

# NEWTONIAN PHYSICS, EXPERIMENTAL MORAL PHILOSOPHY, AND THE SHAPING OF POLITICAL ECONOMY

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## 1. Introduction: analogy and metaphor in the history of science

The relationship between physics and economics is still under the cloud of a die-hard myth. It is the idea that physics, the hardest science among the natural sciences, had a rather obvious influence on economics, the hardest science among the social sciences, and this happened because both disciplines treat quantity, not quality, and quantity is what can be treated mathematically. There is a grain of truth in the myth; indeed only those embodying at least a grain of truth survive; but also this one, like every grain, can yield fruit only if it dies. The story needs just be turned upside down, that is, economics established first a privileged relationship with physics in the age of Newton, as a result of a shift in the 'primary theme' of a long established analogy, the natural-moral analogy, which had been alive since the times of Plato as iatro-political analogy and became instead a mechanico-political analogy as a side effect of the echo of Newton's work, of its theological and political implications, and of the confrontation between Cartesians and Newtonians.

Strangely enough, the main source of inspiration for such transfers from the body to the mind and from the universe to the polity was a movement of ideas apparently far away from the inspiration of modern science, namely Renaissance philosophy of nature. This was dominated by Neo-Platonic themes, and analogy was believed by Renaissance neo-Platonists to be the ruling principle in the universe. Correspondence between the micro and the macro levels, symbolic relationship, and anthropomorphism were the basic features of such theorizing on nature. And yet this climate of ideas did not yield only magic, astrology, and alchemy, granted that several of the best exponents of the scientific revolution were not only 'positive' scientists, as the positivist hagiography believed, but were also practitioners of such pseudo-sciences, encouraged by their Platonism in using mathematics in both modern science and pre-modern pseudo-sciences.

A paradigm-shift, from the iatro-political analogy which had been ruling from the times of Plato to the Renaissance (reaching perhaps the physiocrats and leaving a trace in Adam Smith when he introduces the "animal principle" that restores health to the political body notwithstanding mistaken policies (Smith 1776, iv.ix.14), was the source of the new physico-social analogy that became the ruling framework. The reasons for this shift are still to be explored, but the success of the new Galilean approach in a number of fields within natural philosophy was one reason of interest for physics, or for the new physics, practised according to the Galilean approach, not for the 'old' Aristotelian physics, that was not different enough in its approach from the life sciences as to be able to provide an alternative model. But also within the new paradigm there were alternative blueprints for further developments, roughly marked by the alternative between Cartesianism and Newtonianism. The former, with its basic analogy that equated the universe to a machine such as a clock, suggested paths of inquiry in the field of social and political theory that encouraged artificialism, authoritarian views of political power, ready-made rules for the correct functioning of society. Newtonianism seemed immediately to suggest blueprints for a non-voluntarist view of natural law, a non-absolutist view of government, and a view of society where the individual and the public interest could be reconciled by other means

than direct intervention from political authority. The alternative between the clock and the wheel as basic alternative analogies for two alternative cognitive strategies in facing society has been illustrated with abundant documentation as something widespread between the seventeenth and the eighteenth centuries. The choice of either of these primary themes reveals the political approach adopted, absolutist or proto-liberal, but also the view of societal laws, an artificialist one or one based on spontaneous-order (Mayr 1986).

## 2. Newtonianism and the physico-moral analogy

Newton, who was once believed to have been the first 'empirical' scientist, is now the cross and delight of historians of science for his twofold character. He was both a mathematician and an adept of Neo-Platonic doctrines, and it was precisely because of his refusal of Cartesian rationalism that he was prepared to admit of such a 'semi-magic' notion as action at a distance. Besides, he believed that a new *natural* philosophy should lay the basis of a renewed *moral* philosophy, assuming the two fields to be parallel, like the Cartesian *res extensa* and *res cogitans*, and yet "moral" did not denote a science of man and society, but normative ethics. He wrote in Query 31 of *Opticks*: "And if Natural Philosophy in all its parts, by pursuing this method, shall at length be perfected; the bounds of Moral Philosophy will be also enlarged" (Newton 1704: iii, 264).

A program follows for a normative ethics based on a *natural* theology, i.e. a theology based not on revelation but instead on reason, with a *voluntarist* understanding of the natural law (as a law *imposed* by God's will, not inscribed in the essence of things). He writes:

For so far as we can know by Natural Philosophy what is the First Cause, what power he has over us, and what benefits we receive from Him; so far our duty towards him, as well as at towards one another, will appear to us by the light of Nature (Newton 1704: iii, 264).

The kind of theological speculations to which Newton indulges allows for his exegesis of the language of Biblical Prophets being guided by "the analogy between the world natural and the world political. For the mystical language was founded in this analogy" (Newton 1950: 120). To be fair, we should remember that he was ascribing belief in such an analogy to the Hebrew Prophets, and yet he was far from taking it for nonsense.

Newton's followers developed his program in several diverging directions. The first was the foundation of natural law on a priori evidence by the authors of the "Boyle Lectures", yearly lecture-courses where the ideas of anti-Calvinist Cambridge divines such as Ralph Cudworth (see Cudworth 1731) and Samuel Clarke (see Clarke 1764) were presented, including moral and political doctrines where a few Newtonian items were inserted into a Platonic framework. The main claim was that social life was possible on the basis of "nature", that is, before intervention by "super-nature" or revelation to fix things. The Newtonian elements helped in establishing an analogy between (physical) Nature and Man, suggesting that society is somehow analogous to a Newtonian (not a Cartesian) cosmos in that it is self-regulating, and accordingly neither needs a theocratic regime nor a secular absolutist state, since good and evil are objective entities that may be recognized by a healthy human reason, and accordingly the *social* condition precedes the *political* condition, or man is by nature sociable. Laws of nature are presented as analogous to mathematical relations, and their validity is "as self-evident as the existence of proportions and lack of proportions in geometry and arithmetic" (Clarke 1764: 47), since it would be as difficult for an intelligent person "to deny any natural difference between good and evil" as

for a geometer to establish "as a first principle that a bent line is as straight as a right line" (*Ibidem*: 51). Pope in *An Essay on Man* illustrated the physico-moral analogy by which, as the planets turn on their own axis while turning in a circle around the Sun, so "two consistent motions act the soul", Self-Love and Social Love, which turn out to "be the same" (Pope 1734, iii, vv 314-323). Note that the analogy is the basis of the implication of a possible coexistence of different "movements" which is transferred from physical nature to the mind and society. This points at a sensitive point in post-Reformation discussion, since the Augustinian tradition revived by Luther and by the Jansenists insisted on a dichotomy between Nature and Grace, due to the Fall of Nature after the original sin and carrying impossibility of 'natural' morality. Note that Pope's claim that self-love be compatible with social love sounded, in 1734, as a rejoinder not to hard-line Protestants but to Bernard de Mandeville's *Fable of the Bees*, the latest sceptical *reductio ad absurdum* of Augustinianism by proving that "vice" be useful and "virtue" obnoxious (Mandeville 1713).

Locke travelled a path as diverging as possible from that of the Cambridge Platonists, namely towards an empirical science of man, in so far as he intended to build a "history", or a genealogy of ideas guided by one central item of the Newtonian methodology, caution against hypotheses (Locke 1690, iv.xvii.13), which implied leaving aside any inquiry into *ultimate* causes.

### 3. The Scottish tradition of scientific Newtonianism

During the first half of the eighteenth century, Newton's work became the emblem of the "new philosophy" all over Europe. Aristotelianism, with its occult qualities and substantial forms mocked at by seventeenth century philosophers, was no longer perceived as a real danger, and the villain became instead Descartes, the author of an "illusive philosophy" or of "one of the most entertaining romances" that have ever been written. In Scotland a tradition of scientific Newtonianism, that had its strongholds at Marischal College, Aberdeen, and then at St. Andrews and Edinburgh, was established before Newtonianism was firmly established in England. This tradition – as a result of the Calvinist connection that linked Scotland and the Netherlands – owed something to the Dutch Newtonian school, whose main exponent had been Willelm Jacob van s'Gravesande and which yielded an 'experimentalist' interpretation of Newton's work, stressing the difference between *pure* and *applied* mathematics: since mathematical principles are "within us", while the physical are "outside", pure mathematics is a kind of *certain* knowledge whose objects are created by ourselves, while physics is a kind of *uncertain* knowledge, taking the action of unknown external substances into account. The principles of mathematical physics, being unable to *mirror* true physical principles at work *behind* the phenomena, are mere *tools* for explanation (See Sheperd 1982; Barfoot 1987; Wood 2003; Kerzberg 2006).

The leading figure of the Scottish tradition was Colin MacLaurin, the author of *An Account of Sir Isaac Newton's Philosophical Discoveries* (1748) that presents the contents of Newton's *Principia*, with an extended discussion of Newtonian methodology. MacLaurin's Newton has two enemies: on the hand dogmatic theologians and Aristotelians, on the other, Cartesians. MacLaurin claims that the "interests" of true religion are not "advanced by feigning philosophical systems purposely to favour it" (MacLaurin 1748: 66), but instead an "entire liberty must be allowed in our enquiries" (*Ibidem*), even if we "ought not to abuse this liberty by *supposing* instead of *inquiring*, and by imagining systems instead of learning from observation and experience the true constitution of things" (*Ibidem*: 7). It is

true that in the middle ages the "disputes among the sects... produced a talkative sort of philosophy" (*Ibidem*), but it is also true that such disputes have proved less dangerous than "that pride and ambition" which has led philosophers to produce hastily "a complete and finished system of nature", and in order to round up such a system, to invent "certain principles and hypotheses" from which they pretend to explain all the mysteries of nature. In more detail, the methodological claims are the following. First, while defending Newton against the charge of having denied the conjectural character of science, MacLaurin downplays Newton's emphasis on the exclusion of hypotheses, arguing that he meant to rule out only *groundless* hypotheses (*Ibidem*: 29 ff.). He insists that abuse of "hypotheses" had been the source of "variety of opinions and perpetual disputes" among philosophers who have caused discredit to philosophy as such, in so far as, "instead of searching into nature, men retired to contemplate their own thoughts... gave their imaginations full play... Hypotheses were invented, not for reducing facts or observations of a complicated nature to rules and order, (for which purpose they may be of service) but as principles of science" (*Ibidem*: 94). The "old mode of philosophising" is practiced by "supposing instead of *enquiring*, and by imagining systems, instead of learning from observation and experience the true constitution of things" (*Ibidem*: 7). Secondly, in his interpretation of the analytico-synthetic method, he qualifies Newton's claim of being able to "deduce" theories from observation, explaining that "in natural philosophy, truth is to be discovered by experiment and observation, with the aid of geometry, only" (*Ibidem*: 90-91), and we are accordingly "to proceed by the method of analysis, before we presume to deliver any system synthetically" (*Ibidem*: 91). Third, he argues the legitimacy of analogy as well as its limits claiming that Newton was less rigid than Descartes vis-à-vis analogy, and "when he was not able to demonstrate the causes of the phenomena described in the second [the *Opticks*] more evidently, he endeavours to judge of them, by *analogy*, from what he had found in the greater motions of the system" (*Ibidem*: 21; cf. 51). There are indeed cases of "abuse of analogy", such as those of the Pythagoreans and of Kepler who, by pursuing "analogies and harmonies" (*Ibidem*: 30) have been led astray. Fourth, he claims that there are limits to be set also on the application of "geometry", since the latter is of no use "till data are collected to build on" (*Ibidem*: 30). Fifth, he stresses Newton's vindication of final causes, which were ruled out by the Cartesians. He reminds "how essential the greatest and best philosophers have thought the consideration of final causes to be to true philosophy" (*Ibidem*: 29), and adds that "it gave a particular pleasure to Sir Isaac Newton to see that his philosophy had contributed to promote an attention to them... after Descartes and others had endeavoured to banish them" (*Ibidem*). Sixth, he recalls Newton's belief that natural philosophy is of use in laying "a sure foundation for natural religion and moral philosophy" and he explains how this can be done: "we are to endeavour to rise, from the effects thro' the intermediate causes, to the supreme cause. We are, from his work, to seek to know God, and not to pretend to mark out the scheme of his conduct, in nature, from the very deficient ideas we are able to form of that great mysterious Being" (*Ibidem*: 90). The seventh and most important point is abuse of hypotheses. The reason for lack of the same gradual progress in natural philosophy as was available in geometry was that "Hypotheses were invented, nor for reducing facts or observations of a complicated nature to rules and order, (for which purpose they may be of service) but as principles of science" (*Ibidem*: 94); in other words, we ought not to abuse our intellectual liberty "by *supposing* instead of *enquiring*, and by imagining systems, instead of learning from observation and experience the true constitution of things" (*Ibidem*: 6). This is a sort of paraphrase of the fourth rule, added in the *Principia's* third edition, and omitted in the first popularisations, such as Pemberton's. This is Newton's most markedly anti-Cartesian statement, prescribing that

in experimental philosophy we are to look upon propositions inferred by general induction from phenomena as accurately or very nearly true, notwithstanding any contrary hypotheses that may be imagined, till such time as other phenomena occur, by which they may either be made more accurate, or liable to exceptions (Newton, [1726] 1972: ii, 555).

MacLaurin's work was completed by 1728 and, albeit published only in 1748, circulated in manuscript for 20 years<sup>1</sup>. This may help in accounting for a tortuous story of ideas circulating among Scottish authors between the Thirties and Seventies, a story whose main character was the fourth rule, with its anti-conjectural and anti-systematic implications and its stress on empirical constraints (Force 1987: 180 ff.).

### 3. Scottish Moral Newtonianism

The importance of such transfers was magnified when, at the origins of the Scottish Enlightenment, it was located within a wider strategy where Newton was paradigmatic not only for natural philosophy but also for methodology. The "Newtonian philosophy" became the "third way" between the opposed shoals of untutored empiricism and arrogant rationalism, or between Bacon and Descartes (See Brown 2006: 1084-93; Cremaschi 2000). Francis Hutcheson, professor of Philosophy at Glasgow and Adam Smith's teacher, introduced a physico-moral analogy, whose primary themes are inertia and gravitation and the secondary ones self-love and benevolence. He declares: "Self-love is really as necessary to the good of the whole as benevolence; as that attraction which causes the cohesion of the part, is as necessary to the regular state of the whole as gravitation" (Hutcheson 1725: 263).

The generation after Hutcheson developed his isolated analogy into a sustained allegory, trying to give flesh and bones to Newton's wish that the boundaries of moral philosophy be enlarged as a result of progress in natural philosophy. The first to undertake such a development was George Turnbull, known in his quality of Thomas Reid's teacher at Marischal College<sup>2</sup>. He presented as a graduation thesis at Aberdeen in 1723, two years before Hutcheson's use of the gravitation-benevolence analogy, a dissertation *De scientiae naturalis cum philosophia morali conjunctione*, and in 1740 published his *Principles of Moral and Christian Philosophy* (Turnbull 1740a) where a remarkable methodological preface was prefixed to a rather traditional discussion of normative ethics and of the rational basis of the Christian religion. The first of the two volumes appeared the same year as the third book of Hume's *Treatise*, but its contents were the basis of Turnbull's teaching at Aberdeen in the Twenties and Thirties, and, a certain circulation under the shape of manuscript lecture notes being more the rule than an exception, the possibility of Turnbull's direct influence on Hume should not be dismissed, even if the shared background, i.e. Newton, MacLaurin, and Hutcheson, may have been enough for accounting for almost identical phrasings. The general plan of the work aims at a refutation of moral scepticism from empirical premises, along the line inaugurated by Shaftesbury and travelled on by Hutcheson and, later on, by Thomas Reid. The first book proves the existence of justified moral standards by combining an a priori way, centred on the moral sense, and a *posteriori* way, centred on the good consequences of right actions. The second book tries to prove the existence of a world order and a solution to the problem of theodicy. The contents of the work are hardly innovative, and labour under the inner tensions of an attempt at combining Shaftesbury's Platonic line of inquiry with Richard Cumberland's empiricist one. The real novelty is in the methodological preface. The striking point in this preface is that the refutation of moral scepticism on an empirical basis does no more start with naïve 'observation', like Shaftesbury, but with a would-be

'experimental' approach, qualified by its own peculiar dowry of methodological tools, a dowry that Turnbull declares to be Newton's legacy (*Ibidem*: 6 and 8), including the idea that in order

to bring moral philosophy, or the knowledge of the moral world, upon the same footing with natural philosophy, or the knowledge of the material world, as it now stands; we must enquire into moral phenomena, in the same manner as we do into the physical ones: that is, we must endeavour to find out by experience the good general laws to which they are reducible (*Ibidem*: 56).

Accordingly, "the study of nature, whether in the constitution and oeconomy of the sensible world, or in the frame and government of the moral, must set out from the same first principles, and be carried out in the same method of investigation, induction, and reasoning; since both are enquiries into facts or real constitutions" (*Ibidem*: 47). Other methodological ideas are that the study of human nature is a study of "questions of fact or natural history" (*Ibidem*: 8), the assumption that the world we experience is ruled by general, uniform and constant, laws, and that these may pertain both to moral and to natural philosophy in so far as they are considered under different aspects (*Ibidem*: 8, 48-9, 54 and 56); besides, the claim that "hypotheses assumed at random, and by caprice, or not sufficiently confirmed by experience, are never built upon" (*Ibidem*: 8; cf. 65) and that they are not "to be any further admitted, than as questions, about the truth or reality of which, it is worth while to enquire" (*Ibidem*: 64). One difference from Hume is a more marked confidence in the possibility of building a moral philosophy not as a "beautiful, elegant romance" (*Ibidem*: 62) or a mere "collection of facts discovered by experience" (*Ibidem*), but as "a mixed science of observations, and reasonings from principles known by experience to take place in, or belong to human nature" (*Ibidem*: 63). Accordingly, as in natural philosophy we have a "mixed mathematics", so an account of human nature such as the one proposed may be called "mixed moral philosophy" (*Ibidem*) as far as it is built on the basis of principles taken directly from observation and of others introduced as corroborated hypotheses, proved to be "real solution of appearances" or "found really to take place in nature, either by immediate experiment, or by necessary reasonings from effects" (*Ibidem*: 65).

A decisive difference from Hume is Turnbull's theodicy from which his justification of moral laws in turn depends. Turnbull's reasoning is as follows. First, the general laws of the corporeal world are "good laws", since they "produce its good, beauty, and perfection in the whole" (*Ibidem*: 50). Secondly, "tho' natural philosophy be commonly distinguished from moral; all the conclusions in natural philosophy concerning the order, beauty, and perfection of the material world, belong properly to moral philosophy" (*Ibidem*: 52). Thirdly, the problem of evil is 'settled' by reducing it to "partial evil", subservient to general good, for "no particular effect, which flow from good general laws, can be evil absolutely considered, that is, with regard to the whole" (*Ibidem*: 51). Fourth, also in moral philosophy, unless the moral world be unintelligible, there must be general laws (*Ibidem*: 55) and the criterion of moral goodness depends on the discovery of the "final cause, or moral fitness of any constitution" (*Ibidem*), which is established on the basis of the discovery of the "good principles" of the moral domain, those that "are conducive by their steady and uniform operation and prevalency to the greater good, beauty, and perfection of that whole in the sum of things" (*Ibidem*). This implies that those laws are established which are conducive to general good effects, albeit at the price of partial evil. The general question to answer is in fact whether "all the effects and appearances relative to the constitution of our minds... tend to produce good, order, beauty and perfection in the

whole (*Ibidem*: 66). That is, a passage from *is* to *ought* is available once we are willing to accept partial evil for the sake of general good, what Turnbull was prepared to do. Fifth, the motive for acting morally is provided by enlightened self-interest, as Malebranche had first suggested and as Anglican divines such as John Gay, Thomas Brown, and William Paley repeated. Turnbull writes that reason is a “power of making a just estimate of human life, and its principal end, by connecting things past and to come with what is present; and thus of computing our true interest” (*Ibidem*: 142) and that, accordingly, our sense of right and wrong and our sense of happiness “do not contradict one another” (*Ibidem*: 145), what is “beautiful” is also “useful” (*Ibidem*: 175), our interest in the long run is to do what is right both for the pleasure derived from a virtuous life and for the other-worldly prize carried by it, but virtue is “our natural good” (*Ibidem*: 182) or “our truest interest... whether we are to subsist after this life or not” (*Ibidem*: 201).

Also relevant is *A Discourse upon the Nature and Origin of Moral and Civil Laws*, published as an appendix to Turnbull’s translation of George Gottlob Heinecke’s *Elementa juris naturae et gentium*. Here he claims that Heinecke’s work provides an example of the “experimental way of reasoning” in morals in so far as he tried to deduce the duties of man from the mind’s principles and inner dispositions, thus giving an “experimental” foundation to natural law, an experimental approach practised before Heinecke by Cicero, Grotius, and Pufendorf that cannot be refuted unless by proving that the analysis of the human mind it yields is not “fact” (Turnbull 1740b: 201).

David Hume’s his fame until recently contributed in obscuring the importance of his background and in causing forgetfulness of the elements he shared with other Scots. At last, after a long story of misplaced discussions about Hume the sceptic or Hume the forerunner of analytic philosophy, his ‘Newtonianism’ has been acknowledged. Hume’s project of an all-encompassing “science of human nature”, meant to provide a basis for epistemology and accordingly for every branch of both moral and natural philosophy, founded on the analytic-synthetic method, and built following the blueprint of an analogy between the moral and the (Newtonian) physical world, has been recovered by a rich literature in the last decades with the effect, among others, of stressing similarities between Hume and other Scots<sup>3</sup>. Let us see how the issue of Hume’s Newtonianism may be construed after recent scholarship has tried to do what Forbes asked, namely establishing “what precisely Newtonianism meant for Hume” (Forbes 1975: 3). A first point to be kept in mind is the circumstance that the young Hume’s education was less exclusively literary than Hume scholars used to believe (Barfoot 1990; Sheperd 1980; Gilardi 1990: 213-30) and that, even if we cannot be sure that he attended MacLaurin’s classes in 1725-6, when the latter was appointed at Edinburgh, he was exposed to some serious mathematical and physical teaching. A second point is that Hume’s references to Newton’s work as a whole are enough to refute any claim to his lack of interest in it. In particular, the passage in the *History of England* on Newton and the “mechanical philosophy”, “a theory which, by discovering some of the secrets of nature, and allowing us to imagine the rest, is so agreeable to the natural vanity and curiosity of men” (Hume 1754-1762: vi, 542), whose conclusion is that while Newton “seemed to draw off the veil from some of the mysteries of nature, he showed at the same time the *imperfections* of the mechanical philosophy; and thereby restored her ultimate *secrets* to that obscurity in which they ever did and ever will remain” (*Ibidem*), expresses clearly enough the point of view of somebody who did *not* believe Newton’s to be the last word, and even of somebody who was more doubtful than Newton himself of the human mind’s ability of ever reaching the ultimate causes, but also of somebody who *did* believe his theory to be superior to previous ones. A third point is that the eighteenth-century literary and scientific cultures

were not so separate domains as they have been later, and the comparison of Cicero and Newton, found in Turnbull and then in Reid, was by no means a strange one, since the former had professed the kind of moderate scepticism that the Scots tended to believe was a viable alternative to intemperate Cartesian rationalism; in a word, “Hume is an eighteenth-century man of letters attempting to understand the limits of knowledge and, in so far as the problem of science is the problem of what one can know about unobservable mechanisms, his interest is riveted upon Newton whom he sees as a great ally in the cause of a moderate scepticism” (Force 1987: 178). A fourth point is the availability and quality of secondary sources through which Hume could have access to Newton’s doctrines. Hume may have read not only entries in Chambers *Cyclopaedia* (see Chambers 1728), but also Keill’s and Pemberton’s introductions (see Keill 1718; Pemberton 1728), MacLaurin’s manuscript lecture notes, to be transformed later into his *Account*, and, last of all, the methodological parts of Newton’s *Principia* (Force 1987: 178-87). It is worth recalling in this connection that MacLaurin moved from Marischal College to Edinburgh in 1725, the year in which, or a year before Hume concluded his own education. It is worth noting also that Hume makes clear reference to the fourth rule, which had been completely ignored by Keill (who was writing before the third edition of the *Principia* was published) and had been overlooked by Pemberton.

Let us discuss now the meaning of Hume’s project of an ‘experimental’ moral philosophy. It would be pointless discussing whether he had given origin to sciences like psychology and the social sciences, since the agenda was still different, namely reforming moral philosophy. But it would also be pointless discussing how far the term “experimental” alluded to some more vague Baconian attitude instead of the ‘Newtonian’ method, since what is to be understood as ‘Newtonian’ in this connection has to be established on the basis of the eighteenth-century own comprehension of what Newtonianism was. “Experimental” is indeed a semi-technical term of eighteenth-century jargon and it conveys a reference to Bacon, Galileo, Boyle, and Newton, as well as an opposition to the “conjectural” or “hypothetical”. One more misplaced question would be whether Hume has been actually true to Newton’s methodological standards; the answer would be surely negative, since Hume never reached certain targets such as mathematical treatment of empirical data or real experiments on human behaviour under controlled conditions, but also he never aimed at reaching such targets. A sensible question on the contrary is whether there are significant novelties in Hume’s approach compared with his predecessors and whether they may have been inspired by his ‘experimental’ program. Broadie gives a balanced answer commenting on the title *A treatise on Human Nature being an Attempt at Introducing the Experimental Mode of Reasoning into Moral Subjects*. He recalls that the term “moral”

is used in a wider sense by Hume than we should think appropriate today. For Hume ‘moral subjects’ include the whole range of topics concerned with the life of the spirit... And when Hume speaks of ‘experimental reasoning’ he does not have in mind reasoning based upon experiments. Nowadays we would contrast his ‘experimental reasoning’ with ‘a priori reasoning’. That is, Hume is seeking to draw a map of human nature, not on the basis of an analysis of concepts, or by working from a certain theological position regarding God’s nature and purpose. Instead Hume’s basis is experience (Broadie 1990: 101-2)

More in detail, Hume overall project is older than Newton, being Mersenne’s, Descartes’s, Hobbes’, and Spinoza’s project of a reformed moral philosophy on a methodological basis derived from the new science of nature, and accordingly – after Newton – ‘experimental’. The methodological staple out of which this image of experimental philosophy is made

includes the distinction between “principles” (or “philosophical hypotheses”) and “original qualities”, the analytic-synthetic procedure, the postulate of simplicity of nature, a role for analogy, refusal of “conjectures”, and finally refusal of hypotheses on first causes. A related point on which Hume insists is the limited scope of our knowledge implied by the ‘experimental’ approach, and in fact he believes that the fourth rule is some kind of overarching rule (see Force 1987: 178-87), to the point of keeping his distance from Newton himself by refuting the Argument from Design on the basis of the impossibility of extending the scope of analogical reasoning from individual limited cases that may be the subject-matter of our experience to the world as a whole. Besides – and here the dispute about Hume’s Newtonianism or Ciceronianism may turn out to be pure logomachy – Hume believed that Newton’s example could support an older tradition of moral studies characterized by its refusal both of a priori truths (such as those of Clarke) and artificial conjectures (such as those of Locke). This tradition looked for its own principles in history and observation, like Grotius and Cicero. It excluded a self-styled Newtonian such as Locke because of his ‘Cartesian’ recourse to conjectures in his political doctrine. If this is Hume’s understanding of “experimental philosophy” he was clearly a ‘Newtonian’ and his own was no lip-service to Newton, even if it was different from what others believed Newtonianism to imply. What is pointless is asking Hume and Adam Smith to pass some examination in differential calculus or expecting them to be competent in nineteenth-century ‘Newtonian’ physics<sup>4</sup>.

“Experimental philosophy in the moral subjects” is for Hume tantamount to a “science of human nature”. Talk of human nature does not imply abandoning the Newtonian inspiration, as claimed by Noxon (1973: 157) nor does it imply a program of a ‘modern’ empirical psychology, as claimed by Jessop (1967). Instead, it is tantamount to the whole of the moral subjects or, in a stricter sense, to the core of more general “principles” such as association of ideas that play a role in all the moral subjects. The reason is that the relationship between the core and the peripheral areas of moral subjects is not a deductive one, but instead an inclusive one (See Lecaldano 1991: 29 ff.), since principles are reached through analysis on the basis of observation, and analysis may stop at a higher or lower level of generality and in several cases, mainly in the *Essays*, Hume presents the principles as “maxims” comforted by history and experience without inquiring into underlying mechanisms. This does not mean a methodological turn, but just a choice of stopping at a deeper or less deep level of explanation.

The methodological claims in Hume’s work may be described as follows. First, “hypotheses”, or “philosophical hypotheses”, or “principles” (Hume 1739-40, Intro xxi and ii.1.5), used as equivalent terms following the *Principia*’s first edition where the word “hypothesis” was still used, are law-like expressions of regularities that he may just express in the shape of a maxim or further analyse into deeper mechanisms. Secondly, the analytic-synthetic procedure consists in “deducing” general maxims from a comparison of a number of particular cases in order to make “all our principles as far as possible universal, rising our experiments to the utmost degree of generality and accounting for effects by few and very simple causes” (Hume 1739-40, Intro xxi). Third, analogy is a basic procedure in Hume’s actual way of proceeding (as noted by Monteiro 1978; Gilardi 1988) and makes so that his theories be built in way different from inductive generalization plus deduction, as one would expect by an adept to the analytic-synthetic procedure; in detail, it justifies the very inference from past cases to a novel one (Hume 1748: iv.2), as well as attempts at unifying different principles and the introduction of physical analogues for moral phenomena; the “philosophical hypotheses” of association of ideas (Hume 1739-40, ii.1.5) is introduced precisely by such a controlled use of analogy between the physical and

the moral. Fourth, “experiment” is the basis for “philosophical hypotheses” or for “maxims”, and the test for detecting wild conjectures (Hume 1748: iv.2) such as those of aprioristic doctrines based on fictions such as the social contract. “Experiment” is reliable with different degrees of certainty (Hume 1748, x.1), and in moral subjects it presents us with peculiar difficulties deriving from the impossibility of obtaining uniform conditions and from the uncertainty of introspection, since there are phenomena that it is hard to reduce to “original qualities” (Hume 1739-40, i.1.5) and it is impossible to explain “ultimate principles” (*Ibidem*, Intro.10). The most reliable observational basis he seems to be able to point at is history and observation of current human behaviour; what kind of warrant the “maxims” he builds on such a basis may claim is unclear, and in particular the distinction between those maxims that aim at formulating genuine empirical generalizations and those that are simply formulations of generally accepted conventions is even less clear (see Brown 1984: 107-8).

The positive elements in Hume with a Newtonian pedigree are the following: first, association of ideas as an observed general phenomenon; the basis of association is a mechanism, like a “gentle force” that brings two ideas together as if “nature has bestowed a kind of attraction on certain impressions and ideas” (Hume 1739-40, ii.1.5); second, an analogue of *vis inertiae* as the basis of “habit” and “custom” (Hume 1748, v.1); it is important to note that inertia is an element of a dynamical physical model such as Newton’s and it was absent from Cartesian physics, that was based purely cinematic and on which Hobbes’s social theory was modelled; iii) “belief” (Hume 1748, v.2) and the “fellow-feeling” or “sympathy” (Hume 1751, v.2), both assumed to be generally observable ways of behaving of our ideas expressible in maxims, and possibly analysable into a more basic mechanism, association of ideas; iv) feed-back mechanisms such as those of the monetary flow (See Hume 1742: 315), the balance of trade (*Ibidem*: 311-2), the tendency of manufactures to move elsewhere after they have lead a country to opulence (*Ibidem*: 333); the two latter mechanisms are self-regulating, or are analogous to the scales, singled out by Mayr as the emerging model in eighteenth-century political studies (see Mayr 1986; cf. Brown 1984: 85 ff.).

Adam Ferguson, known mainly as the author of *An Essay on the History of civil society* (1767), claimed in his *Institutes of Moral Philosophy* echoing Turnbull that moral philosophy, “the knowledge of what ought to be” presupposes a knowledge of “the history of man’s nature, his dispositions, his specific enjoyments and sufferings, his conditions and future prospects” (Ferguson 1769: 10). Such knowledge in turn may be built by establishing “principles”, that is general rules “applied to explain or regulate particulars” (*Ibidem*: 3), and theory is “explanation from principles” through the analytic and the synthetic method; theory establishes laws of nature, that is general rules “collected from facts” (*Ibidem*); facts may be either physical or moral, the latter being “any general expression of what is good” (*Ibidem*: 5). Note that a moral law is reached through analysis, starting with “the sentiments and actions of intelligent natures” (*Ibidem*: 6). The usual negative example of pseudo-explanation, Descartes’s theory of vortexes, is invoked in order to assess that “all theory must rest on ultimate facts. To require proof *a priore* for every fact, were to suppose, that human knowledge requires an infinite series of facts and explanations; which is impossible” (*Ibidem*: 9)

There are at least two “laws of human nature”: the law of self-preservation and the law of society that makes men desire the welfare of their fellow-creatures. The latter law does exist, even if it has been disputed, since it acts constantly, even if the actions of men are regulated, not by this law only, but by this combined with every other law of their nature” (*Ibidem*: 92). Accordingly, the

general tendency of the law of gravitation is, to cause bodies to approach each other; as the tendency of the law of society is to cause men to produce public good, or to abstain from public harm. But the external result is opposite in opposite circumstances. Heavy bodies are not always falling, nor social natures always are acting for the public good... And thus, the operation of the law of society, like that of gravitation itself, is always real, though the external result is not always the same (*Ibidem*: 92-3).

Thomas Reid, a disciple of Turnbull and a critic of Hume, partly developed Turnbull's program and partly recycled much of Hume's own ideas while attacking him. He outlined the program of a philosophy of mind with a scope more restricted than Hume's science of human nature and yet more neatly qualified as an empirical science and outlined a 'Newtonian' way to knowledge, the "way of observation and experiment", avoiding "conjectures" and sticking to "just induction from facts" (Reid 1764, i.1), a way practised every day in common life by "common sense" that unwittingly follows Newton's rules, and then proposed his own foundation of morals (Reid 1785: 637-9). Reid's main heir was Dugald Stewart who, in his *Elements of the Philosophy of the Human Mind* (Stewart 1792, 1813, 1826) grafted ideas from Ferguson, Smith, and Hume himself onto the trunk of Reid's anti-sceptical common-sense epistemology yielding the nineteenth-century Scottish Philosophy, namely a synthesis of ontological realism and epistemological anti-rationalism, which left its own legacy to Pragmatism. As a conclusion, it would not be never stressed enough that the idea of "experimental philosophy" as the third way between Bacon and Descartes and the only adequate response to the challenge of neo-scepticism is the key to a meaningful intellectual-historical account of what the Scots were doing. This implies taking this program in the very terms in which its proponents formulated it (See Wood 2003: 107). Besides, it implies recognizing the continuity existing between all the Scottish Enlighteners and realizing that even when Reid was attacking the "sceptical" Hume he was just playing tactical manoeuvres in order to introduce 'Humean' ideas into the Presbyterian establishment, parading as the true enemy of the 'atheist' Hume<sup>5</sup>. Besides, the legacy of previous generations should be considered as essential to the following, unless one fall into Laudan's blunder (Laudan 1970) of discovering Reid's philosophy as the turning point toward Newtonian methodology, just because one's library does not possess Turnbull and MacLaurin. Last of all, it is true that different writers tended to bend the same program into different directions, and the refusal of the Design Argument, and of theodicy are the watershed. It is true that Hume is at one pole of a spectrum whose opposite pole is Turnbull (not by chance a convert to Anglicanism) and that Smith differentiated himself from Hume in epistemology, morality, religion, and politics by the principle that belief can be corrected on the basis of 'practical' constraints posed by our relationships with the world, but nonetheless, no Scottish-Enlightenment scholar can fall, as Schliesser (2005: 727) does instead, into the trap of the myth of "Humean despair" just because Kant and Hegel and Quine (none of whom was a Scottish-Enlightenment scholar) had bought such a myth from Reid, who had his own reasons for spreading it. It needs be kept in mind that it was between the Fifties and the Seventies, after Turnbull and Hume had launched their experimental-philosophy manifestos, and while Ferguson and Reid were working at their own developments, that Adam Smith wrote pieces of his philosophical history of the arts and sciences, the first version of *The Theory of moral Sentiments*, dictated the *Lectures on Jurisprudence*, and then wrote *The Wealth of Nations*. Once the pieces of the context are brought before our eyes, the idea that the whole of Smith's work fitted in this program becomes plausible enough, and various attempts at accounting for Smith's inspiration outside of such context (Foley's Democritean philosophy, Lindgren's Kuhnian epistemology, Schliesser's 'realism') turn out to be anachronistic.

## 5. Adam Smith's moral Newtonianism

The history of the interpretations of Smith's work in general, and of *The Wealth of Nations* in particular, is a curious one, and it may be compared with several odd features of the history of the interpretations of Newton. Smith's works having been almost universally neglected by historians of philosophy, *The Wealth of Nations* was left to historians of economic thought to be read out of context. Smith's contribution was considered for a few decades following the marginalist revolution to be an example of pre-scientific, aprioristic, 'metaphysical' theorizing. When the most historically minded writers perceived the existence of some Newtonian influence on Smith, they tended to homologate it to the Boyle Lectures philosophy, that is, precisely to the dogmatic theological and political theorizing that was required in order to reassure post-marginalist economists about the unbridgeable gap subsisting between post-1870 science and pre-scientific dogmas. In the twentieth century *The Wealth of Nations* was rescued, and a new reading offered proving that Smith after 1759 had dropped theology thus becoming an 'empirical' scientist, with the "virtual disappearance from the *Wealth of Nations* of the doctrine of an order of nature designed and guided by a benevolent God" (Viner 1927: 222), a doctrine allegedly central to the *Theory of Moral Sentiments* (*Ibidem*: 221). Due to lack of competence in the history of science and philosophy, Viner and his contemporaries tended to read Smith's 'empirical' attitude in terms of the twentieth century empiricist *vulgata*. This line of interpretation came to its *reductio ad absurdum* when it was suggested that Smith had *already* become an empirical scientist in 1759, since his first work was, more than a contribution to ethics, a contribution to social psychology (Bittermann 1940; Campbell 1971).

In the meantime, Smith's *Essays on Philosophical Subjects* had been rescued, first by an excellent, albeit neglected, paper by Moscovici (1956)<sup>6</sup>, and later, during the Sixties and Seventies, by a few British and American contributions, the most notable being Lindgren (1974: 1-19). With the exception of Moscovici, those contributions were not 'real' intellectual history, in so far as they were trying to bring Smith's methodology into comparison with twentieth-century philosophy of science. To my taste, also Schliesser (2005) falls into this camp of a-historical reconstructions since "modest realism" as a label for Smith's epistemology is too vague to add anything to our understanding of Smith's contribution. Berry (2006) even falls outside the camp of intellectual history of any kind, since he simply tries to dissolve interpretative problems by such tricks as decreeing that Smith's Newtonianism "is better understood as a general orientation rather than a specific agenda" (Berry 2006: 126)<sup>7</sup>.

Berry's trivial conclusion notwithstanding, an articulated Smithian methodology can be reconstructed. There is clear acknowledgment of the superiority of Newton's positive contribution, and of the Newtonian analytic-synthetic method vis-à-vis Cartesian physics and Cartesian methodological attitudes. This needs to be stressed, since the claim of Smith's adhesion to Cartesianism has circulated (Foley 1974; Mirowski 1986), even if adhesion to Cartesianism could hardly have been conceivable in eighteenth-century Scotland and its ascription to Smith is incompatible with textual evidence such as the following from the *Lectures on Rhetoric*:

the Newtonian method is undoubtedly the most philosophical and in every science, whether of Morals or Natural Philosophy, etc., vastly more ingenious, and for that reason more engaging, than the other [i.e. the Aristotelian] (Smith 1982, ii.134-5).

The notoriously 'sceptical' considerations by which *The History of Astronomy* ends, according to which, while Smith has been "endeavouring to represent all philosophical systems as mere inventions of the imagination", he has "insensibly been drawn in, to make use of language expressing the connecting principles of this one [Newton's], as if they were the real chains which Nature makes use of to bind together her several operations" (Smith 1795, iv.76) have been used to prove alternatively that Smith was a Cartesian or an outright sceptic. When matched with the quote from the *Lectures on Rhetoric* they allow instead for the conclusion that Smith believed in the superiority of the Newtonian method and of the Newtonian theory, that he did not believe Newton's theory to be the 'final' discovery of first causes, but also that this did not amount to asserting instead that "everything goes", since a better theory is such in so far as it reflects in a more satisfactory way with the response by unchanging laws of the mind when facing new external conditions (see Cremaschi 2000).

Smith's understanding of the Newtonian method derives mainly from Hume's "experimental philosophy in the moral subjects", to which Maclaurin's, perhaps Turnbull's, and surely Condillac's legacies are added. This implies stressing the Dutch, Scottish and then French 'experimentalist' interpretation of Newtonian methodology and giving pride of place to the distinction between "original qualities" in external reality and "principles" in the mind. Yet this distinction is not the basis for a sceptical argument; on the contrary, Smith goes more farther away from scepticism than Hume does, since he abandon's the latter's claim of the impossibility to reform "belief"; he adds an item he might have learned from Condillac, namely the idea that there are *constrains* to beliefs posed by our practice (both in the knowledge of nature and in morality) that make so that eventually neither, on one hand a priori systems, nor, on the other, custom and habit can resist good arguments bases on our practices. So, the conclusion of *The History of Astronomy* neither is an expression of outright scepticism nor an irrelevant gloss, being instead the formulation of a theoretical tension in Smith's epistemology between the merely 'internal' character of our criteria for theory-choice and a need to postulate some correspondence of theory and world-order.

An explicit program for a 'Newtonian' moral philosophy may be easily found in Smith. It recommends development of peripheral areas of moral philosophy, namely ethics, jurisprudence and political economy, instead of the centre, the "abstract science of human nature"; it prescribes accordingly that speculations about the original qualities of human nature be left aside, even if the 'principles' of the mind are more directly accessible to us than those of physical reality (Smith 1759, vii.ii.4.14), and we may assume that there are "unchanging principles of human nature" (Smith 1759, iii.2.30) albeit yielding opposite phenomena in different situations (See Smith 1776, i.ii.1; Berry: 130-1). The reason is that we never meet human-nature-in-a-void – something Hume perhaps still longed for in 1739 – and also the unchanging 'principles' we formulate are introduced by generalization and analogy like in natural philosophy, starting with phenomena or "manifestations of human nature" (Smith 1759, vii.ii.3.4; cf. Cremaschi 1984: 96-99, 138-42, 148-51).

Thomas Pownall (1722-1805), governor of Massachusetts from 1757 to 1759 and then member of Parliament, writer on several subjects, wrote a letter to Smith after the publication of *The Wealth of Nations* where he criticized him on a couple of points after having proposed an interpretation of the work's structure, while referring to Newton, in terms of analytic-synthetic procedure (Pownall 1776: 337). Smith (1997: 224) acknowledged Pownall's comments, kept them in mind while preparing the second edition of the work, but was aware that Pownall would not have been satisfied with the changes

introduced (*Ibidem*: 250). Even if Berry (20006: 126) not surprisingly explains away such references to Newton as a mere “compliment”, due to “the very prestige of Newton”, the work may be read instead precisely as Pownall suggests, that is, as consisting of the sum of an *analysis* and a *synthesis*, both meant to carry out the function assigned to them in Newton's work. The former should consist of a collection of observations on human behaviour at different times and places, on which a few general maxims concerning human conduct in economic affairs could be based. Analysis brings in new theoretical entities, such as equilibrium, circulation, labour-value, by elaborating on the physico-moral analogy that allows for creation new entities, *invisible* chains, *imaginary* machines, *invisible* hands, following the Newtonian idea of “analogy of nature”<sup>8</sup>.

Exclusion of hypotheses on original qualities (as about the propensity to truck and barter) was the strategic factor in allowing for an *experimental* moral science and it is made even more explicit in *The Wealth of Nations*. In the *Lectures on Jurisprudence*, hypotheses were formulated on deeper ‘mechanisms’ behind the principle invoked in the explanation of exchange, that is, the propensity to truck and barter (Smith 1978, [B] vi.56); in the *The Wealth of Nations* exploration of ‘deeper’ qualities is dismissed as not pertaining “to the current inquiry” (Smith 1776, i.ii.2). It may be noted that this resembles Hume's change in mood noted by Noxon (1973: 3-8) after the *Treatise*, when he abandons his inquiry about the centre of the science of man in favour of exploration of its peripheral areas such as government, morality, and commerce.

## 6. Adam Smith's Moral Newtonianism and the shaping of political economy

After discussing the Newtonian methodological legacy, I try to show now how several positive theoretical items were transferred from Newtonian physics to political economy.

1. *Mechanisms*. In seventeenth- and eighteenth-century literature on commerce, a number of isolated mechanisms had been ‘detected’ behind individual market and monetary phenomena (See Brown 1984: 25-48). Those discoveries had been made possible by the use of an analogy with familiar physical mechanisms such as wheels, scales, flow of fluids. *The Wealth of Nations* goes one step forward by linking phenomena with “principles” in a systematic way. As a side effect it creates an overall view of society as a sum of mechanisms. One of them is equilibrium or gravitation. Society is viewed, statically, as a universe of exchange-values attracting each other and consisting of labour embodied in marketable material goods. Equilibrium establishes itself within that system, in so far as different goods tend to gravitate around a “natural rate” which is their average or ordinary value (Smith 1776, i.vii.9-15; cf. Cremaschi 1984: 135-136). The latter, and more complex, mechanism is that of value circulation, providing – unlike the former – a dynamical view of society. This mechanism is apparently derived from the Physiocrats' idea of a circulation of goods (and in fact it cannot be traced in the *Lectures on Jurisprudence*, that precede Smith's acquaintance with the *économistes*), but with a decisive shift in its meaning. Smith's “great wheel of circulation” carries around value, not of physical goods, and it is such circulating value the magnet attracting fresh potential value, hidden in remote corners of society, so that society's total amount of value grows bigger with each phase of such circulation process (Smith 1776, ii.ii.11-160; ii.ii.230; iv.vii.c.43; cf. Cremaschi 1984: 137-8 and 189-93).

2. *Concepts of force*. Newton's idea of universal attraction had become a magic word, and every kind of counterpart in the moral world had been introduced, ranging from Locke's principle of the association of ideas to Hutcheson's sympathy and Helvétius' interest.

Smith recalls on one occasion Hutcheson's metaphor of benevolence as a "moral attraction" by which the different members of society are "drawn to one common centre of mutual good offices" (Smith 1759, ii.ii.3.1). In *The Wealth of Nations* an explicit *analogon* of physical gravitation is introduced, and it is something much less universal, but at the same time more precisely defined, than other moral equivalents of attraction. The gravitation of prices is an observed behaviour of commodities that may be interpreted as if the latter were attracted by a "centre of gravitation", which is not something existing in the real world, but only an ideal point. The observed phenomena, which may be described in terms of action of a *vis attractiva*, may be resolved into the action of a *vis a tergo*; the latter is identical with one of the "principles" of the theory, namely "desire of bettering our condition". The sum of actions by these forces yields a final order, equivalent to the order that could have been previously established according to some Design. The expression "invisible hand" airs such an equivalence of *vis a tergo* and *vis attractiva*; this use of the expression can be found indeed in Roger Cotes with reference to a physical experiment (Newton 1959-1977: v, 392; cf. Cremaschi 2002a: 101-2).

3. *Final and efficient causes.* One closely related subject is the role of teleology. Nineteenth-century interpreters used to read into Smith a *HarmonienLehre*, a dogmatic assertion of harmony between individual and collective interest, via a quasi-animistic action of the invisible hand. Twentieth-century reactions detected in *The Wealth of Nations* only law-like statements of regularities, only "ordinary" or "average" behaviour (even if described occasionally by the old-fashioned adjective "natural"). Truth lies not in between but somewhere else; indeed, teleology does play a role in Smith's system, but as limited as the one it played in Newton, namely in a social (weakened) equivalent of the Design argument, which shows how an overall order results from the sum of numberless instances of efficient causality. The equivalence of the "desire of bettering our condition" and the invisible hand indicates precisely the possibility of a quasi-teleological reading of the theory. But Smith neither believed in the Design Argument nor in any social theodicy and for him order, both in the moral and in the natural world, is postulated as objective but inaccessible in any detail, while an 'imaginary' order – provided by those imaginary machines in which theories consist – may help in seeing and connecting a number of causal connections. A number of such individual connexions are known to be *real*, not 'imaginary' – what is imaginary is what is *added* by imagination in order to fill the gaps between phenomena, thus yielding "imaginary machines" or "invisible chains". Thus, theories in natural philosophy (and the same holds for moral philosophy) are forever imperfect approximations to an opaque world-order. I should add that Smith is, to say the least, more prudent than Newton had been in presenting his own theoretical achievements as a basis for theological speculation. Newton says in the famous Query xxi that the discovery of an order in the universe had made a foundation available for natural theology (Newton 1704: 261-4). Smith, both in the first and in the sixth edition of *The Theory of Moral Sentiments*, had mentioned the Design Argument as bearing also on society, understood as a "part of nature" (Smith 1759, ii.iii.3.2 and vi.iii.30), but admitting such argument only as a legitimate subject for speculation, not as an established starting-point from which a deduction may follow.

4. *Societal laws.* Their status of in Smith is a central issue in Smith interpretation. The nineteenth-century literature used to stress Smith's indebtedness to the natural law tradition; as a reaction, twentieth-century literature, say Viner and Bittermann, vindicated the 'empirical' character of Smith's theory, with mention of Smith's Newtonianism made incidentally by Bittermann just as a proof of his 'empiricism' and his negation of any role for 'natural law'. Things are in fact more complex, since the natural law tradition did have an

impact on the origins of the social sciences, but not as an alternative to some tradition of 'empirical' theorizing inspired by the model of the natural science. The point is rather that during the eighteenth century there was at first a coexistence, and subsequently a fusion, of two distinct traditions of social theorizing, namely the systematic tradition of natural law and the tradition of piecemeal social theorizing of Cameralistic and Mercantilist literature (Brown 1984: 70). *The Wealth of Nations* is precisely a result of a fusion of both traditions, and Smith's Moral Newtonianism was the essential catalyst that made it possible (Cremaschi 1981; 1984: 204-207). Theoretical confusion prevailing until recently on the point was connected with lack of historical awareness about natural law. The latter used to be associated with 'Deism', theology, and metaphysics, all assumed to be roughly equivalent. On the contrary, it is worth stressing that, as shown in an important, but rather neglected, article by Francis Oakley, in which Zilsel's famous thesis on the origins of modern science are criticized (See Oakley 1961; Zilsel 1942; cf. Cremaschi 2002b), the Scholastic legacy in natural law doctrines was twofold, in so far as, besides the Thomist notions of *lex aeterna* from which the law of nature derives, directly reminiscent of the Stoics' immanent rational law of nature, there was an opposite notion, the idea of a law 'imposed' by God on the world. The latter was typical of the *via moderna*, that is, of philosophers such as William of Ockham and John Buridan, who were the most direct forerunners of Galilean physical science (Ghisalberti 1990: 147-62). It is from this tradition that the Newtonian image of the clock and the clockmaker derives, and it is within this tradition that, before Galileo and Newton, a mechanistic pre-comprehension of the physical world was created according to which the world is composed of parts endowed with certain "essential qualities" but devoid of any immanent *telos*, and it is to the sum of those parts that a system of laws is superimposed. I would like to add that the former view was a hindrance to social theorizing, as shown by the Physiocrats' example, where the order discovered by the theory is immediately identified with the moral order. Smith, on the contrary, was encouraged in framing his own view of societal laws by his association with the latter tradition. It is worth recalling that in *The Theory of Moral Sentiments* a kind of a 'Stoic' ideal world-order, one in which what *is* and what *ought to be* ideally converge, is described as an ideal which is declared to be both unknowable and impracticable. What is relevant to an ethical theory is the acknowledgment of some 'weaker' order, which is produced in human affairs by re-adjustments of sympathetic reactions facing both reciprocal mirroring in social life and changing external circumstances. Smith notes that, if all general rules are commonly denominated laws, including those which bodies observe in the communication of motion, called the laws of motion, yet

those general rules which our moral faculties observe in approving or condemning whatever sentiment or action is subjected to their examination, may much more justly be denominated such. They have a much greater resemblance to what are properly called laws, those general rules which the sovereign lays down to direct the conduct of his subjects" (Smith 1759, iii.5.7).

In *The Wealth of Nations*, Smith avoids the term "law" to indicate scientific social laws, even if that usage had already been introduced by Locke<sup>9</sup>, and talks instead of "principles", a term belonging to Newtonian terminology. Two important traits of the Smithian principles are their relationship to phenomena and their non-ultimate character. *The Wealth of Nations* starts with what would be called, in Newton's words, a "phenomenon", similar in its status to the phenomena listed at the beginning of Book III of the *Principia* (See Smith 1776, i.1; Newton 1723: iii, 3-10), which is division of labour. From the phenomenon a principle, namely the propensity to truck and barter, is 'deduced'; it is subsequently shown to agree, not only with the phenomenon taken as its basis, but

also with other observed phenomena (Hetherington 1983; Brown 2006). This procedure clearly follows a scheme according to which explanation is composed of an *analysis* and a *synthesis*<sup>10</sup>.

The principle introduced during the construction of the theory (and supposedly 'deduced' from the phenomena) is assumed to be non-ultimate in its character and its resolution into more basic qualities of human nature is declared to go beyond the scope of the inquiry undertaken. Note that, by this statement, one more element of Newtonian methodology, namely anti-essentialism, expressed by the "*hypotheses non fingo*", clause is embodied in Smith's economic theory.

My conclusion is the fruitfulness of *lex imposita* view of natural law, the one adopted by the theological voluntarists such as the Franciscans and then the Reformers, in favouring the 'discovery' of societal laws, and the bareness the 'immanent' natural law view. This conclusion may be compared with Canguilhem's remark concerning the ineffectiveness of mechanicism in preparing the discovery of the reflex mechanism (Canguilhem 1977: 169) due to the circumstance that vitalists were more prepared to 'see' individual mechanisms in biological phenomena precisely because they believed that mechanical connections were exceptions, not the rule. Adam Smith, unlike the ancient Stoics and the seventeenth-century Platonists – pace recent proponents of Smith's Stoicism – was *not* a believer in cosmic harmony. For him, the idea of a world order was a kind of 'regulative' idea, unusable for evaluating real-life cases. And yet, precisely Smith's post-scepticism proved to be an excellent basis for innovative use of metaphor, that is, precisely because Smith believed all theories to be creations of our imagination, he felt free in adopting several analogies as sources of cognitive strategies while treating the phenomena of society, politics, and commerce, and the familiar physico-moral analogy in Smith's hands ceased to be a rhetorical device for preachers and started being used as a tool for highlighting previously undetected causal connections. But this happened because for Smith no overall world-harmony held and beneficial unintended results carried by such causal connections were an exception, not the rule.

Mirowski's historical epistemology, inspired by recent developments in philosophy of science, has granted metaphor a role much more basic than McCloskey's once famous economic rhetoric that 'discovered' just that also economists make persuasive use of discourse; this amounts to discovering the 'perlocutive' dimension of economic discourse, while Mirowski's 'discovery' has looked beyond surface metaphorical expressions, and indeed beyond *discourse*, looking at *language* as the mould by which economic thinking is given its shape, and identifying 'deep' metaphors, such as the physico-moral parallel which underlies the modern world-view and also moulded economic science (Mirowski 1989). His contribution overlaps fairly well with what has been argued for by Cremaschi (1984: 182-193; 2002a) in taking developments in post-empiricist philosophy of science seriously, but his program of studying the interaction between physics and economics at the time of the marginalist revolution might be expanded to include classical political economy. It is enough to realize that Adam Smith was not the Cartesian materialist depicted by Foley (1976) and accordingly that there is room for exploring analogies between Smith's economic theory and Newton's (not Descartes's) physics, and that the kind of reciprocal interaction between nineteenth-century economics and physics detected by Mirowski may be recognized also between eighteenth-century political economy and natural philosophy. Indeed, all that the present paper intends to deny is the content of one of Mirowski's footnotes:

There exists a literature that attempts to claim that Newtonian physics had some influence on Smith (Llobera 1981; Mayr 1981; Hetherington 1983). However, this is of necessity misguided because Newton was not the conduit through which Smith imbibed his scientific

influences; the first to point this out was Foley (1976), and this section owes much to that superb work (Mirowski: 407-8).

To be more precise, that any Scot might have been a Cartesian is a curious idea, and that Foley's work be "superb" is a really strange one, since this book is famous among Smith scholars for its mistakes. Nobody among them – apart from dissent on the interpretation of Smith's Newtonianism – contends that Smith was *not* a 'Newtonian' and a critic of Cartesianism<sup>11</sup>. Thus, it is possible to reconstruct the role played by a substance-view of value in Adam Smith, and possibly to criticize the loose ends of his theories without overlooking the fact that he was sophisticated enough as to introduce such an idea not as a dogma but instead as an avowedly fictional element (see Freudenthal 1983; Cremaschi 1984: 189-93).

## 7. Conclusions

1. Mirowski's attempt at applying two ideas from contemporary philosophy of science to the reading of economic texts is quite fruitful, even if slightly less novel than he believes; yet these ideas, namely (a) a constant interaction between theories and observations, (b) a metaphorical character of the re-description of phenomena by theories, may yield results partially different from his own; in more detail, the history of the relationship of physics and economics did not start in 1870 and it was not the story of a one-way influence of Cartesianism over economics.

2. Yet the story was an intricate one: there were borrowings of substantive items before the methodological justification for the borrowing, and there were methodological programs that seem to open the way to 'scientific' economics and then turn 'back' toward Cicero; yet this is not so bad, since Cicero was not so obscurantist as to represent an outright alternative to 'science'.

3. The fact that the story was complex does not imply that it was a messy one and that Newtonianism was just a confused catch-all label; the problem is instead that it makes little sense discussing whether Smith was more like Kuhn or like Putnam, while it does make sense asking whether he was closer to a voluntarist or to an intellectualist view of natural law; the 'Newtonian philosophy' for the Scots was a third way beyond Rationalism and Empiricism that promised a way out of the knot of theological voluntarism and political authoritarianism that had apparently locked up post-Reformation Northern Europe into a deadlock; thus, far from being a sixteenth-century sceptic or a twentieth-century epistemological relativist, Smith – pace all those who believe that the Newtonian inspiration was for him "a general orientation rather than a specific agenda" (Berry 2006: 125-6) – was at his best a 'Newtonian' precisely while writing *The Wealth of Nations*.

## Bibliography

- Barfoot, Michael (1990) 'Hume and the Culture of Science in the Early Eighteenth Century', in Stewart (1990): 151-190.
- Berry, Christopher J. (2006) 'Smith and Science', in Haakonssen (2006a): 114-135.
- Bittermann, Henry J. (1940) 'Adam Smith's Empiricism and the Law of Nature', *Journal of Political Economy*, 48: 487-520 and 703-734.
- Boehm, Stephan; Gierke, Christian; Kurz, Heinz; Sturm, Richard eds. (2002) *Is There Progress in Economics?*, Cheltenham: Elgar.
- Broadie Alexander (1990) *The Tradition of Scottish Philosophy. A New Perspective on the Enlightenment*, Edinburgh: Polygon.

- Broadie, Alexander ed. (2003) *The Cambridge Companion to the Scottish Enlightenment*, Cambridge: Cambridge University Press.
- Broadie, Alexander (2005) 'Introduction', in Turnbull (1740-41): ix-xvii.
- Brown, Robert (1984) *The Nature of Social Laws*, Cambridge: Cambridge University Press.
- Brown, Robert (2006) 'Social Sciences', in Haakonssen 2006b: 1069- 1106.
- Campbell, Roy H., Skinner, Andrew S. eds. (1982) *The Origins and Nature of the Scottish Enlightenment*, Edinburgh: Donald.
- Campbell, Thomas D. (1971) *Adam Smith's Science of Morals*, London: Allen and Unwin.
- Canguilhem, Georges ([1955] 1977) *La formation du concept de réflexe aux XVIIe et XVIIIe siècles*, Paris: Vrin.
- Capaldi, Nicholas (1975) *David Hume. The Newtonian Philosopher*, Boston: Twayne.
- Chambers, Ephraim (1728) *Cyclopaedia: or, a Universal Dictionary of Arts And Sciences*, 2 vols., London: Knapton.
- Cremaschi, Sergio (2000) 'Les lumières écossaises et le roman philosophique de Descartes', in Senderowicz and Wahl (2000): 65-88.
- Cremaschi, Sergio (1981) 'Adam Smith, Newtonianism and Political Economy', *Manuscrito. Revista de Filosofia*, 5: 117-134.
- Cremaschi, Sergio (1984) *Il sistema della ricchezza. Economia politica e problema del metodo in Adam Smith*, Milano: Angeli.
- Cremaschi, Sergio (1988) 'Metafore, modelli, linguaggio scientifico: il dibattito postempirista', in Melchiorre 1988: 31-102
- Cremaschi, Sergio (1989) 'Adam Smith: Sceptical Newtonianism, Disenchanted Republicanism, and the Birth of Social Science', in M. Dascal and O. Gruengard eds., *Knowledge and Politics. Case Studies on the Relationship between Epistemology and Political Philosophy*, Boulder (Co): Westview Press.
- Cremaschi, Sergio (1992) *L'illuminismo scozzese e il newtonianismo morale*, in M. Geuna and M.L. Pesante eds., *Interessi, passioni, convenzioni. Discussioni settecentesche su virtù e civiltà*, Milano: Angeli, pp. 41-76.
- Cremaschi, Sergio (1998) 'La herencia newtoniana en la economía política del siglo XVIII', in Elena, Ordóñez, Corbi (1998): 77-101
- Cremaschi, Sergio (2002a) 'Metaphors in the Wealth of Nations', in Boehm, Gierke, Kurz, Sturm (2002): 89-114.
- Cremaschi, Sergio (2002b) 'Two views of Natural Law and the Shaping of Political Economy', *Croatian Journal of Philosophy*, 2: 65-80.
- Cudworth, Ralph (1731) *A Treatise Concerning Eternal and Immutable Morality*, ed. by S. Hutton, Cambridge University Press, Cambridge 1996.
- Elena, Alberto, Ordóñez, Javier, and Colubi, Mariano eds. (1998) *Después de Newton: ciencia y sociedad durante la Primera Revolución Industrial*, Madrid: Anthropos.
- Ferguson, Adam ([1766] 1995) *An Essay on the History of Civil Society*, ed. by F. Oz-Salzberger, Cambridge: Cambridge University Press.
- Ferguson, Adam ([1769] 1994) *Institutes of Moral Philosophy*, London: Routledge / Thoemmes Press.
- Ferguson, Adam ([1792] 1978) *Principles of Moral and Political Science*, 2 vols., New York: Garland.
- Foley, Vernon (1976) *The Social Physics of Adam Smith*, West Lafayette (IN).
- Forbes, Duncan (1975) *Hume's Philosophical Politics*, Cambridge: Cambridge University Press.
- Force, James E. (1987) 'Hume's Interest in Newton and Science', *Hume Studies*, 13 : 166-216.
- Freudenthal, Gideon (1981) 'Adam Smith's Analytic-Synthetic Method and the System of

- Natural Liberty', *History of European Ideas*, 2: 135-54.
- Freudenthal, Gideon (1983) *Atom und Individuum im Zeitalter Newtons. Zur Genese der mechanistischen Natur- und Sozialphilosophie*, Frankfurt a.M.: Suhrkamp; English transl. *Atom and Individual in the Age of Newton. On the Genesis of the Mechanistic World View*, Dordrecht: Reidel 1986.
- Ghisalberti, Alessandro (1990) *Medioevo teologico*, Roma-Bari: Laterza.
- Gilardi, Roberto (1988) 'Hume, Newton e il Principio di Analogia', *Rivista di Filosofia Neoscolastica*, 80: 63-104.
- Gilardi, Roberto (1990) *Il giovane Hume*, Milan: Vita e Pensiero.
- Griswold, Charles L. (1999) *Adam Smith and the Virtues of Enlightenment*, Cambridge: Cambridge.
- Haakonssen, Knud (2000) *Adam Smith* (The International Library of Critical Essays in the History of Philosophy), Aldershot: Ashgate.
- Haakonssen, Knud (2006a) *The Cambridge Companion to Smith*, Cambridge: Cambridge University Press.
- Haakonssen, Knud (2006b) *The Cambridge History of Eighteenth-Century Philosophy*, 2 vols., Cambridge: Cambridge University Press, 2006.
- Heinecke, Johan Gottlieb (1738), *Elementa juris naturae et gentium*, Halae: Orphanatroph.
- Heinecke, Johan Gottlieb (1763) *A Methodical System of Universal Law*, translated and illustrated with notes by George Turnbull, 2 vols., London (transl. of Heinecke 1738)
- Hetherington, Norris S. (1983) 'Isaac Newton's Influence on Adam Smith's Natural Laws in Economics', *Journal of the History of Ideas*, 44: 497-505.
- Hume, David ([1739-1740] 1998) *A Treatise of Human Nature*, ed. by D.F. Norton and M.J. Norton, Oxford: Oxford University Press.
- Hume, David ([1748] 1975) 'An Enquiry Concerning Human Understanding', in *Enquiries concerning Human Understanding and concerning the Principles of Morals*, ed. by L.A. Selby-Bigge and P.H. Nidditch, Oxford: Clarendon.
- Hume ([1751] 1964) 'An Enquiry Concerning the Principles of Morals', in *Enquiries concerning Human Understanding and concerning the Principles of Morals*, ed. by L.A. Selby-Bigge and P.H. Nidditch, Oxford: Clarendon,
- Hume, David ([1842] 1964) 'Of Money', in *The Philosophical Works*, 4 vols, ed. by Th.H. Green and Th.H. Grose, Aalen: Scientia Verlag: iii, 309- 20.
- Hume, David ([1754-1762] 1983) *The History of England, from the Invasion of Julius Caesar to the Revolution in 1688*, 6 vols, Indianapolis: Liberty Fund.
- Hume, David ([1874-5] 1964) *The Philosophical Works*, 4 vols, ed. by Th.H. Green and Th.H. Grose, Aalen: Scientia Verlag.
- Hutcheson, Francis ([1725] 1969) *An Inquiry into the Original of our Ideas of Beauty and Virtue* (Collected Works of Francis Hutcheson 1), Hildesheim: Olms.
- Keill, J. ([1718] 1721) *An Introduction to the true Astronomy*. London: Strahan (translated from Latin).
- Kerszerg Pierre (2006) 'Natural Philosophy', in Haakonssen 2006: 973-902.
- Laudan, Larry (1970) 'Thomas Reid and the Newtonian Turn of British Methodological Thought', in Butts and Davis 1970: 103-131.
- Lecaldano, Eugenio (1980) 'Il metodo della scienza dell'uomo nell'illuminismo scozzese da Hutcheson a Smith', *Studies on Voltaire and the Eighteenth Century*, 190: 457-467.
- Lecaldano, Eugenio (1991) *Hume e la nascita dell'etica contemporanea*, Roma-Bari: Laterza.
- Lindgren, J. Ralph (1974) *The Social Philosophy of Adam Smith*, The Hague: Nijhoff.
- Llobera, Josep (1981) 'The Enlightenment and Adam Smith's Conception of Science', *Knowledge and Society*, 3: 109-136.
- Locke, John 1690: *An Essay concerning Human Understanding*, ed. by Peter H. Nidditch,

Oxford: Clarendon Press, 1975.

Maclaurin, E. Colin B. ([1748] 2004) *An Account of Sir Isaac Newton's Philosophical Discoveries*. Bristol: Thoemmes (Newtonianism in Eighteenth-Century Britain. 7)

Mandeville, Bernard de ([1705-1729] 1966) *The Fable of the Bees*, ed. by F.B. Kaye, Oxford: Oxford University Press.

Mayr, Otto (1986) *Authority, Liberty and Automatic Machinery in Early Modern Europe*, Baltimore: John Hopkins University Press.

Megill, A.D. (1975) 'Theory and experience in Adam Smith', *Journal of the History of Ideas*, 36: 79-94.

Melchiorre, Virgilio ed. (1988), *Simbolo e conoscenza* Milano: Vita e Pensiero, 1988.

Mirowski, Philip (1989) *More Heat than Light: Economics as Social Physics, Physics as Nature's Economics*, Cambridge: Cambridge University Press.

Montes, Leonidas (2004) *Adam Smith in Context*, New York: Palgrave Macmillan.

Monteiro, João Paulo (1978) 'Indução e Hipótese na Filosofia de Hume', *Manuscrito. Revista de Filosofia* 1: 85-112.

Moscovici, Serge (1956) 'À propos de quelques travaux d'Adam Smith sur l'histoire et la philosophie des sciences', *Revue d'histoire des sciences et de leurs applications*, 9: 1-22.

Newton, Isaac ([1726] 1972) *Philosophiæ Naturalis Principia Mathematica*, 2 vols, ed. by A. Koyré and I.B. Cohen. Cambridge (MASS): Harvard University Press.

Newton, Isaac ([1704] 1964) *Opticks*, vol. iv of *Opera*, ed. by S. Horsley, Stuttgart-Bad Cannstatt: Fromann, 5 vols.

Newton, Isaac (1950) *Sir Isaac Newton's Theological Manuscripts*, ed. by H. Mc Lacklan, Liverpool: University Press.

Newton, Isaac (1959-1977) *The Correspondence of Isaac Newton*, 7 vols., ed. by H.W. Turnbull and J.F. Scott, London: Cambridge University Press.

Norton, D.F. (1975), 'George Turnbull and the Furniture of the Mind', *Journal of the History of Ideas*, 36: 701-716.

Norton, D.F. (1982), *David Hume. Common-sense Moralist, Sceptical Metaphysician*, Princeton (NJ): Princeton University Press

Noxon, James (1973) *Hume's Philosophical Development*, Cambridge: Cambridge University Press.

Oakley, Francis (1961) 'Christian Theology and the Newtonian Science: the Rise of the Concept of the Laws of Nature', *Church History*, 30: 433-457.

Pack, Spencer (1991) *Capitalism as a Moral System: Adam Smith's Critique of the Free Market Economy*, Aldershot: Elgar.

Pemberton, Henry (1728) *A View of Sir Isaac Newton's Philosophy*, London: Palmer.

Pope, Alexander ([1734] 1969) *An Essay on Man*, Menston: The Scolar Press.

Porter, R. (ed.) (2002) *The Cambridge History of Science*, iv, Cambridge: Cambridge University Press.

Pownall, Thomas ([1776] 1977) *A Letter from Governor Pownall*, in Smith 1977: 337-376.

Reid, Thomas ([1764] 1997) *An Inquiry into the Human Mind on the Principles of Common Sense*, ed. by D.R. Brooks, Edinburgh: Edinburgh University Press.

Reid, Thomas ([1785] 1967) *Essays on the Active Powers of Man*, in *Philosophical Works*: ii, 509-679.

Reid, Thomas ([1895<sup>8</sup>] 1967) *Philosophical Works*, 2 vols., ed. by W. Hamilton, Hildesheim: Olms.

Rothschild, Emma (2001) *Economic Sentiments: Adam Smith, Condorcet and the Enlightenment*, Cambridge (MA): Harvard University Press

Schliesser, Eric (2005) 'Wonder in the Face of Scientific revolutions: Adam Smith on Newton's "Proof" of Copernicanism', *British Journal for the History of Philosophy*, 13: 697-732.

- Schwartz, Gilson (1989) 'Newton e a Economia Política', *Cadernos de História e Filosofia da Ciência*, Série 2, 2: 53-63.
- Senderowicz, Yaron and Wahl, Yves eds. (2000) *Descartes: Reception and Disenchantment*, Tel Aviv: University Publishing Projects.
- Sheperd, C. M. (1982) 'Newtonianism in Scottish Universities in the Seventeenth Century', in Campbell and Skinner 1982: 65-85.
- Smith, Adam ([1755] 1980) 'Letter to the Edinburgh Review', in Smith 1980: 242-254.
- Smith, Adam ([1759] 1976) *The Theory of Moral Sentiments*, ed. by D.D. Raphael and A.L. Macfie, Oxford: Clarendon.
- Smith, Adam ([1776] 1977) *An Inquiry into the Nature and Causes of the Wealth of Nations*, ed. by R.H. Campbell; A.S. Skinner; W.B. Todd, Oxford: Clarendon.
- Smith, Adam ([1795] 1980) *The Principles which Lead and Direct Philosophical Enquiries: Illustrated by the History of Astronomy*, in Smith 1780: 31-105.
- Smith, Adam (1798) *Lectures on Jurisprudence*, ed. by R.L. Meek, D.D. Raphael, and P.G. Stein, Oxford: Clarendon.
- Smith, Adam (1977) *The Correspondence of Adam Smith*, ed. by Mossner, E.C. and Ross, I.S., Oxford: Clarendon.
- Smith, Adam ([1795] 1980) *Essays on Philosophical Subjects*, ed. by W.P.D. Wightman, J.C. Bryce, and I.S. Ross, Oxford: Clarendon.
- Smith, Adam (1982) *Lectures on Rhetoric and Belles Lettres*, ed. by J.C. Bryce, Oxford: Clarendon.
- Stewart 1990: 151-190.
- Stewart, Michael A., ed. (1990) *Studies in the Philosophy of the Scottish Enlightenment*, Oxford: Clarendon Press.
- Stewart, Dugald ([1792, 1813, 1826] 1994) *Elements of the Philosophy of the Human Mind*, 3 vols. (vols. 2-4 of *The Collected Works of Dugald Stewart*, ed. by W. Hamilton), Bristol: Thoemmes Press.
- Turnbull, George ([1740-1741] 2005) *The Principles of Moral and Christian Philosophy*, 2 vols., ed. by A. Broadie, Indianapolis: Liberty Fund, 2005.
- Turnbull, George (1740), *A Discourse upon the Nature and Origin of Moral and Civil Laws*, in Heinecke 1763 (with a distinct titlepage bearing date 1740).
- Viner, Jacob ([1927] 1958) 'Adam Smith and Laissez Faire', in *The Long View and the Short*, Glencoe: Free Press: 213-245.
- Vivenza, Gloria (2002) *Adam Smith and the Classics*. Oxford: Oxford University Press.
- Wood, Paul (1990) 'Science and the Pursuit of Virtue in the Aberdeen Enlightenment', in Stewart 1990: 127-149.
- Wood, Paul (2002) 'Science, Philosophy and the Mind', in Porter (2002): 908-35
- Wood, Paul (2003) 'Science in the Scottish Enlightenment', in Broadie (2003): 95-111.
- Worland, Stephen T. (1976) 'Mechanistic Analogy and Smith on Exchange', *Review of Social Economy*, 34: 245-258.
- Zilsel, Edgar (1942) 'The Genesis of the Concept of Physical Law', in Id., *The Social Origins of Modern Science*, ed. by D. Raven, W. Krohn, R.S. Cohen, Boston Studies in Philosophy of Science 200, Dordrecht: Kluwer 2000: 245-79.

This paper has greatly benefited from Bernard Schefold's discussion at the ESHET Annual Meeting in Stirling, June 9-12 2005. Sections 2 and 3 draw on Cremaschi 1992 and 1998.

<sup>1</sup> See Murdoch 1748: vi; see also Gilardi 1990: 241 ff.; Laudan 1968: x-xiii.

<sup>2</sup> On Turnbull see Norton 1975; 1982, ch. 4; Brown 1984, ch. 3; Forbes 1975, ch. 1; Broadie 2005.

<sup>3</sup> See Noxon 1973: 27-123; see also Capaldi 1975: 49- 70; Lecaldano 1991; Gilardi 1990.

<sup>4</sup> This is Mirowski's unreasonable request (Mirowski 1989). A solace may be that he is not alone, for Schwartz (1989) came independently to the formulation of the same request.

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<sup>5</sup> Berry, with his usual nonchalance, takes the deep divergences between Turnbull's and Hume's conclusions (on the proof of God's existence, the Design argument and theodicy) as a proof that the Newtonian inspiration was something very loose; what he misses is that the *program* was the same, even if some of the main *conclusions* were incompatible.

<sup>6</sup> Haakonsen's collection on Adam Smith in "The International Library of Critical Essays in the History of Philosophy", does not include this paper, since such an *International* library reprints only materials published in English (Haakonssen 1998). Berry (2006: 119) quotes him once but with relation to a quite marginal point, apparently missing the paper's main contents.

<sup>7</sup> Schliesser claims that Smith's epistemology was not "tendentally" sceptic, and that his position was "subtly different" (2005: 697) from Hume's, and so far I would agree. But he also believes (Schliesser 2005: 697) that his claims runs counter a recent trend started by Cremaschi (1989), followed by Griswold (1999), Pack (1991), and Rothschild (2001) in claiming that Smith was a sceptic. Schliesser argues that Smith rejects Hume's mitigated scepticism since "it is entirely reasonable to accept scientific theories that are deeply at odds with common life" (*Ibidem*: 698, fn.) and is committed to the view that "scientific theories can transform common sense" (*Ibidem*). I would like to note that the claims made by the present writer are that (a) Smith goes *beyond* Hume in trying to account for scientific progress, what Hume was not able to do; (b) Smith's epistemology is marked by a *tension* between *internal* criteria of scientific truth and an *external* criterion of truth as correspondence, required as a 'regulative idea' precisely in order to avoid the shoals of scepticism but also impossible to translate into criteria for comparison of different theories; in other words, that "the source of Smith's dissatisfaction was the contrast between the need felt by the imagination to believe in the real existence of principle connecting phenomena, on the one hand, and the compulsory conclusion, reached on rational reflection, that it is impossible to know what 'real chains' Nature uses to bind phenomena and that the explanatory principles have a conventional character, on the other hand" (Cremaschi 1989: 87). This is a view of Smith not as a sceptic, but instead as a post-sceptical thinker. Besides, I feel that the definition of Smith's epistemology as "Sceptical Newtonianism" – where the latter term is a substantive and the former an adjective – is more fruitful than Schliesser's "modest realism"; on the basis of what has been illustrated in the present paper about the eighteenth-century image of "Newtonianism" as a "philosophy" providing a third way between Bacon and Descartes, one may see why interpreting Smith's epistemology as post-sceptical Newtonianism may account for something, while claiming that he was not a sceptic but a "modest realist" is giving a name to a problem thus believing to have offered a solution. Schliesser also admits that his label "realism" cannot be easily defined since "the norms that are taken to be constitutive of realism can change over time in an open-ended fashion" (*Ibidem*), what leaves the reader empty-ended<sup>7</sup>. A similar mistake is made by Berry, who claims that the present writer argued that Smith's epistemology was 'antirealist' (Berry 2006: 123). I would like to note that on the contrary the present writer argued that Smith acknowledged the superiority of the Newtonian theory in terms of ability to account for phenomena besides than in terms of simplicity, familiarity, consistency and comprehension, and also of ability of exciting wonder (Cremaschi 1981; 1984: 11-72; 1989: 85-87), but pointed out a deep tension between internal criteria for comparison between theories and external criteria – somehow indispensable as regulative ideas – for assessing degrees of correspondence between theories and reality. This is not antirealism but a 'tragic' awareness of the greatness and misery of science. The point is that Smith's context is the post-Cartesian debate on essences and phenomena, and it is when read against this background that the final sentence of *The History of Astronomy* makes sense. What Berry does is explaining it away by suggesting that the sentence is not important (who told him?) and probably meant to establish some distance not from Newton but from the Design Argument accepted by MacLaurin and other Newtonians (see Berry 2006: 124-5). But what is discussed by Smith is not the Design argument, is the distinction between internal and external 'truth' of theories.

A more sensible discussion of the issue is in Montes (2004) , who claims that "the myth of Smithian Newtonianism' lie at the root of the undue ascription to Adam Smith of the origins of the formalistic approach in economic theory. Montes's main claim, namely that Smith was not the grandfather of formalism in economics but favoured instead *realism of hypotheses* (that is, realisticness, or avoiding abstract models and instead trying to build explanations of real-world cases), Smith was not an atomist, the Newtonian method was not simply mathematization and deduction, is sound. Yet, he goes too far in assuming that Smith endorsed some kind of methodological dualism, that his methodology implied aversion to "the use of sophisticated mathematics in political economy" (Montes 2004: 157), with no better support than a quote where Smith says that the most abstract parts of mathematics are useless in *primary* education, and that his epistemology was a kind of *realism* (that is, the doctrine that theoretical entities are no fiction but do have some kind of existence, quite a different matter from realism of hypotheses). I would say that trying to prove that somebody who wrote that theories are "imaginary machines" believed that theories do try "to uncover the real structure underlying social and moral phenomena" (Montes 2004: 160) is a rather hazardous enterprise, and that to pin up such a claim to a quote from *History of Astronomy* where philosophy is

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described as an attempt “to lay open the concealed connections” of nature (Smith 1795, iii.5; cf. Montes 2004: 149-50) is even more risky, since the whole sentence reads “that science which *pretends* to lay open the concealed connections that unite the various appearances of nature” (*Ibidem*) and is accordingly a clear profession of unbelief in any kind of epistemological realism.

<sup>8</sup> See Gilardi (1988); Monteiro (1978); Cremaschi (1984: 146-8); Cremaschi (2002a); Freudenthal (1981; 1983: 253-256) has raised the doubt whether analysis, as actually carried out by Smith, really consists of such an inductive generalization or lapses instead at crucial points into dogmatic confusion of definitions of theoretical entities used in the explanation and assertions of original qualities of human nature.

<sup>9</sup> On Locke's use of the expression "law of value", see Brown 1984: 63-66.

<sup>10</sup> Pace Berry's dismissal of Pownall's interpretation (Berry 2006: 125)

<sup>11</sup> For example on Adam Smith and ancient physics he start with the unconceivable conjecture that Smith may have had in mind what the pre-Socratic philosophy was before nineteenth-century philologists had undertaken the demanding task of collecting the pre-Socratics' fragments, and adopts as a matter of course the idea that Smith wrote disguising his true opinions like the French *libertins* used to do one century before, as if the eighteenth-century Scottish context was basically the same as the seventeenth-century French context (see Vivenza 2002: 126-9, 207-8).