universe was Aristotelian, albeit modified and altered in various ways, most conspicuously by the introduction of epicyclic astronomy. The chief features of the Aristotelian cosmos was that it was finite and that it was *centrifocal*, to use David Furley's convenient expression (Furley 1989: vol. 1:25). Contrary to what is often assumed this did not make the centre the most important point—indeed quite the opposite—but it did introduce an inherent *value gradient* into the universe: in contemplating the heavens one looked quite literally *upward*, and not merely *outward*, as we now do.¹² Because of its hierarchical organisation the Aristotelian-Ptolemaic cosmos was admirably suited to serve as a concrete, spatially extended manifestation or symbol of the metaphysical hierarchies of the intelligible world. The infinite universe of Bruno and Descartes entirely lacked this character, not because of its extent but because it was both homogeneous and isotropic; in such a universe there is no intrinsic difference between anywhere and anywhere else.

It is therefore unsurprising that some of the main proponents of the new

astronomy had little sympathy with the old metaphysics. In Galileo's *Dialogue Concerning the Two Chief World Systems* Simplicio, the spokesman for the Aristotelians, began—following Aristotle's order in *De Caelo*—by arguing that the universe must have three dimensions because it is perfect. Salviati, representing Galileo himself, responded with unconcealed derision:

I feel no compulsion to grant that the number three is a perfect number, nor that it has a faculty of conferring perfection upon its possessors. I do not even understand, let alone believe, that with respect to legs, for example, the number three is more perfect than four or two; neither do I conceive the number four to be any imperfection in the elements, nor that they would be more perfect if they were three. Therefore it would have been better for him [Aristotle] to leave these subtleties to the rhetoricians, and to prove his points by rigorous demonstrations such as are suitable to make in the demonstrative sciences.

(Galileo 1967:11)

When the notion of perfection was next mentioned it was again dealt with harshly, this time by the third participant, Sagredo:

I cannot without great astonishment—I might say great insult to my intelligence—hear it attributed as a prime perfection and nobility of the natural and integral bodies of the universe that they are invariant, immutable, alterable etc., while on the other hand it is a great imperfection to be alterable, generable, mutable etc.

(Ibid.: 58)

Like Hobbes, Galileo thought that notions such as perfection and imperfection, or nobility and baseness are entirely out of place in natural philosophy and have meaning only in relation to the circumstances of human life:¹³

What greater stupidity can be imagined than that of calling jewels, silver, and gold 'precious', and earth and soil 'base'? People who do this ought to remember that if there were as great a scarcity of soil as of jewels or precious metals, there would not be a prince who would not spend a bushel of diamonds and rubies and a cartload of gold just to have enough earth to plant a jasmine in a little pot...

(Ibid.: 59)

The kind of explanations Galileo preferred were of an entirely different character. While Simplicio argued that the heavenly bodies are all perfect,

and consequently ‘their shape is also perfect; that is to say, spherical’, Salviati replied by saying that the moon is (approximately) spherical because of the tendency of its parts towards their centre, not because the sphere is a perfect shape (ibid.: 84, 97).

The example of Galileo suggests an attractively simple solution to our problem: hierarchical metaphysics fell into disuse because hierarchical physics—the physics of the Aristotelian-Ptolemaic cosmos—was abandoned. Unfortunately things are not quite as simple as this. As the case of Descartes makes clear, there is no rigid connection between cosmology and metaphysics, such that anyone rejecting the old cosmology had necessarily to reject the old metaphysics, or vice versa. In natural philosophy Descartes and Hobbes were moderns: both were advocates of the new heliocentric cosmology and the mechanical world picture. Whatever the role of scientific theory-change in the fall of the hierarchical world picture, by itself it does not even begin to explain the deep metaphysical chasm—this seems hardly too strong a word—that manifests itself in the third set of *Objections and Replies*.

Quite a number of the real (or alleged) characteristics of Hobbes’s thought can be eliminated fairly quickly as general causes of the decline of hierarchical metaphysics: in particular, materialism, atheism and naturalism. If the fall of hierarchical metaphysics had depended on the widespread acceptance of any of these, it would have occurred much later than it actually did—certainly not until the nineteenth century, possibly not until the twentieth. In fact it was rejected by most of Hobbes’s successors.¹⁴

Though Locke cautiously endorsed a version of the Great Chain of Being (*An Essay concerning Human Understanding*, III. vi. 1–12) the *Essay* contains almost no trace of hierarchical metaphysics in any strict sense. The one partial exception occurs at the end of the proof of God’s existence in Book IV, where we find the following passage:

And whatsoever is first of all Things, must necessarily contain in it, and actually have, at least, all the Perfections that can ever after exist; nor can it ever give to another any perfection that it hath not, either actually in it self, or at least in a higher degree.

(*Essay* IV. x. 10)

There are good reasons for supposing that this section of the *Essay* was written under the influence of Cudworth (Ayers 1991, vol. 2 170–6); certainly it seems to presuppose a type of metaphysics that Locke made little if any use of elsewhere.

Berkeley’s attitude to materialism and atheism could hardly have been more unlike that of Hobbes, but at least in his youth he had no time for hierarchical metaphysics (the Neoplatonism of *Siris* is another matter). In

his notebooks he bluntly rejected a key axiom of the older view: '*Nihil dat quod non habet* or the effect is contained in the Cause is an axiom I do not Understand or believe to be true.'¹⁵ This is the Causal Axiom in its scholastic form, but Berkeley's objections were not merely to the schoolmen, as the very next entry in the notebook makes clear: 'Whoever shall cast his eyes on the writings of Old or New Philosophers & see the Noise is made about formal & objective Being Will etc.'¹⁶ The grammar of this may be obscure, but the tone of disdain is not, and nor is the target (as the entries that follow make clear): the most conspicuous generator among the new philosophers of this particular variety of noise was Descartes.¹⁷

At this point it might appear that we have found the answer to our problem: the two parties to the dispute are neither the Ancients and Moderns, nor the Copernicans and anti-Copernicans, but rather our old friends the Rationalists and the Empiricists. Consider, after all, how the two parties seem to line up: on one side we have Descartes and Spinoza, and indeed Leibniz as well, while on the other we have Hobbes, Locke and Berkeley.¹⁸

At first sight this link with the rationalist/empiricist divide seems very plausible: the idea of perfection is a metaphysical idea, not obviously constructible out of any data provided by the senses, and is therefore presumably vulnerable to an empiricist critique. There are however some reasons for being cautious. *Nihil est in intellectu quod non prius erat in sensu* is after all good scholastic doctrine, accepted by Aquinas as well as Locke; nevertheless it is quite clear that Aquinas' acceptance of it in no way inhibited his employment of the metaphysics of perfection. The reason for this is not hard to find: the rules of this kind of concept-empiricism, if interpreted strictly, would rule out any kind of abstract thinking at all; if interpreted loosely—as they always are, even by Hume—they can be adjusted to let in pretty well anything one cares to choose.

The rejection of hierarchical metaphysics by the empiricists has therefore, I believe, to be explained on metaphysical rather than epistemological grounds.

Except for Berkeley, the empiricists did not see themselves as metaphysicians, but if one looks through their writings certain basic assumptions about the nature of reality do become apparent. One, explicitly asserted by all four, is arguably of crucial importance: this is the nominalist principle that everything that exists is an individual.¹⁹ It was not a new idea in the seventeenth century, though it is likely that many of its proponents—Gassendi being an exception—were unaware of its earlier history. In some form or other it goes back to as far as hierarchical metaphysics itself, to the fourth century BC, though in this case it was to the opponents of Plato, such as Antisthenes, rather than to Plato himself. The first person to adopt the

principle as a fundamental metaphysical axiom was William of Ockham, in the early fourteenth century.

The adoption of nominalism has profound implications for hierarchical metaphysics. In scholastic realism the hierarchy of genera and species—the Tree of Porphyry—was a metaphysical hierarchy of increasingly abstract and universal entities. For Ockham, as later for Locke, (Milton 1981:128–45) it was purely a system of classification. The only real entities are those at the base: the individuals themselves.

Nominalism introduces therefore a kind of metaphysical egalitarianism: all individuals have the same basic ontological status. They are not of course equal in other respects—some are physically much *larger* than others for example, or are more important in other ways—but all are equally *real*: there is no hierarchy of existence.

In Ockham and his late-medieval followers the consequences of this metaphysical revolution were limited to philosophy, in the narrow sense of that word. Part of the cement that held together the Aristotelian world-picture had been removed, but the edifice as a whole was not disturbed. The universe retained its old hierarchical organisation, from the central earth to the outermost sphere of the *primum mobile*. The most important difference between the fourteenth-century nominalists and their seventeenth-century successors is to be found outside metaphysics: the former saw themselves as inhabiting a Ptolemaic universe, the latter a Copernican one.

It is clear that hierarchical doctrines in natural philosophy and in metaphysics are logically independent of one another: one can have both a physical hierarchy and a metaphysical hierarchy, as in Aquinas; a physical hierarchy without a metaphysical hierarchy, as in Ockham; a metaphysical hierarchy without a physical hierarchy, as in Descartes; and finally a rejection of both, as in Locke. The mixed options, if one may refer to them thus, are clearly possible, but history suggests that they have been less enduring than their rivals, and one reason for this is that they appear to be less intellectually stable.

In Descartes's thought the metaphysical theory of perfections is dangerously isolated. Historians of philosophy have been frequently been struck by the contrast between the centrality of God in Cartesian epistemology, and his near total absence from Cartesian physics. A similar divide appears here. In Descartes' metaphysics the notion of perfection is central and ineliminable; in his physics it is altogether absent.²⁰ Descartes saw no place for explanations of the sphericity of heavenly bodies in terms of the perfection of that shape; like Galileo he preferred to use efficient causes alone (*Principle of Philosophy*, in. 61, iv. 19 ff.).

The effect of this revolution in physics was not to destroy hierarchical metaphysics, but to expose and thereby in the long run to undermine it.

Hierarchical metaphysics no longer had a secure place as a counterpart to hierarchical physics; it was on its own, standing or (increasingly) falling by what were perceived to be its own merits.

Notes

- 1 Translation taken from Descartes 1984, vol. 2:28; also Descartes 1964–76 vol. 7:40–1. Since the English translation also includes the Descartes 1964–76 page numbers in the margins, these alone have been given in the citations that follow, preceded by AT (Adam and Tanney, eds).
- 2 This is not of course an isolated passage: when in the *Second Replies* Descartes provided a formal exposition of his system *more geometrico* the same principle is listed as Axiom IV: ‘Whatever reality or perfection there is in a thing is present either formally or eminently in its first and adequate cause’ (AT VII: 166). It can also be found in the *Principles of Philosophy* (i.18).
- 3 Hobbes made both charges: according to John Aubrey he was sure that Descartes disbelieved in transubstantiation and defended it only to please the Jesuits; he thought Descartes would have done much better to stick to mathematics since ‘his head did not lye for Philosophy’ (Aubrey 1949:94–5).
- 4 On the horrified reaction of Anna Maria van Schurman to some unusually indiscreet remarks made by Descartes when he called on her and found her reading the Old Testament in Hebrew, see AT IV:700–1; also Verbeek 1992.
- 5 Lampe (1961) s.v. *ἱεραρχία*. The identity of Pseudo-Dionysius is unknown, and even his date uncertain, though at least some of his writings were in circulation by 532 AD (Pseudo-Dionysius 1987:13–14). His influence on Aquinas is described in O’Rourke 1992.
- 6 *Summa Theologiae*, I^a q.4 a. 1. For the two senses in which a created being can be perfect, see q.73 a.1.
- 7 This is Dodds’s translation; the Greek is rather less ornate:
τὰ πρῶτα τελειότερα τῶν δευτέρων ἐστὶ, καὶ τὰ δευτέρα τῶν μετ’αὐτὰ
(the first are more perfect than the second, and the second than those after them).
- 8 Lovejoy (1936) is concerned more with changes in the world picture and their consequences than with their metaphysical underpinnings; it remains however essential reading. There are some interesting essays in Kuntz and Kuntz 1987.
- 9 This could seem like two questions, but I think that there is really only one; hierarchical metaphysics became unacceptable *because* it no longer seemed intelligible. I doubt that there has ever been anyone who thought that it made perfect sense to talk about perfections, degrees of reality etc., but nevertheless held that the world just is not like that.
- 10 The Latin original is in Hobbes 1973:369.
- 11 ‘By reality and perfection I understand the same thing’ (*Ethics*, II. def.6). What exactly this is meant to be a definition of is characteristically unclear.
- 12 In Dante the centre of the world is the lowest region of hell, occupied by Satan.
- 13 ‘It is scarcity and plenty that make the vulgar take things to be precious and worthless’ (Galileo 1967:59).
- 14 It was not rejected by everyone: a very traditional restatement can unsurprisingly be found in one of Hobbes’s most determined critics, Ralph Cudworth. ‘It being on the one hand, undeniably evident, that *Lesser Perfections* may Descend from

- Greater, or at least from that which is *Absolutely Perfect*...but on the other hand utterly Impossible, that *Greater Perfections and Higher Degrees of Being*, should Rise and Ascend out of Lesser and Lower' (Cudworth 1678:728).
- 15 *Philosophical Commentaries*, #780, Berkeley 1949–57, vol. 1. The literal sense of the Latin is: 'nothing gives which it does not have.'
 - 16 *Ibid.*, #781, quoted complete.
 - 17 Especially ##782, 784–5.
 - 18 Hume can, of course, be added to this group, though there is one ghostly remainder of the metaphysics of perfection in the *Treatise*, where Hume mentions what he describes as 'an establish'd maxim in both natural and moral philosophy, that an object which exists for any time in its full perfection without producing another, is not its sole cause'; he himself later endorsed the maxim when it reappeared as the last of his eight rules by which to judge of causes and effects (Hume 1978:76, 174).
 - 19 Hobbes 1991, chapter 5; Locke 1975, III.iii.1; Berkeley 1949–57, vol. 2:192; Hume 1978, I.i.7:19.
 - 20 The same contrast is apparent also in Malebranche: he did not reject the hierarchical metaphysics completely, but retained it only for the order of perfections within the divine intellect (Malebranche 1980:228–9, 617–8).

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