The persona of the natural philosopher in the early to mid seventeenth century

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The question of what it means to be a philosopher goes back to the origins of the understanding of what philosophy is, which we can trace to Plato and the immediate Platonist tradition. This tradition was not a disinterested one. Its concern was not to discover what had been meant by ‘philosophy’ — the Presocratics had in fact designated what they were doing as historia (enquiry) — but to carve out and shape a particular kind of discourse for its own purposes, providing it with a genealogy and characterising it in a way that marginalises its competitors. It did this in a particularly successful way, to the extent that it is difficult for us even to reconstruct what the alternatives might have been. But there are residual problems in the way that it conceives of the philosophical project, and these residual problems come to a head in the medieval and Renaissance rediscovery of philosophical discourse.

There are two sets of contrasts at work in Plato and the Platonist tradition. The first is that between philosophical discourse and earlier forms of thought which make no claim to the title of ‘philosophy’; the second is that between competing conceptions of what philosophy consists in. In the latter respect, Plato’s concern is to mark out what he takes to be the philosophical enterprise from the activities of the sophists. The image of the sophist that stands out is that of someone who is willing to teach anyone who is prepared to pay, to devise arguments to win a case, including making weak arguments appear better than strong ones. In short, the failing of the sophist is ultimately not an intellectual but a moral failing, and this is the question on which I want to focus.

The tendency to see philosophical failings along the lines of moral ones will have a long history and it is especially prevalent in the seventeenth century. Hobbes and his followers, for example, were regularly accused of immorality. An anonymous pamphlet of 1675 written against ‘town-gallants’ associates them with Hobbesians. The three cardinal virtues of the town-gallant, we are told, are Swearing, Wenching, and Drinking; and if other mens lives may be compared to a Play, his is certainly but a Farce, which is acted only on three Scenes, The Ordinary, the Play-house, and the Tavern. His Religion
(for now and then he will be pratling of that too) is pretendedly Hobbian:
And he Swears the Leviathan may supply all the lost leaves of Solomon ...

But ancient philosophers, as well as contemporary ones, were equally the subject of attack, and the condemnation of Aristotle by Joseph Glanvill, one of the most prominent apologists for the Royal Society, brings out the flavour of the issues at stake:

Consonant whereunto are the observations of Patricius that he carpes at the Antients by name in more than 250 places, and without name in more than 1000. [H]e reprehends 46 Philosophers of worth, besides Poets and Rhetoricians, and most of all spent his spleen upon his excellent and venerable Master Plato, whom in above 60 places by name he hath contradicted. And as Plato opposed all the Sophisters, and but two Philosophers, viz. Anaxagoras and Heraclitus; so Aristotle that he might be opposite to him in, this also, oppos’d all the Philosophers, and but two Sophisters viz, Protagoras and Gorgias. Yea, and not only assaulted them with his arguments, but persecuted them by his reproaches, calling the Philosophy of Empedocles, and all the Antients Stuttering, Xenocrates, and Melissus, Rusticks; Anaxagoras, simple and inconsiderate; yea, and all of them in a heap, as Patricius testifies, gross Ignorants, Fools and Madmen.

Glanvill’s use of Bacon here is pivotal. A crucial part of Bacon’s project for the reform of natural philosophy was a reform of its practitioners. One ingredient in this was the elaboration of a new image of the natural philosopher, an image that conveyed the fact that the natural philosopher is no longer an individual seeker after the arcane mysteries of the natural world, employing an esoteric language and protecting his discoveries from others, but a public figure in the service of the public good, that is, the crown.

The idea that philosophers prefer useless learning to virtue goes back to Petrarch, and indeed is one of the mainstays of Petrarchian humanism. Renaissance humanists raised the question of the responsibilities appropriate to the humanist, in particular whether the life of activity in affairs of state (negotium) should be preferred to that of detachment and contemplation (otium). The answer almost invariably given — not least by Bacon himself, in the seventh Book of De Dignitate — was that negotium should be preferred to otium. Once this question had been decided, the issue then became not just the appropriate learning but also, given the practical nature of the programme, the appropriate behaviour for such a practical humanist. The choice, in the first instance, is between the active or practical life and the contemplative life, where philosophers had traditionally fallen in the latter category. The explicit shift to the defence of the active or practical life places new requirements on philosophy, for philosophers now had to show that they were able to live up to the aims of the active or practical life. What Bacon effectively does is to transform philosophy
into something that comes within the realm of negotium. This is completely at odds with the conceptions of philosophy of classical antiquity and the Christian Middle Ages. Promoted through the rhetorical unity of honestas and utilitas, Bacon presents philosophy as something good and useful, and thus as intrinsic to the active life. Indeed, it starts to become a paradigmatic form of negotium, and in this way, it can usurp the claims made for poetry by writers such as Sidney, who argued that poetry can move one to act virtuously, whereas philosophy cannot do this.

In the humanist thought that makes up the source from which Bacon derives much of his inspiration, moral philosophy figures very predominantly. There are two respects in which the model of moral philosophy is important here. First, philosophical self-fashioning had always turned on the moral question of the understanding and regulation of the passions, and because of this they have a peculiar centrality, for they have not merely been one object of study among others for philosophers, but something which must be understood if one is to be ‘philosophical’ in the first place. Mastery of the passions was, in one form or another, not only a theme in philosophy but a distinctive feature of the philosophical persona from Socrates onwards, and Renaissance and early modern philosophers pursue the theme of self-control with no less vigour than had the philosophers of antiquity. This is the model around which Bacon wishes to shape his new practitioner of natural philosophy. It is a model inappropriate to the artisan, and it gives the new practitioner a dignity and standing that the collective nature of his work would not otherwise suggest. Second, in a humanist dimension, being virtuous and acting virtuously are the same thing: there is no separate practical dimension to morality. Indeed, this forms the basis for much humanist criticism of traditional moral philosophy: Sidney, for example, in stressing the superiority of the active, practical life over the contemplative one, draws what he takes to be the consequences for moral thought, namely that teaching the nature of virtue is not the same thing as, and indeed is no substitute for, moving people to practice virtue, and that all philosophy has managed is the former. Sidney and Bacon both want to obliterate the distinction between being moral and acting morally. Moreover, it is interesting to note here that Bacon stresses in the Advancement of Learning that moral philosophy is a cognitive enterprise, one in which the practical outcome is constitutive of the discipline. If, as I am suggesting, we see natural philosophy as being in some respects modelled on moral philosophy, something which is natural enough in a humanist context, and which is reinforced in the shift from otium to negotium, then we may be able to delve a little more deeply into why
Bacon claims that the aim of the natural philosopher is not merely to discover truths, even informative ones, but to produce new works.

The moral basis of his conception is evident, I suggest, in his discussion of the classical philosophers in *Redargutio Philosophiarum*. We are told there that there are three classes of philosopher. First, there are the sophists, who claimed to know everything and travelled around teaching for a fee. Second, there are those philosophers who, having a more exalted sense of their own importance, opened schools which taught a fixed system of beliefs, in which category Bacon includes Plato, Aristotle, Zeno of Citium, and Epicurus. Third, there were those who devoted themselves to the search for truth and the study of nature without fuss, without charging fees, and without setting up a school, such as Empedocles, Heraclitus, Democritus, Anaxagoras, and Parmenides. Regarding philosophers of the second category as no better than those of the first, he proceeds to look at individuals, namely Plato and Aristotle, not entering into controversy on points of doctrine but judging them by ‘signs’, that is, those distinctive characteristics of a doctrine (including the character of those who propound it and what its effects are). What follows is a reflection on the personalities of Aristotle and Plato, in effect a reflection on their personal worth. In the case of Aristotle, the exercise could be mistaken for one in character assassination: Aristotle was, we are told, impatient, intolerant, ingenious in raising objections, perpetually concerned to contradict, hostile to and contemptuous of earlier thinkers, and purposely obscure. We need to ask what the point of these personal criticisms is. It is not as if Bacon does not have specific objections to the content of Aristotle’s philosophy. He mentions some of the major points on which he disagrees with Aristotle here in *Redargutio Philosophiarum*: Aristotle mistakenly constructs the world from categories, and no less mistakenly deals with the distinctions between matter and void, and rarity and density, in terms of a distinction between act and potency. The personal attack on Aristotle seems both unnecessary to make his point, and counterproductive.

But I think that to see matters thus is to miss Bacon’s point. The personal criticism is not an added extra: it is integral to his project. He explicitly tells us he is going to judge not by content of particular doctrines but by signs. Why, then, is the personal criticism so central to what he wants to do? The answer is that the natural philosopher is not simply someone with a particular expertise for Bacon, but someone with a particular kind of standing, a quasi-moral standing, which results from the replacement of the idea of the sage as a moral philosopher...
by the idea of the sage as a natural philosopher. We expect the moral philosopher to act in a particular way, like a sage, and this is an indication of the worth of his moral philosophy. The shift from moral philosopher to natural philosopher as the paradigmatic sage means that the natural philosopher now takes on this quality. The worth of a natural philosophy is reflected in its practitioners, just as the worth of a moral philosophy is reflected in its practitioners: or, perhaps, one should say embodied in its practitioners.

In his discussion of moral philosophy in Book II of the *Advancement of Learning*, Bacon remarks on the various ways in which reason can be affected:

> For we see Reason is disturbed in the administration thereof by three means; by Illaqueation or Sophism, which pertains to Logic; by Imagination or Impression, which pertains to Rhetoric; and by Passion or Affection, which pertains to Morality. And as in negotiation with others men are wrought by cunning, by importunity, and by vehemency; so in this negotiation with ourselves men are undermined by Inconsequences, solicited and importuned by Impressions or Observations, and transported by Passions. Neither is the nature of man so unfortunately built, as that these powers and arts should have the force to disturb reason, and not to establish and advance it: for the end of Logic is to teach a form of argument to secure reason, and not to entrap it; the end of Morality is to procure the affections to obey reason, and not to invade it; the end of Rhetoric is to fill the imagination to second reason, and not to oppress it: for these abuses of arts come in but *ex obliquo*, for caution.  

The ultimate aim of moral philosophy, in Bacon’s view, is to get people to behave morally; to discourse on the nature of the good, or to dispute whether ‘moral virtues are in the mind of man by habit and not by nature’, will not secure this end in their own right. What moral philosophy does not provide, and what needs to be provided, are the means of educating the mind so that it might aspire to and attain what is good:

> The main and primitive division of moral knowledge seemeth to be into the Exemplar or Platform of Good, and the Regimen or Culture of the Mind; the one describing the nature of good, the other prescribing rules how to subdue, apply, and accommodate the will of man thereunto.  

The first question, on the nature of the good, is divided into discussions of the various kinds of goods, and the various degrees of good. We can distinguish something that is good in itself, for example, from something that is good as part of a greater whole, and the latter should have priority over the former: ‘the conservation of duty to the public ought to be much more precious than the conservation of life and being.’ It is on this basis that Bacon rejects Aristotle’s claims for the value of the contemplative life over the active life, for all the arguments Aristotle gives for the contemplative life ‘are private, and respecting
the pleasure and dignity of man’s self,’ where of course the contemplative life is pre-eminent, and he gives examples of the social harm that can come from ignoring civil life and using one’s own happiness as a criterion. On the question of the relative merits of active and passive good — to actively propagate or to conserve — Bacon comes down firmly on the side of the former. On the question of how to inculcate morality, Bacon refers to ‘the Culture and Regimen of the Mind.’ He quotes Aristotle’s remark that we want to know what virtue is and how to be virtuous: they are part of the same package, as it were. But he also points to Cicero’s praise of Cato the younger, who took up philosophy not that he might dispute like a philosopher, but that he might live like one. It is not just the parallel between the moral life and the philosophical life that is of interest here, but the fact that there is a particular persona associated with morality and with philosophy: it is not simply a question of having a particular expertise. What we must understand from the outset is what is within our power and what is not. We are limited in what we can do by the nature of the mind, and we need to ‘set down sound and true distributions and descriptions of the several characters and tempers of men’s natures and dispositions, specially having regard to those differences which are most radical in being the fountains and causes of the rest, or most frequent in concurrence or comixture.’ In understanding these, we are discovering ‘the divers complexions and constitutions’ of the mind, but we also need to discover ‘secondly, the diseases, and lastly the cures.’ The ‘diseases’ are the ‘perturbations and distempers of the affections’ that disturb the mind. The cure consists in setting before oneself ‘honest and good ends’, and being ‘resolute, constant, and true unto them’. The diseases and cure here have an importance that goes far beyond the moral realm, however, and Bacon’s detailed account of the nature of the diseases and the regimen required for their cure is developed not in the context of moral philosophy, but in that of natural philosophy.

This takes us to the question how one becomes such a sage in the Baconian sense. In the most general terms, at least one ingredient in the answer is a very traditional one: the purging of the emotions. But Bacon puts a distinctive gloss on this. The sage for Bacon must purge not just affective states but cognitive ones as well. This is the core of his doctrine of the ‘idols’ of the mind, the need for which he spells out in the Preface to *Novum Organum*:

I propose to establish progressive stages of certainty. I retain the evidence of the senses, helped and guarded by a certain process of correction [reductio], but I shall reject, for the most part, the mental operation which follows the act of sense; instead of it I open up and set out a new and certain path for the mind to proceed along, starting directly from simple sense perception. Those who attributed so much importance to Logic no doubt felt the need
for this; for they showed thereby that they were in search of aids for the understanding, and had no confidence in the native and spontaneous process of the mind. But this remedy comes too late to do any good, when the mind is already, through the daily intercourse and conversation of life, occupied with unsound doctrines and beset on all sides by vain **idols**. And therefore that art of Logic, coming (as I said) too late to the rescue, and no way able to set matters right again, has had the effect of fixing errors rather than disclosing truth. There remains but one course for the recovery of a sound and healthy condition, namely, that the entire work of the understanding be commenced afresh, and the mind itself, right from the very beginning, should not be left to take its own course, but should be guided at every step; and the matter must be carried out as if by machinery.\(^{20}\)

This provides the platform for setting out, in Book I of *Novum Organum*, an account of the systematic forms of error to which the mind is subject, and here the question is raised of what psychological or cognitive state we must be in to be able to pursue natural philosophy in the first place. Bacon believes an understanding of nature of a kind that had never been achieved since the Fall is possible in his own time because the distinctive obstacles that have held up all previous attempts have been identified, in what is in many respects a novel theory of what might traditionally have been treated under a theory of the passions, one directed specifically at natural-philosophical practice.

Bacon argues that there are identifiable obstacles to cognition arising from innate tendencies of the mind (idols of the tribe), from inherited or idiosyncratic features of individual minds (idols of the cave), from the nature of the language that we must use to communicate results (idols of the market-place), or from the education and upbringing we receive (idols of the theatre). Because of these, we pursue natural philosophy with seriously deficient natural faculties, we operate with a severely inadequate means of communication, and we rely on a hopelessly corrupt philosophical culture. In many respects, these are a result of the Fall and are beyond remedy. The practitioners of natural philosophy certainly need to reform their behaviour, overcome their natural inclinations and passions etc., but not so that, in doing this, they might aspire to a natural, prelapsarian state in which they might know things as they are with an unmediated knowledge. This they will never achieve. Rather, the reform of behaviour is a discipline to which they must subject themselves if they are to be able to follow a procedure which is in many respects quite contrary to their natural inclinations. In short, the reform of one’s **persona** is needed because of the Fall: after the Fall it is lacking in crucial ways. Whereas earlier philosophers had assumed that a certain kind of philosophical training would shape the requisite kind of character, Bacon argues
that we need to start further back as it were, with a radical purging of our natural characters, in order to shape something wholly new.

One of the great failures of Bacon’s project, in his own lifetime, was his inability to find an audience for his work. The transformation of the natural philosopher is necessary for the transformation of natural philosophy, but who was this new natural philosophy written for? After all, if the qualities required by the new natural philosopher were so radically different from those of the old, surely these needs would be paralleled in the readers, but these could no more be the traditional readers than the writers were the traditional writers. If the new natural philosophers were not simply to write for one another, it was crucial that a new kind of audience be constructed for the new kind of natural philosophy.

Bacon, who showed no knowledge of or interest in centres of natural-philosophical research (not even the leading such institution of the day, Gresham College, which had been set up from an endowment from Bacon’s own uncle’s will), and who engaged in no correspondence on natural-philosophical questions, saw the audience for his natural philosophy as being the monarch, although neither Elizabeth nor James showed any interest in his expensive grandiose schemes.21 Descartes, by contrast, wrote several letters on natural-philosophical topics each day in his maturity, maintaining extensive contact with the natural-philosophical community through the circle of Mersenne, he designed his Principia Philosophiæ along the model of late scholastic textbooks as something for use in colleges and universities, and in the last weeks of his life he was busy drawing up a plan for an Academy at Stockholm.22 Descartes certainly had a better sense than did Bacon of the importance of an audience able to respond to the new work in the appropriate way, but his writings were subject to significant censorship in the second half of the seventeenth century,23 whereas Bacon’s quite suddenly began to receive an enthusiastic reception, in England and in continental Europe, in the years immediately after his death.24 As a result, it was Bacon, rather than Descartes, who provided the ideology behind the new scientific academies, even in intensely nationalistic France, where Cartesians were excluded from membership of the Académie des Sciences, which was founded by Colbert, chief minister to Louis XIV, ‘in the manner suggested by Veralum [Bacon]’.

But it is the case of Galileo that is the most interesting one in this respect, for here we can discern a process whereby an audience is shaped and the natural-philosophical enterprise legitimated. Galileo was a mathematician, a
profession which was associated with the mechanical arts and had a particularly lowly standing in the ranking of university disciplines. His own education in the subject had come not from his university training — following his father’s wishes he had trained in medicine at Pisa, although he left before taking his degree — but from the Florentine court instructor Ostilio Ricci, who taught military fortification, mechanics, architecture and perspective, and whom Galileo had invited to his father’s house for instruction. When Galileo took up a university teaching post in mathematics, at Pisa (1589) and then at Padua (1591), the fact that he was able to do this without having completed a degree indicates that he was teaching not in a philosophical discipline but in a technical one, which was learned through apprenticeship rather than training, and the salary was correspondingly less: about one-sixth to one-eighth that of a philosophy professor. Mathematics was crucial to Galileo’s understanding of natural philosophy, which took its starting point from the practical-mathematical disciplines, above all mechanics. There was very little Galileo could do within the university system to further his approach to natural philosophy, or even to build up an audience for it.

The patronage system, by contrast, was structured in an entirely different way, with an entirely different ranking of priorities. Its attraction was not that it had a more sympathetic approach to the practical-mathematical disciplines than the universities, for it didn’t, but that there was no inherent fixed ranking of disciplines. The main clients of the Florentine patrons — painters, sculptors, architects and others — had attempted, throughout the sixteenth century, to enhance their social status by developing explicit theories grounded in the liberal arts, attempting to transform their standing as mere artisans into that of artists, thereby setting a model for natural philosophers. The overriding factor in the patron/client relationship was the enhancement of the reputation of the patron, and in the realm of natural philosophy, natural-philosophical discoveries played a key role. Just as in painting, architecture, music, and verse, the client was expected, ideally, to produce something that would dazzle the patron’s competitors, so too in natural philosophy what was to be preferred was some dazzling new discovery. Here we have something which in many ways realised Bacon’s picture of a successful natural-philosophical practice, in that it was directed towards manifest and concrete results, and had no place for merely contemplative natural philosophy. Moreover, the princes to whom Galileo dedicates his discoveries have for many purposes the same absolutist powers as had the sovereign whom Bacon wishes to oversee his ‘great instauration’. Patronage provided a powerful system of legitimation outside the university.
system, with its own standards of social status and credibility, but one in which
the patrons needed the clients as much as the clients needed the patrons, and as
a result the natural-philosophical agenda — as long as it produced the goods —
could be shaped to a large extent by the client natural philosophers, since the
patrons themselves were considered to be above the details, to which their
characteristic attitude was one of disinterestedness.\textsuperscript{30} In this way, natural
philosophy makes a move from the clerical to the civil terrain. The price to be
paid, as Biagioli points out, is that ‘within court patronage one could gain
legitimation as a scientific author only by effacing one’s individual authorial
voice. To be a legitimate author meant to represent oneself as an “agent” ... of the
prince.’\textsuperscript{31} When Kepler and Galileo communicate, for example, it is as clients of
Rudolph II and Cosimo II respectively, not in their own right: Galileo gives Cosimo
a copy of \textit{Sidereus Nuncius}, which Cosimo sends to Rudolph, which Rudolph then
passes on to Kepler for his opinion. Moreover, although the patron does not
dictate the natural-philosophical programme of research, the client is there to
respond to queries from the patron, or to comment on reports of discoveries
passed on to him by the patron. Biagioli has shown how Galileo’s interests, once
he is in (or has one foot in) the patronage network, are shaped by this mode: he
addresses himself to topical debates, invariably engineered by patrons, on such
questions as buoyancy, the Bologna stone, and sunspots, or to accidental events
such as the new star of 1604 or the comets of 1618, where he is asked specific
questions such as ‘what are comets about?, ‘why does ice float on water?’, ‘why is
Saturn three-bodied?’ ‘why does the Bologna stone shine of its own light?’ and
‘what are sunspots?’\textsuperscript{32}

The main difference between the patronage model and that advocated by
Bacon was that, in Bacon’s scheme, gentlemanly behaviour required rejection of
adversarial dispute characteristic of scholasticism, since this was considered as
ungentlemanly and fruitless, whereas, in the patronage system of the northern
Italian states, patrons initiated and managed natural-philosophical disputes to
enhance their image. They were part of a social economy of honour and status,
much as duels had been, and like duels they had sharply defined rules of
etiquette, constraining who should dispute with whom: attacks on Galileo’s work
on buoyancy derived from someone of lower social standing, for example, and he
was advised to have them answered by ‘someone young’ so that his opponent
could be shamed and ‘taught a lesson’.\textsuperscript{33} It was also crucial that clients of other
patrons did not get any advantage. So, for example, when Kepler finally receives a
copy of \textit{Sidereus Nuncius}, the first thing he requests is Galileo’s telescope —
Galileo had produced a number of telescopes for Cosimo to circulate — but
Galileo keeps putting him off, maintaining he does not have a spare one, for fear that Kepler might use it to make discoveries that could eclipse the great success of Galileo and his patron. What resulted from the patronage model was a radically adversarial mode of dispute, although it functioned in a significantly different way from scholastic dispute. In the first place, the whole adversarial style was different. Galileo criticises those who ‘would like to see philosophical doctrines compressed into the most limited space, and would like people always to use that stiff and concise manner, that manner bare of any grace or adornment typical of pure geometricians who would not even use one word that was not absolutely necessary.’ Galileo’s attacks on the spokesman for Aristotelianism in his dialogues, Simplicio, was, as Biagioli notes, ‘not only Galileo’s straw man but also a representative of what court culture perceived itself to be rejecting,’ and we should remember here that court culture included senior clerics, such as cardinals, who were very different from the scholastic representatives of religious orders. Second, scholastic dispute was above all part of a method of discovery, whereas that is not the case here. Rather, what seems to be at issue in the case of patronage-directed disputes is that they act as a means of defending the dignity, and expanding the standing, of the patron: in the process, they act to legitimate the natural-philosophical programmes pursued under the umbrella of the patronage.

Entry into the upper echelons of the patronage system, namely gaining the patronage of a major prince, was not straightforward. Galileo’s attempts began in the early 1600s, when he refined the sector or proportional compass, a device using repeated fixed proportions to solve arithmetical and geometrical problems. Noting the difficulty that many gentlemen had in performing such operations as calculating compound interest, arranging armies with unequal fronts and flanks, using sighting devices on cannons, and calculating the height of distant buildings, Galileo explained the uses of his own improved proportional compass in *Le Operazioni del compasso geometrico et militare* (1606), dedicated to the ‘most serene Prince Cosimo de’ Medici.’ Gentlemen falter and abandon their undertaking, he tells us, because they are ‘occupied and distracted with many other affairs’ and so ‘cannot exercise in this the assiduous patience that would be required of them’, so he offers them instruction in his pamphlet which ‘will enable them to resolve instantly the most difficult of arithmetical operations; of which however I describe only those that occur most frequently in civil and military affairs.’ Cardinal Gonzaga and Cosimo de’ Medici responded favourably to presents of the compass and the pamphlet, but they failed to gain him the patronage he sought.
The spectacular development which finally projected Galileo into the public arena, and quickly secured him the patronage of the Grand Duke of Tuscany, came in 1609. In that year, Galileo put to one side his pathbreaking work on mechanics, to which he had devoted most of the past twenty years, and to which he returned in a serious way only in the 1630s, to concentrate on the development of his telescope, the implications of which were to occupy him over the next twenty years.\(^{39}\) The first public record of the telescope is from September 1608, when the Dutch spectacle maker Hans Lipperhay applied for a patent for a device ‘by which things at a very great distance can be seen as if they were nearby’. On hearing of the invention in May 1609, Galileo immediately bought spectacle lenses and reproduced the telescope, and set about improving the instrument, offering it, on the basis of its great military potential, to the doge of Venice. By November he had developed a telescope with a magnifying power of twenty times, and on 30 November he began to use it to study the moon, finding a rough, uneven surface marked with large craters and mountains, and the drawings that accompany *Sidereus Nuncius* emphasise and indeed exaggerate these very earthlike surface features. This is in contrast with the traditional Aristotelian conception of the moon’s surface as perfectly smooth,\(^{40}\) where its apparent surface patterns, for example, are taken to be a reflection of the earth’s oceans.\(^{41}\) By January 1610 Galileo had resolved the Milky Way into clusters of stars, and had noted the peculiar behaviour of three stars, normally obscured by the brightness of Jupiter, which he soon realised, on analysing their behaviour, must be satellites of Jupiter; by this time he had discovered a fourth satellite, and he named them collectively ‘the Medicean stars’, a tribute which appears in block capitals on the title page of the work. *Sidereus Nuncius* appeared within nine weeks — distributed via the patronage network, copies being sent to ambassadors, princes, and cardinals, and from there passed on the mathematicians and astronomers — and it catapulted Galileo to fame.

The novelty value of the work was not lost on contemporary audiences, which for discoveries of this magnitude were immense, for the concern with novelties was not restricted to the patronage system. The Jesuits paid extensive attention to novel scientific discoveries in the teaching in their colleges, to the extent that some critics of the Jesuit teaching system have suggested that the Jesuit masters had little genuine scientific interest, but were concerned rather with novelties.\(^{42}\) In 1611, on the first anniversary of the death of it founder, Henri IV, the collège at La Flèche — where Mersenne, Descartes, and Descartes’ later collaborator in optics, Claude Mydorge, were all students — engaged in elaborate celebrations.\(^{43}\) Among the sonnets presented to commemorate the king was one
describing how God had made Henri into a celestial body to serve as ‘a heavenly torch for mortals’; it is entitled ‘On the death of King Henri the Great and on the discovery of some new planets or stars moving around Jupiter, made this year by Galileo, celebrated mathematician of the Grand Duke of Florence’. Galileo’s discovery of the moons of Jupiter was indeed widely celebrated, and the Collegio Romano had supported theses defending Galileo in the same year, although they had incorporated the discovery into a Tychonic framework, not a Copernican one. There can be no doubt that the Jesuits encouraged a fascination with novelties in their students, and Descartes was to be no exception. In a manuscript dating from 1621, he describes with evident fascination how to create various optical illusions deriving from della Porta’s *Magia naturalis* — a textbook of natural-philosophical illusions, remedies, novelties and much else — which first appeared in 1589, and which he was almost certainly familiar with from his days at La Flèche. In short, the concern with novelty that was so central to the patronage of natural philosophy was not unique to it, but pervaded European culture more widely. And of course it stands to reason that if what the patronage system had prized had attracted no interest and had no appeal outside that system, then it would hardly be able to further the interests and influence of patrons, or display their grandeur and qualities. Indeed, to a large extent the patronage system was able to present itself both as a source of natural-philosophical novelties, and of the no less remarkable and ingenious taming of these novelties by court natural philosophers, fuelling a kind of interest in natural philosophy which was quite different from the increasingly limited appeal of scholastic textbook natural philosophy.

The same concern to shape a new kind of natural philosopher is evident in Descartes, although the questions are approached differently from both Bacon and Galileo. That Descartes should be concerned with such questions might at first seem somewhat surprising, especially when compared with Bacon. Bacon’s purging is targeted very precisely in his doctrine of idols, and his understanding of what is needed to build on the newly-cleared foundations is not abstract and metaphysical but something psychological and practical: in keeping with his conception of the reformed philosophical enterprise. It might seem that Descartes could not countenance a project of this kind, since he has such a rarefied notion of philosophical activity: after all, the *Meditationes* ask us to begin our search for knowledge by imagining that there is no natural world, and that we have no bodies. In his *Disquisitio metaphysica*, Gassendi makes exactly these criticisms of Descartes. Gassendi had been one of those asked by Mersenne to set out a set of objections to Descartes’ *Meditationes*, which were published with Descartes’
replies, and unsatisfied with the reply, he had elaborated on his own objections, and responded to Descartes’ replies at length.\textsuperscript{48} Descartes attacks Gassendi for raising objections which are not those that a philosopher would raise,\textsuperscript{49} thereby opening up the question of what it is to be a philosopher. Amongst other things, he charges Gassendi with using debating skills rather than philosophical argument; with being concerned with matters of the flesh rather than those of the mind; and with failing to recognise the importance of clearing the mind of pre-conceived ideas. The dispute pits Descartes the advocate of a complete purging of the mind against Gassendi the defender of legitimate learning. But in fact matters are not quite so simple and, in the broad outlines of what it seeks to achieve, Descartes’ aims are similar to those of both Bacon and Galileo.

To understand how, it is crucial that we distinguish between two kinds of enterprise. The first, which is largely legitimatory, is set out in the \textit{Meditationes} and in \textit{Principia Philosophiae},\textsuperscript{50} and the route it follows is that of a radical purging of the mind of anything that can conceivably be doubted, establishing clarity and distinctness (manifested paradigmatically in the \textit{cogito}) as the only criterion by which to establish the veridicality of our ideas, and then, having established that our understanding of the natural world must begin with quantitatively and mechanistically formulated ideas, building up a novel cosmology. This is the way to establish the truth of Cartesian natural philosophy, but the important thing to note is that Descartes does not claim that it is the way to pursue this natural philosophy: Gassendi assumes that this is what he is maintaining and is understandably shocked at the claim. What is offered in these works is the route to be followed by someone who wishes to be convinced of the truth of Cartesian natural philosophy, but it is not the path of discovery to be followed by the natural philosopher. This latter path, and the requisite state of mind and character of the natural philosopher who wishes to pursue it, are formulated in quite different terms, ones that involve psychological and moral considerations as much as epistemological ones.\textsuperscript{51}

Descartes’ discussion of this path occurs in \textit{La Recherche de la verité par la lumière naturelle}, which contrasts the fitness for natural philosophy of three characters: Epistemon, someone well versed in scholasticism; Eudoxe, a man of moderate intelligence who has not been corrupted by false beliefs; and Poliandre, who has never studied but is a man of action, a courtier, and a soldier (as Descartes himself had been). Epistemon and Poliandre are taken over the territory of sceptical doubt and foundational questions by Eudoxe, but in a way that shows Poliandre’s preparedness for, or capacity for, natural philosophy, and
Epistemon’s lack of preparedness. Preparedness here is in effect preparedness for receiving instruction in Cartesian natural philosophy. The *honnête homme*, Descartes tells us,

came ignorant into the world, and since the knowledge of his early years rested solely on the weak foundation of the senses and the authority of his teachers, it was close to inevitable that his imagination should have been filled with innumerable false thoughts before his reason could guide his conduct. So later on, he needs to have either very great natural talent or the instruction of a very wise teacher, to lay the foundations for a solid science.\(^{52}\)

The thrust of Descartes’ discussion is that Poliandre has not had his mind significantly corrupted, because, in his role as an *honnête homme*, he has not spent too much time on book-learning, which ‘would be a kind of defect in his education.’ The implication is that Epistemon has been corrupted in this way, and so is not trainable as the kind of natural philosopher that Descartes seeks. It is only the *honnête homme* who can be trained, and it is Poliandre whom Eudoxe sets out to coax into the fold of Cartesian natural philosophy, not Epistemon. It is true that we might think of the procedure of radical doubt and the purging that results as a way of transforming everyone into an *honnête homme*, and to some extent it is, although in his account of the passions Descartes makes it clear that, once we leave the programmatic level, ridding ourselves of prejudices and pre-conceived ideas is not so simple, and it requires the cultivation of a particular mentality, which is really what we witness in *La Recherche*.

In *La Recherche*, the *honnête homme* alone is identified as the kind of person who uses his natural faculty of forming clear and distinct ideas to the highest degree: or, at least, it is he who, when called upon, uses it to the highest degree. This does not mean that the *honnête homme* alone is able to put himself through the rigours of hyperbolic doubt and discover the true foundations of knowledge: in theory everyone is able to do that, scholastics included. After all, hyperbolic doubt erases our beliefs — everyone’s beliefs — to such an extent that everyone becomes a natural-philosophical *tabula rasa*:

An examination of the nature of many different minds has led me to observe that there are almost none at all so dull and slow as to be incapable of forming sound opinions or indeed of grasping all the most advanced sciences, provided they receive proper guidance. And this may be proved by reason. For since the principles in question [namely, those of the *Principia*] are clear, and nothing is permitted to be deduced from them except by very evident reasoning, everyone has enough intelligence to understand the things that depend upon them.\(^{53}\)
But if the aim is to develop and refine natural-philosophical skills as one progresses, then we require something different:

As for the individual, it is not only beneficial to live with those who apply themselves to [the study of philosophy]; it is incomparably better to undertake it oneself. For by the same token it is undoubtedly much better to use one’s eyes to get about, but also to enjoy the colours of beauty and light, than to close one’s eyes and be led around by someone else. Yet even the latter is much better than keeping one’s eyes closed and having no guide but oneself.54

‘Using one’s eyes to get about’ is not something that everyone finds equally easy, however. What Descartes is seeking are those who can develop his system to completion:

The majority of truths remaining to be discovered depend on various particular observations/experiments which we can never happen upon by chance but which must be sought out with care and expense by very intelligent people. It will not easily come about that the same people who have the capacity to make good use of these observations will have the means to make them. What is more, the majority of the best minds have formed such a poor opinion of the whole of philosophy that has been current up until now, that they certainly will not apply themselves to look for a better one.55

We must recognise that some are more fitted than others to follow the path of instruction/enlightenment in natural philosophy. And in the *Recherche*, Descartes realises, practically, that people come to natural philosophy not with a *tabula rasa* but with different sets of highly developed beliefs which are motivated in different ways and developed to different degrees. These rest upon various things, and this is what leads him, in *La Recherche*, to construct an image of the *honnête homme* as a model in which the moral sage and the natural philosopher meet,56 for, as he puts it in the Prefatory Letter to the French translation of the *Principia*, ‘the study of philosophy is more necessary for the regulation of our morals and our conduct in this life than is the use of our eyes to guide our steps.’57

In the *Principia*, Descartes set out to reform philosophy in its entirety, but he does not see the project as establishing the kind of stagnant system that scholasticism had become, where what has caused the decline of the system was clearly in large part due, in his view, to the slavish adherence of its proponents to Aristotle. In this respect, Descartes is not in the slightest interested in winning over scholastic philosophers to his system: they are simply not the kind of people who can develop it, and would only lead it to the kind of stagnation to which they have led Aristotelianism. *A fortiori*, they cannot act as paradigm philosophers, as sages whose wisdom can guide the rest. This role falls instead to those who,
reflecting upon the current state of philosophy, have formed a low opinion of it, and have avoided taking it up. This low opinion, wholly merited, is what makes them honnêtes hommes, and it is precisely these whom Descartes sees as being potentially the new paradigm philosophers, marked by an intellectual honesty which rescues philosophy from the intellectual disgrace into which it has fallen. Note also that these honnêtes hommes are invited to engage in co-operative work.

Descartes’ vision of natural philosophy as a co-operative enterprise reflects, just as does Bacon’s, the idea that natural philosophy increases the public good, thus fulfilling what is in effect a moral imperative. In this way, the contrast with useless scholastic natural philosophy shows that a secular enterprise does something morally fulfilling in a way that the scholastic enterprise does not.

Not only the concern with the usefulness of philosophy, but also that of intellectual honesty, overlaps very significantly with those of Bacon and Galileo, and what underlies it is above all the rejection of the idea of coming to natural philosophy with pre-conceived ideas. Bacon’s doctrine of idols is dedicated to removing such pre-conceived ideas, and this informs the whole outlook of the Royal Society. Robert Hooke, in his Preface to Robert Knox’s history of Ceylon, for example, describes to the reader the qualities required in the ideal reporter: ‘I conceive him to be no ways prejudiced or byassed by Interest, affection, hatred, fear or hopes, or the vain-glory of telling strange Things, so as to make him swarve from the truth of Matter of Fact.’

In his history of the Royal Society, Sprat stresses that the ‘histories’ collected by the Royal Society ‘have fetch’d their Intelligence from the constant and unerring use of experienc’d Men of the most unaffected, and most unartificial kinds of life’ and that:

If we cannot have sufficient choice of those that are skill’d in all Divine and human things (which was the antient definition of a Philosopher) it suffices, if many of them be plain, diligent, and laborious observers: such, who, though they bring not much knowledg, yet bring their hands, and their eyes uncorrupted: such as have not their Brains infected by false Images; and can honestly assist in the examining, and Registring what the others represent to their view.

Galileo uses the charge that his opponents have pre-conceived ideas as a rhetorical ploy, and he links this with their failure to control their passions. This is clear in his attacks on Grassi in *Il Saggiatore*, where Grassi’s failure to appreciate the novel hypotheses on the nature of comets that Galileo presents to him is taken as ‘a sign of a soul altered by some passion.’ Pre-conceived ideas are construed here as a form of vested interests, and Grassi, as a supporter of Aristotelianism, is presented as someone with an axe to grind, someone who is unable to argue a case on its merits and so has to rely on a philosophical system,
which is treated as a form of intellectual dishonesty and a lack of objectivity. In fact, Galileo is far from being entirely fair to Grassi, and, twelve years earlier, he had done exactly what he is now accusing Grassi of doing. In a dispute with della Colombe over buoyancy that began in 1611, it is Galileo who, when faced with recalcitrant evidence, tries (ultimately with success) to turn the dispute away from particular observations to systems of natural philosophy. In this case, Galileo had maintained that whether a body floats on the surface of water or sinks depends on the specific weight of the body and not its shape. Delle Colombe was able to show, however, that whereas a sphere of ebony sank to the bottom of a container of water, a shaving of ebony floated on the surface. Galileo envelops the questions in basic hydrostatics, trying to turn the focus away from della Colombe’s experiment, and arguing for its irrelevance when seen in the context of the larger theory.

Whatever the rights and wrongs of the dispute, however, the crucial point is that, whereas earlier disputes in natural philosophy automatically involved competing systems (for that was what was ultimately at stake), there is now a new ingredient in the brew, as charges of intellectual dishonesty are brought against those who argue from the standpoint of a purported systematic understanding. This anti-system view will take a variety of forms. One will be the kind of radical stand against system-building that we find defended in the eighteenth century in Voltaire and Hume. Another, which has a more direct bearing on our present concerns, is eclecticism. Lipsius, who was one of the first to use the term ‘eclecticism’ in the modern era, takes Seneca as his model, and advises that we should ‘not strictly adhere to one man, nor indeed one sect’ and that the only sect we should follow ‘is the Eclectic (let me translate it “Elective”) which was founded by one Potamo of Alexandria’. The English natural philosopher Walter Charleton spells out his debt to this ‘school’ in no uncertain terms, telling us that eclectics

adore no Authority, pay a reverend esteem, but no implicite Adherence to Antiquity, nor erect any Fabrick of Natural Science upon Foundations of their own laying: but, reading all with the same constant Indifference, and æquanimity, select out of each of the other sects, whatever of Method, Principles, Positions, Maxims, Examples, &c. seems in their impartial judgements, most consentaneous to Verity; and on the contrary, refute, and, as occasion requires, elenchically refute what will not endure the Test of either right Reason, or faithful Experiment. ... Here to declare ourselves of this Order, though it be no dishonour, may yet be censured as superfluous: since not only those Exercises of our Pen, which have formerly dispersed themselves into the hands of the Learned, have already proclaimed as much.
Boyle set out his preference for a form of syncretism in a no less explicit way, telling us approvingly that eclectics do ‘not confine themselves to the notions and dictates of any one sect, but in a manner include them all, by selecting and picking out of each that which seemed most consonant to truth and reason, and leaving the rest to their particular authors and abettors.’ The connection between the character of eclecticism and the character of the philosopher, if anything reinforced in the eighteenth century, is spelled out particularly clearly in d’Alembert’s entry on eclecticism in the *Encyclopédie*:

The eclectic is a philosopher who, riding roughshod over prejudice, tradition, antiquity, universal consent, authority, in a word, everything that subjugates the mass of minds, dares to think for himself, goes back to the most clear and general principles, examines them, discusses them, allowing only that which can be demonstrated from his experience and his reason; and having analyzed all philosophical systems without any deference or partiality, he constructs a personal and domestic one that belongs to him. I say a *personal and domestic philosophy* because the ambition of the eclectic is not so much to be the instructor of the human race as its disciple; not so much to reform others as to reform himself; to know the truth rather than to teach the truth. He is not a man who plants and sows; he is a man who reaps and sifts. ... The sectarian is a man who embraces the doctrine of a philosopher; the eclectic, on the contrary, is a man who recognises no master.

This is a distinctively Enlightenment statement of the values of eclecticism, but the way in which it focuses on the dignity of the philosopher captures a good deal of what was at stake in the seventeenth-century sense of what it meant to be a natural philosopher.

In sum, the figures we have focussed on — Bacon, Galileo, and Descartes — each saw philosophy as being in desperate need of radical reform, and each of them saw this reform as being carried out by a wholly new kind of person: a philosopher wholly unlike the clerical scholastics who wrote and taught philosophy. These new kinds of philosopher were not simply people who carried out investigations in a different way from their predecessors: they had, and needed to have, a wholly different *persona*. The techniques of self-examination and self-investigation encouraged both by the wholesale attempt to transfer monastic religious values to the population at large, and by the sense that one was responsible for the minute details of one’s daily life in the form of new norms of appropriate behaviour, opened up the possibility of a new understanding of one’s psychology, motivation, sense of responsibility, and shaped one’s personal, moral, and intellectual bearing. Bacon, Galileo, and Descartes used this — in rather different ways, but with the same broad aims — to transform our
understanding of what qualities, including personal qualities, one needs to be a philosopher.


Joseph Glanvill, *A Letter to a Friend Concerning Aristotle*, appended to *Scire/i Tuum Nihil Est*; or, the Author’s Defence of the Vanity of Dogmatising* (London, 1665), 84-5. The reference to Patrizi is to his *Discussionum Peripateticarum tomī IV, quibus Aristotelice philosophiae universa historia atque dogmata cum veterum placitis collata, elegantur et erudite declarantur* (4 vols, Basle, 1581).

This forms one of the central themes of Gaukroger, *Francis Bacon and the Transformation of Early Modern Philosophy*: see esp. chs. 2 and 4.


The antithesis between a quiet life of contemplation and public life can be traced back to Euripides’ *Antiope*.

Among the more important exceptions are Lipsius, who, in his *De Constantia* (Leiden, 1584), advocated avoidance in public affairs, and Thomas More, who though serving as ambassador, under-treasurer of the Exchequer, and Lord Chancellor, longed for the contemplative life throughout his career. In the course of the seventeenth century in France, there was a widespread move away from the ideals of civic humanism towards those of the private life: see Nannerl Keohane, *Philosophy and the State in France: The Renaissance to the Enlightenment* (Princeton, 1980). Gassendi was a staunch defender of the contemplative life: see Lisa Tunick Sarasohn, ‘Epicureanism and the Creation of a Privatist Ethic in early Seventeenth-Century France’, in Margaret J. Osler, ed., *Atoms, Pneuma, and Tranquillity: Epicurean and Stoic Themes in European Thought* (Cambridge, 1991), 175-96.

Bacon, *Works*, vol. 1, 713-44 [text]/vol. 5, 3-30 [trans].

This is particularly evident in Bacon’s account of his scientific utopia, *New Atlantis*, where self-respect, self-control, and internalised moral authority are central.

Sidney, *An Apology for Poetry*, ed. Geoffrey Shepherd (London, 1965), 112. Compare Bacon’s assessment in *De Augmentis*: ‘Moral philosophers have chosen for themselves a certain glittering and lustrous mass of matter, wherein they may principally glorify themselves for the point of their wit, or power of their eloquence; but those which are of the most use for practice, seeing that they cannot be so clothed with rhetorical ornaments, they have for the most part passed over.’ (*Works*, vol. 1, 715 [text]/vol. 5, 4-5 [trans]).

*Bacon, Works*, vol. 3, 565. For more detail see ch. 4 of Gaukroger, *Francis Bacon and the Transformation of Early Modern Philosophy*, which I draw on here.

to Descartes (Cambridge, 1992), 393-423; and Tad M. Schmaltz, ‘What has Cartesianism to do with Jansenism?’, Journal of the History of Ideas vol. 60 (1999), 37-56. For details of publication of Descartes’ works in the seventeenth century, see Matthijs van Otegem, A Bibliography of the Works of Descartes (1637-1704) (2 vols, Utrecht, 2002).


See Peter Burke, The Italian Renaissance: Culture and Society in Italy (Princeton, 1986), ch. 3. Biagioli notes that Galileo felt similarly obliged to immerse himself in literary and artistic disputes — on Dante’s Inferno, on the relative priorities of Ariosto and Tasso, on the relative merits of painting and sculpture — to prove his competence with both curial and academic culture: Galileo Courtier, 118-19.


There are variations here, and, as the seventeenth century progressed, some patrons did begin to take a more active role in experiments. Prince Leopoldo de’ Medici took such an especially active role in the Accademia del Cimento (1657-1667), for example. On the Accademia de Cimento, see W. E. Knowles Middleton, The Experimenters: A Study of the Accademia del Cimento (Baltimore, 1971); and Paolo Galluzzi, ‘L’Accademia de Cimento: Gusti del Principe, Filosofia e Ideologia dell’Esperimento’, Quaderni Storici vol. 48 (1981), 788-844.

Biagioli, Galileo Courtier, 53.

Ibid, 159-209.

See ibid, 62, and more generally 60-73.

Mario Biagioli, ‘Replication or Monopoly? The Economics of Invention and Discovery in Galileo’s Observations of 1610’, in Jürgen Renn, ed., Galileo in Context (Cambridge, 2001), 277-320. Galileo was able to retain his preeminent position as the leading observational astronomer until the observation of three comets in the second half of 1618 by Jesuits associated with the Collegio Romano.

Galileo to Prince Leopold of Tuscany, quoted in Biagioli, Galileo Courtier, 114-15. The gulf between Italian patronage culture and later Royal Society culture could not be greater here. Compare Sprat’s instruction to adopt ‘a close, naked, natural way of speaking; positive expressions; clear senses; a native easiness, bringing all things as near to mathematical plainness as they can; and preferring the language of Artisans, Countrymen, and merchants, before that of Wits, and Scholars.’ History of the Royal-Society, 113.

Biagioli, Galileo Courtier, 115-16.

Biagioli notes that Pope Urban VIII, who was behind the 1633 condemnation of Galileo, was not an orthodox Aristotelian at all but held a position closer to Ockhamism (ibid, 351).


Theatre and public spectacle were an important ingredient in Jesuit culture: see Per Bjurström, ‘Baroque Theater and the Jesuits’, in Rudolph Wittkower and Orma B. Jaffe, eds., Baroque Art: The Jesuit Contribution (New York, 1972), 99-110.

See Camille de Rochemonteix, Un Collège des jesuits au XVII et au XVIII siècles (4 vols, Le Mans, 1889), vol. 1, 147.

On its impact in England, where there Harriot and his circle had been observing the moon with a telescope at the same time as Galileo, see Francis J. Johnson, Astronomical Thought in Renaissance England (Baltimore, 1937), ch. 7.

Biagioli points out that the Jesuits also supported Galileo’s anti-Aristotelian work on buoyancy, and were unhappy with the 1616 condemnation of Copernicanism (Galileo Courtier, 296-7).


For a detailed discussion see Gaukroger, Descartes’ System of Natural Philosophy, chs. 1 and 3. We shall return to these questions below.

See ibid, 239-46.

Descartes, Oeuvres, vol. 10, 496. On La Recherche see Alberto Guillermo Ranea, ‘A “Science for honnêtes hommes”: La Recherche de la Vérité and the deconstruction of experimental knowledge,’ in Stephen Gaukroger, John Schuster, and John Sutton, eds., Descartes’ Natural Philosophy (London, 2000), 313-29. The standard contemporary account of the honnête homme and how he should make his way in the world is Nicolas Faret, L’Honneste Homme. Ou l’Art de plaire a la court (Paris, 1630). This immensely popular work was reprinted five times in the 1630s alone, and within two years of its first publication had appeared in English as The Honest Man: or, the Art to Please in Court. (London, 1632).

Descartes, Oeuvres, vol. 9B, 12.


There can be little doubt that this was a radical move, especially in view of the association of the honnête homme with a ‘scorn for religion’, as one contemporary put it: see René Pintard, Le libertinage érudit dans la première moitié du XVII siècle (2 vols, Paris, 1943), vol. 1, 15.

Descartes, Oeuvres, vol. 9B, 3-4


Sprat, History of the Royal-Society, 257.

Ibid, 72-3.

Galileo Galilei, Il Saggiatore (Rome, 1623), trans. in Stillman Drake, The Controversy on the Comets of 1618 (Philadelphia, 1960), 151-336. There is an excellent discussion of the controversy in Biagioli, Galileo Courtier, ch. 5. As Biagioli notes, the situation is complicated, for Galileo’s argument in Il Saggiatore is not anti-system per se, but rather a response to the 1616 condemnation of the Copernicanism system. Worried that the Tychonic system might replace the condemned Copernican one (as indeed it was doing among Jesuit astronomers), Galileo responds by trying to put the whole question of astronomical reality on hold, denying validity to any system.

Cited in Biagioli, Galileo Courtier, 308.

On this dispute see Stillman Drake, Galileo Studies (Ann Arbour, 1970), ch. 8 and Biagioli, Galileo Courtier, ch. 3.


Walter Charleton, Physiologia Epicuro-Gassendo-Charltoniana: or A Fabrick of Science Natural, upon the Hypothesis of Atoms (London, 1654), 4.

Denis Diderot, Encyclopédie ou Dictionnaire Raisonné des Sciences, des Arts et des Métiers (17 vols., Paris, 1751-65), vol. 5, 270 col. 1-col. 2. The article on eclecticism runs from 270 col. 1 to 293 col. 2, and the treatment is comprehensive.

For a detailed account of how this worked in the case of one small section of society — the French aristocracy between the late sixteenth century and the beginning of the eighteenth century — see Jonathan Detwald, Aristocratic Experience and the Origins of Modern Culture: France, 1570-1715 (Berkeley, 1993).