<CT> **BEFORE THE TWO CULTURES:**

<SUBTITLE>**MERGING THE CANONS OF THE HISTORY OF SCIENCE AND PHILOSOPHY**

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<ABS>**Abstract:** This article argues that early modern philosophy should be seen as an integrated enterprise of moral *and* natural philosophy. Consequently, early modern moral and natural philosophy should be taught as intellectual enterprises that developed hand in hand. Further, the article argues that the unity of these two fields can be best introduced through methodological ideas. It illustrates these theses through a case study on Scottish Newtonianism, starting with visions concerning the unity of philosophy and then turning to a discussion of how methodological ideas figure in those visions. Finally, the article argues that methodological considerations can serve as good starting points to introduce and discuss central topics and canonical figures of the early modern period.

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<A>Introduction

Ever since C. P. Snow's famous essay "The Two Cultures" (1959), it has been a commonplace to refer to the divide separating the sciences and the humanities. This divide did not exist for those working on the questions of natural and moral philosophy in various discourses of the

seventeenth and eighteenth centuries. Instead, the participants saw themselves as contributing to a joint enterprise that could potentially converge upon a unified account of natural and moral phenomena encompassing physical, physiological, ethical, and theological approaches. While the unifying character of this enterprise was considered as a matter of course, philosophy was not preoccupied with reconciling the "scientific" and the "manifest" image of man, as Wilfrid Sellars's (1963) happy phrase has it, but aspired to a comprehensive explanatory understanding of human beings from their natural, cognitive and affective constitution to their moral and transcendent ends.

Early modern philosophers formulated various visions of the unity of philosophy. At one end of the early modern epistemological spectrum, Descartes's influential vision of the sciences, in *Principles of Philosophy* (1644), as branches growing out of metaphysical foundations represents one version of how unity could be conceived. Descartes's original vision of method that underpinned this unity prescribed analysis into intuitively clear and infallibly known metaphysical principles, the world's basic constituents, "simple natures," from which deductive knowledge in physics and other fields of knowledge was attainable (see Garber 2000). At the other end of the spectrum, David Hume's foundational project in *Treatise of Human Nature* (1739–40) aspired to empirical knowledge about the limits and prospects of human cognition, a basis upon which a "compleat system of the sciences" could be erected (see Boehm 2013; Hazony 2014; Demeter 2012a).

Due to these visions of the unity of philosophy, its various branches tended to exploit the same conceptual and methodological resources while discussing phenomena in natural, moral, and theological contexts. Relying on the same concepts and methods, various branches of theoretical inquiry were intertwined so that different layers of discourse exerted mutual influence on one another: discourses of natural philosophy were filled with hidden moral meaning and religious content, and vice versa. Therefore, the discourses of the natural, psychological, social,

and transcendent aspects of nature and human nature exhibited a remarkable unity in the early modern period—just before they started to develop into specialized fields of knowledge.

This insight has significance in the context of present-day historiographies of both science and philosophy that are still inclined to treat their canons separately,[1] and it is even more so if we consider the practice of teaching early modern philosophy. In the present article I intend to point out that the separation of what we today call "the history of philosophy" and "the history of science" inculcates a distorted image of early modern philosophy. In what follows, I will make a case for teaching the history of early modern philosophy and of science in a synoptic view. I will motivate this commitment by a quick look at how this unity was conceived among Scottish Newtonians in the eighteenth century, and then I will make a suggestion as to how to approach moral philosophy from the angle of early modern methodological ideas. It is, I suggest, the method of analysis-synthesis and its various interpretations that could define a unifying perspective on early modern natural and moral philosophy around which course material could be fruitfully organized.

<A>The Unity of Philosophy: The Case of Scottish Newtonianism

In late seventeenth- and early eighteenth-century Scotland the unity of philosophy was typically conceived in a Newtonian framework that postulated the primacy of experimental natural philosophy. Following the summary of his method of analysis and synthesis in Query 31 of the *Opticks* (which first appeared in the 1706 Latin edition), Newton formulated his legacy for moral philosophy in a much-quoted sentence: "If natural Philosophy in all its Parts, by pursuing this

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[1] Although there is a tendency to merge the canons: notable examples include Janiak 2008, Garber 2009, Janiak and Schliesser 2014, and Biener and Schliesser 2014. For a recent discussion of the problem see Schmaltz 2013.

Method, shall at length be perfected, the Bounds of Moral Philosophy will also be enlarged" (Newton 2004, 140). According to Newton, this enlargement should proceed through the perfection of natural philosophy, which consists in its increasing contribution to our knowledge of the attributes and intentions of God: "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 that towards one another, will appear to us by the light of nature" (140). This self-understanding of natural philosophy was quite unlike that of modern science: it did not only aspire to a descriptive, explanatory, and secular knowledge of nature—it also had intrinsic moral and theological content and implications (see Cunningham 1991; Grant 2000).

For Newton, the derivation of moral and theological knowledge from knowledge of nature was possible because the laws of morality, unlike the laws of nature, did not depend on God's volition. As Peter Harrison puts it, for Newton God "wills good things—things are not good because God wills them" (Harrison 2004, 43). As Newton himself says, God is "freely willing good things . . . and constantly cooperating with all things according to accurate laws, as being the foundation and cause of the whole of nature, except where it is good to act otherwise" (cited by McGuire 1995, 216). Therefore, not the presupposition of God's inexplicable will, but his goodness should be our guide in understanding nature. Newton's inquiry is all about God's creation: it is an inquiry by which we find out about his intentions and so about our own duty. By the analysis of phenomena we find the laws of physics, and as these laws reflect God's will and God wills good things, *a fortiori*, the laws of physics must concur in the production of good effects.

Newton did not take decisive steps to fulfill this vision of disciplinary unity, but he clearly formulated a task and a framework for Newtonian philosophers: to refine moral philosophy within the methodological and theological framework that his natural philosophy had set. Due to this heritage many Scottish natural and moral philosophers were willing with David Fordyce to "consider nature or the World as the Volume or Book of God in the meanest page of which his

perfections are legible" (Fordyce 2003, 200). Having been committed to this understanding of the world, Colin Maclaurin in his influential mid-eighteenth-century introductory text to the ideas of Newton's *Principia* also insisted on the representation of natural philosophy as an enterprise "subservient to purposes of a higher kind, and is chiefly to be valued as it lays a sure foundation for natural religion and moral philosophy" (Maclaurin 1775, 3). The elaboration of the implications, as well as the critique, of Newton's program for philosophy was left to the next generations, and many Scottish philosophers were willing to take up the Newtonian torch.

One of the most self-conscious Newtonians, George Turnbull, in his *Principles of Moral and Christian Philosophy*, published in two volumes in 1739–40, makes an attempt to set the principles on the basis of which moral philosophy can be made out to be continuous with the program of Query 31 (Turnbull 2005, 1:48–50). Turnbull's central idea is this: regular and orderly appearances are due to the rule of laws in nature, and their physical explanation is given if an effect is subsumed under physical laws. Some of these laws are such that produce "good, perfection and beauty" in the material world, and an effect is thus instantly accounted for morally once it is shown to be produced by such laws. Explaining phenomena in this way is the *part* of natural philosophy that can be called moral philosophy. Just as Newton envisaged, the perfection of this part can proceed only through the refinement of natural philosophy, and our knowledge of the final causes that it provides.

Probably writing under the influence of Colin Maclaurin, Turnbull proclaims:

<EXT>[A]ll the conclusions in natural philosophy, concerning the order, beauty, and perfection of the material world, belong properly to moral philosophy; being inferences that respect the contriver, maker, and governor of the world, and other moral beings capable of understanding its wise, good and beautiful administration, and of being variously affected by its laws and connexions. In reality, when natural philosophy is carried so far as to reduce phenomena to good general laws, it becomes moral philosophy; and when it stops short of this

chief end of all enquiries into the sensible or material world, which is, to be satisfied with regard to the wisdom of its structure and oeconomy; it hardly deserves the name of philosophy in the sense of Socrates, Plato, Lord Verulam, Boyle, Newton, and the other best moral or natural philosophers. (2005, 1:52–53)<MC>

So moral philosophy begins where the *conclusions* of natural philosophy are reached. The conclusions themselves are already part of moral philosophy, because they are related to order (beauty, good, and perfection) of the material world. Precisely for this reason they have constitutive reference to moral laws, just as they are bearers of theological content with respect to the design and government of the universe.

The unity of various branches of philosophy so conceived amounts to more than a mere congruence of vague methodological pronouncements: it arises from the very nature of the subject matter common to these branches. As Turnbull himself puts it, unity arises from "the nature of things," as the material world had been created purposively "for the sake of the moral world," so that the material and the moral worlds "make one strictly, connected system" (2005, 1:440). On the basis of this view of the world Turnbull even goes almost as far as endorsing a view akin to Berkeley's idealism when he says that the material world "considered apart from its effects upon perceptive beings, hath no existence"—and he only slightly qualifies this strong metaphysical commitment by adding the proviso "at least, cannot be said to merit existence" (1:441). There is thus a constitutive reference in the material world to the world of perceptive and moral beings, a reference without which the material world cannot be accounted for.

It is thus not a bottom-up unity that Turnbull envisages for philosophical disciplines that is secured by the foundational discipline of natural philosophy. Instead, in his vision natural, moral, and religious insights have a mutual reliance on one another: the study of the natural world presupposes perceptual and psychological capacities that can be studied both as phenomena of physiology and as distinctively human phenomena of a "science of man." The

unity and mutual dependence of these aspects of the world as studied in natural, moral, and theological branches of philosophy are underpinned by the fact that the world is fit for purpose—that it is adapted to a certain end.

This teleological unity of the world is also reflected in Francis Hutcheson's 1742 lectures on moral philosophy that prescribes searching for the purposes in our constitution for which God and nature have "formed us" (Hutcheson 2007, 24). Hutcheson also finds a motivation for natural philosophy in studying what "these things are which our natural senses {or perceptive powers} recommend to us" (24), and his vision of unity is consonant with Turnbull's. And so is Fordyce's influential *The Elements of Moral Philosophy* (1754), in which he introduces philosophy as a descriptive enterprise that aspires to the knowledge of things "whether natural or artificial, by observing its Structure, the Parts of which it consists, their Connection and joint Action" (Fordyce 2003, 6). This descriptive knowledge of the "Constituent Principles" that things follow in the course of their normal functioning directly leads to knowledge of their "Office and Use," which in turn leads to knowledge of the "common Effort or Tendency of the Whole" (6).

So the dominant vision concerning the unity of philosophy conceives the union of various branches of knowledge against the background of final causes with theological and normative aspirations. In this context David Hume's account of human nature is outstanding because Hume's vision of unity avoids theological aspirations, and aims primarily at a secular and explanatory science of man. For Hume, the unity of philosophy is conceived primarily by the means of method, and not against the background of final causes or teleological considerations (Schliesser 2009; Demeter 2012a). Yet, for the world of living organisms he retains some of the rhetoric of the mutual dependence of parts for a common purpose (Hume 2007 1.4.6.12), and due to his preference for the methods of anatomy while exploring human nature (2007 2.1.12.2), a similar, functionalistic and synoptic outlook is characteristic to his account (see Demeter 2012b). The conclusions reached in this inquiry allow for drawing further conclusions about what is good or useful for the particular constitution called human nature, and this can result in

normative considerations on how to act in various situations, or how to change the circumstances so as to ensure in a given situation the desirable action of those involved. But it certainly does not allow drawing conclusions concerning the nature or intentions of the deity.[2]

The unity of philosophical inquiry was just as popular an idea among natural philosophers and physiologists as it was with moral philosophers. As part of a wider European tendency (see Reill 2005; Wolfe 2008), vitalistic ideas increasingly populated various branches of natural philosophy in Scotland from the early decades of the eighteenth century. As a consequence the sharp distinction that mechanical philosophies had drawn between mind and matter has been blurred (Wright 2002), a development that could provide further support for the idea that various branches of philosophy are united by the intricate connections among their respective subject matters. It is in this context that John Gregory could conclude in 1770 that "[t]he laws of union between the mind and body, and the mutual influence they have upon one another . . . is one of the most important enquiries that ever engaged the attention of mankind, and almost equally necessary in the sciences of morals and of medicine" (Gregory 1998, 128).

The search for the laws of psychophysical unity connected the field of human physiology to morals and religion. In very much the same manner as Maclaurin understood natural philosophy as being subservient to purposes of a higher kind, George Cheyne, the fashionable Scottish doctor, proclaimed in 1724 that "[t]he infinitely wise author of nature has so contrived things that the most remarkable rule of preserving life and health are moral duties commanded us, so true it is, that 'Godliness has the promises of this life, as well as that to come'" (Cheyne 1787, 4). So conceived, medical research contributes to fulfilling our moral duty and transcendent aspirations by preserving our health in accordance with God's commandments, and it also helps us understand the world better by explaining what our creator has actually intended for us.

[2] This is the lesson of Hume 2000, sections 8.2 and 11.

The interconnections among various branches of philosophy are thus not ensured by one-way influences but, as most authors emphasize, constitute a system of mutual dependencies. Irrespective of the widespread reference to a theological framework, the central point of these visions, as is commonly acknowledged by natural and moral philosophers, is an aspiration to knowledge of "the nature, laws & connections of things, . . . & from thence deduce rules for the conduct & improvement of human life" (Fordyce 2003, 166)—that is, a comprehensive account of the world of dead and living matter, of morals, and, to most philosophers, of God. The aim is thus a coherent account of the world, where *coherence* is not primarily a logical property of theories. Instead, it is used in the context of terms like "connection" and "order," bestowing of which upon the variety of things is the main task of philosophy, as it is, in the words of Adam Smith, "the science of the connecting principles of nature" (Smith 1982, 45). For Smith, philosophy, being responsible for "representing the invisible chains which bind together all these disjointed objects, endeavours to introduce order into this chaos of jarring and discordant appearances" (45–46). The success of this enterprise is partly measured by the coherence various theories forge in a world of disordered phenomena.

<A>The Methods of Analysis and Synthesis

Many in the early modern period conceived the method of forging this coherence by a combination of analysis and synthesis. The introduction to this method in the classroom comes typically from Descartes's *Discourse on Method* (1637) and does not go much beyond that. The Cartesian method is propositional (see Garber 2000): inquiry consists in analyzing a complex question into simpler ones until intuitive, that is, clear and distinct, answers can be given. Then comes synthesis in deducing explanations from these clear and distinct insights. Experience plays only an auxiliary role here, either in helping us to choose how to proceed with our questions or in checking the empirical adequacy of our answers.

Usually, teaching method in early modern philosophy sticks with the Cartesian understanding of what analysis and synthesis meant, despite the fact that early modern philosophers had had significant methodological controversies, and these controversies had significant impact on how inquiry in natural and moral philosophy was conducted. In the seventeenth and eighteenth centuries particularly, Newton's understanding of this method turned out to be especially influential and more successful in integrating moral and natural inquiries.

As Newton summarized it in his influential Query 31 of the *Opticks*, "[A]nalysis consists in making experiments and observations, and in drawing general conclusions from them by induction. . . . By this way of analysis we may proceed from compounds to ingredients, and from motions to the forces producing them; and in general, from effects to their causes, and from particular causes to more general ones, till the argument end in the most general. This is the method of analysis, and the synthesis consists in assuming the causes discovered, and established as principles, and by them explaining the phenomena proceeding from them, and proving the explanations" (Newton 2004, 139).

So analysis is either a resolution of "compounds to ingredients" or "motions to the forces producing them." It has a focus on the search for causes, and once found, on their explanatory use. Understood either way, the steps to be taken in inquiry can be summarized as follows (see Hintikka and Remes 1974, 110):

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1) Resolution of phenomena into their causal components.

2) Investigation into the components' mutual dependence and interaction.

3) Generalization of the relations so revealed to every similar phenomenon.

4) Deployment of the principles thus gained in the explanation and prediction of phenomena.<MC>

In the *Principia* this method is focused on motions and forces producing them, and there

"the basic problem of philosophy seems to be to discover the forces of nature from the phenomena of motions and then to demonstrate the other phenomena from these forces" (Newton 2004, 41). This problem is to be solved by mathematical means, by conforming to – what I. B. Cohen termed "the Newtonian style." This meant more than deriving numerical results from experiments, or a focus on measurement, or a commitment to a way of exposition that proceeded from definitions and axioms. It also meant taking mathematics as the model of reality: constructing "the mathematical analogue of a natural situation" and then advancing from this idealized case by the addition of further conditions towards more accurate mathematical analogues of actual situations (Cohen 1980, 51, 151). In this framework, Newton's axioms or laws of motion do not serve the purposes of explanation and prediction directly but function as "inference-tickets" that allow for drawing conclusions from motions to forces, and vice versa, and from macrophysical to microphysical forces composing them (Smith 2002, 143).

The project of the *Principia* is thus to search for a specific, quantifiable natural kind, that is, force, in the background of phenomena; it is not interested in qualitatively different components. The method of analysis of "compounds to ingredients" belongs to the project of the *Opticks*. The two different ways of analysis-synthesis that are applied in the two works reflect different aims and different methodological commitments. The fact that in Query 31 Newton mentions two different ways of analysis seems to reflect the failure to extend mathematical analysis to all optical phenomena. This anomaly is perhaps the most obvious in the case of colors, where he had to give up his initial hopes for a demonstrative mathematical exposition that he had achieved for fits and refrangibility (Cohen 1980, 138–40). This might motivate Newton's permission for qualitative analysis as a route to explanatory principles, especially if we bear in mind that Newton contemplated the possibility of accounting for optical phenomena as chemical

phenomena (see Shapiro 1993, 142 n. 16).[3]

In the *Opticks* the method of analysis is not mathematical but analogical: Newton proceeds by the observation and comparison of different rays of light with respect to various properties like "refrangibility, reflexibility, and colour, and their alternate *fits of easy reflexion* and *easy transmission*" (Newton 2004, 139). As Newton had to give up the project of revealing all the optical properties of surfaces in relation to different colors, the hopes for mathematizing color phenomena arising from reflection and refraction withered away too. Eventually he had to allow for an experimental decomposition of white light into its component colors but to stop short of giving it full mathematical treatment in terms of motions and forces acting on light corpuscles (see Guicciardini 2009, 316–17). Therefore the qualitative differences of differently colored rays of light persisted in Newton's treatment, and this fact gets reflected in the methodological pronouncement of Query 31.

This qualitatively oriented way of analyzing phenomena proved to be fruitful in other fields of study that resisted mathematization, for example in the study of chemistry and organized living matter, and allowed one to extend the label "Newtonian" to these approaches and thus to increase the confusion about the meaning of this label.[4] Most of eighteenth-century Scottish chemistry developed under the influence of this anomaly of Newton's original program, that is,

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[3] The same terminology is reflected in William Cullen's chemistry lectures notes of 1748–49. Chemistry, for Cullen, studies those properties of bodies that depend on their mixture by means of analysis of compounds into "constituent parts." This is a process of qualitative analysis that focuses on the "particular properties" of the different constituents of which a given mixture is composed, and it aims at revealing those components with respect to their "habits of mixture" and the "properties of mixts from different ingredients." See Donovan 1975, 97–99.

[4] On the critique of mathematical analysis and the rise of comparative, qualitative, and functional analysis in the eighteenth century see Reill 2005, 33–55.

the failure of the project of analyzing optical phenomena in a mathematical language. One of the consequences was the replacement of the demonstrative ideal in several parts of natural philosophy by much more modest knowledge claims. For example, Joseph Black declared of chemistry toward the end of the century that "[w]e are very far from the knowledge of first principles. We should avoid every thing that has the pretensions of a full system. The whole of chemical science should, as yet, be analytical, like Newton's Optics; and we should obtain the connecting principle, in the form of a general law, at the very end of our induction, as the reward of our labour" (Black 1803, 1:547).

Black's teacher William Cullen also emphasized that explanatory principles in chemistry are to be sought at the phenomenal level and not to be derived from some allegedly fundamental mechanical hypothesis. Physicians like George Cheyne and James Keill, who at the end of the seventeenth-century had worked within a mechanical framework, also turned to explore physiological phenomena in terms of "varied attractive forces of different substances," that is, in a qualitatively oriented chemical language inspired by the *Opticks* (Guerrini 1985, 257).

<A>Newtonian Analysis and Synthesis in Moral Philosophy

Let us now turn to the question of how Newton's methods of analysis and synthesis were turned into a methodological tool for the integration of moral and natural philosophy. Francis Hutcheson may be credited with an attempt to implant the "Newtonian style" of the *Principia*. His *Inquiry into the Original of Our Ideas of Beauty and Virtue* (1725) was originally subtitled "an Attempt to introduce a Mathematical Calculation in Subjects of Morality."[5] And indeed, Hutcheson attempted "[t]o find a universal Canon to compute the Morality of any Actions, with all their Circumstances," and laid down the "axioms" of such complex calculations as first steps toward

[5] See Hutcheson 2008, 199n1; in subsequent editions the subtitle was removed.

"applying a mathematical Calculation to moral Subjects" that was supposed to be "further pursu'd" in this way (Hutcheson 2008, 128ff., 134). In these pages Hutcheson represents morality as essentially mathematical and calculable, and he provides, as it were, the mathematical principles of morals.[6]

Having defined benevolence that extends over the whole of humankind as the "universal Foundation of our Sense of moral Good, or Evil" (2008, 120), Hutcheson unites all virtue in this single one that is supposed to provide the uniting force of the human world analogous to gravity in the natural world: "This universal Benevolence toward all Men, we may compare to that Principle of Gravitation, which perhaps extends to all Bodys in the Universe; but, like the Love of benevolence, increases as the Distance is diminish'd, and is strongest when Bodys come to touch each other. Now this increase of Attraction upon nearer Approach is as necessary to the Frame of the Universe, as that there should be any Attraction at all. For a general Attraction, equal in all Distances, would by the Contrariety of such multitudes of equal Forces, put an end to all Regularity of Motion, and perhaps stop it altogether" (2008, 150).

Benevolence, or virtue, is a calculable quantity that, in first approach, is "always directly as the Moment of Good produc'd in like Circumstances, and inversely as their Abilitys: or $B = M/A$." By adding a further condition, the initial axiom is refined and brought closer to actual situations: some of our actions are good to ourselves and harmful to the public, or vice versa. Therefore "the Virtue of the Action, or the Strength of the Benevolence," can be calculated as $B = (M \pm I)/A$, where "I" expresses the "Interest" or "Advantage" the agent obtains by performing the action, and it is calculated as "a compound Ratio of his Self-Love, and Abilitys," that is: "$I = S \times A$." If the action is harmful to the agent then it increases "the Strength of the Benevolence" of the action, so it should be added to the "Moment of Good"; if it is

[6] Four versions of the fourth edition have been identified, two of which lack the mathematical formulation, and speak about "Rule" instead of "Canon." But the calculating spirit remains in the text. See Hutcheson 2008, 240–41.

advantageous to the agent, then it should be subtracted (Hutcheson 2008, 128f.).

Hutcheson's core idea seems rather Newtonian and *Principia*-style—even if it is rudimentary and much less refined if compared to the elaborate mathematical apparatus of the *Principia*. Hutcheson's approximation to an accurate mathematical description of the amount of Benevolence treated as an essentially calculable quantity is analogous to Newton's strategy of successive approximations starting from an idealized situation and refining it by the addition of further conditions. Similarly to Newton, Hutcheson builds his moral philosophy on mathematical calculation, and he provides the axioms to calculate unknown quantities from a set of previously established parameters.

Hutcheson is also eager to maintain the common theological framework of natural and moral philosophy. The spirit of Newton's famous dictum in the *Scholium Generale* (first published in 1713), namely, "to treat of God from phenomena is certainly a part of natural philosophy" (Newton 2004, 92), finds an expression in Hutcheson's introduction to moral philosophy, first published in 1742: "We must therefore search accurately into the constitution of our nature, to see what sort of creatures we are; for what purposes nature has formed us; what character God our Creator requires us to maintain. Now the intention of <God and> <TYPESETTER: RETAIN ANGLE BRACKETS HERE>nature with respect to us, is best known by examining what these things are which our natural senses {or perceptive powers} recommend to us, and what the most excellent among them? and next, what are the aims of our several natural desires, and which of them are of greatest importance to our happiness?" (Hutcheson 2004 24).

Exploring God's intentions toward us through the study of nature is consonant in Newton and Hutcheson, and so is the commitment to empiricism in these explorations: it is the study of nature through our senses that brings us closer to the knowledge of what we are intended to do and what brings us happiness. Other contemporary Scottish moral philosophers, like Turnbull and Fordyce, also share this religious and teleological perspective that promises to deliver knowledge of God, of the purpose of human beings, and aims to draw direct normative

consequences concerning our duty (Fordyce 2003, 6; Turnbull 2005, 1:10, 1:459).

George Turnbull is another bearer of the Newtonian torch in Scottish moral philosophy. Mathematical spirit, albeit not mathematical calculation, is central to Turnbull's vision. In the spirit of Newtonian "mixed mathematics," Turnbull identifies his approach as "mixed moral philosophy," which is "an account of human nature, mixed of principles inferred from immediate observation, and others deduced from such principles, by reasoning from ideas or definitions" (2005, 1:65). Elsewhere he gives a hint as to how to understand that part of moral philosophy which "bears very nearly the same relation to morals (by which let me be understood to mean the whole of philosophy relating to human nature and human affairs) that mathematics bears to natural philosophy," that is, the part that is based on reasoning from definition and not from observation (Turnbull 2003, 347). This part "consists in investigating or demonstrating what moral qualities may co-exist, what must co-exist, and what are absolutely incompatible," and in the determination of their proportions (Turnbull 2005, 1:62–63). Although this abstract, *a priori* part of moral philosophy does not form an "orderly system of universal truths" comparable to mathematics, moral philosophy is still modeled on the ideal of a Newtonian mixed mathematics.

Mathematics alone, however useful and foundational, is imperfect for the purposes of moral philosophy, because "even natural philosophy, if it stop short of final causes, and the moral conclusions which evidently result from thence, is a very defective and imperfect science" (Turnbull 2003, 11). The task of moral philosophy is to proceed by a method of Newtonian analysis and synthesis consisting of reasoning from principles to effects and effects to principles, which explores the "general laws of our constitution" and thereby reveals man's "natural powers, end, dignity and happiness" (Turnbull 2005, 1:66). The abstract, quasi-mathematical part of moral philosophy is the guide of analysis here: a law will be established if it can be derived from the definition of "intelligence, volition, affection, habit, or any moral power" *and* if it is supported by universal experience. If phenomena are found to conform to the definition of any moral power then the laws so established may be deployed in accounting for further phenomena arising from

those powers (Turnbull 2005, 1:63–65).

Hume's science of man is congruent with post-Newtonian *Opticks*-inspired natural philosophy (see Demeter 2014b). The axiomatic-mathematical-quantifying outlook is entirely missing from Hume. Hume's emphasis on comparative analysis and analogical reasoning fits rather well into the framework of the *Opticks*: "experiments" should be "judiciously collected and compar'd" (Hume 2007 6), and the principles underlying them should be revealed "from the observation of several parallel instances" (Hume 2000, 8.13). Hume's way of using historical and everyday observations is therefore similar to Newton's use of experiment in the *Opticks* (see Hintikka and Remes 1974, 106–9). Both Hume and Newton proceed by comparing some phenomena, arriving at hypotheses by generalizing the findings; in Hume's words: "What I discover to be true in some instances, I *suppose* to be so in all" (Hume 2007 2.1.5.1). And these are to be tested by carefully chosen experiments, or against seeming counterexamples, taken from history and everyday life or from a purposively created artificial setting.

Hume is using both history and observation as sources of *experimenta crucis* (Hume 1998, 5.17): showing the explanatory strength and plausibility of his theory by comparing and contrasting phenomena to assess the truth or falsehood of alternative explanations. An explicit example is his discussion of why love is always followed by benevolence and hatred by anger when he contrasts two possible hypotheses and decides between them on the basis of observation (Hume 2007, 2.2.6.3–4). Instead of accumulating several examples Hume carefully chooses cases he considers crucial in a given context and highlights features that make them especially relevant in his account. It is thus not the way in which empirical material for theory building is gained but the *methodological role* it plays that makes this material experimental.

"All the logic" (2007 1.3.15.11) Hume follows in this inquiry is summarized as a set of rules to regulate the explorations of causes, rules that are equally uniform for both natural and moral philosophy. These rules are applied in both fields "to reduce the principles, productive of natural phænomena, to a greater simplicity, and to resolve the many particular effects into a few

general causes, by means of reasonings from analogy, experience, and observation" (Hume 2000, 4.12). Finding analogies between different instances gives the chance of explaining causes and reducing them to "more general principles" (Hume 2007 Appendix.3).

Hume also clarifies how to use the experimental basis in analogical reasoning so as to arrive at the principles of human nature and the explanation of human phenomena. The method here is a kind of analysis and synthesis: "By means of this guide [that is, historical and everyday observations of human behaviour], we mount up to the knowledge of men's inclinations and motives, from their actions, expressions, and even gestures; and again descend to the interpretation of their actions from our knowledge of their motives and inclinations. The general observations treasured up by a course of experience, give us the clue of human nature, and teach us to unravel all its intricacies" (Hume 2000, 8.9). This method of exploring the understanding by the "exact analysis of its powers and capacity" (Hume 2000, 1.12) is not an exclusively philosophical method: it is continuous with the everyday way of finding out what is on someone else's mind.

The products of this analysis are the principles of various faculties, like perception, imagination, reason, and so on, whose interaction results in ideas and impressions causing behavior, but their contribution can hardly be measured, and the principles of their interaction can hardly be quantified—not even in principle. So their relations cannot be represented in an algebraic way, in terms of relations of quantities, either. Instead, they are *qualitatively* different principles of human nature, and the explanation of human phenomena consists in a description of how these principles with their distinctive characteristics figure in producing them.

Given his vision of what moral philosophy should aspire to, Hume quite unsurprisingly claims that moral philosophy can have only indirect normative consequences: knowing the anatomy of human nature can be useful for the moralist in the same sense as knowing the anatomy of human body can be useful for the painter (Hume 2007 3.3.6.6). Knowledge of the anatomy of human nature allows for drawing conclusions about what is good or useful for this

particular constitution, and this can result in normative considerations on how to act in various situations, or how to change the circumstances so as to ensure in a given situation the desirable action of those involved. Only knowledge of this anatomy can provide a firm foundation for putting forward normative claims concerning the correct course of behavior to be followed under various circumstances (see Demeter 2014a).

The possible inference from conclusions concerning our constitution to normative claims may seem similar to Turnbull's project. Yet, Hume's vision of progress for moral philosophy, unlike Turnbull's, does not proceed through the perfection of natural philosophy and through our knowledge of final causes. The science of man is the foundational science, as he proclaims it in the *Treatise*'s introduction, as it will delineate possible claims of knowledge in other disciplines—including natural philosophy and religion too (see Boehm 2013; Hazony 2014). As a consequence Hume's project eliminates claims aspiring to knowledge of transcendence, or more precisely, Hume takes pain to argue that our conclusions in moral and natural philosophy cannot be stretched to the intentions of the Deity: "We can never be allowed to mount up from the universe, the effect, to Jupiter, the cause; and then descend downwards, to infer any new effect from that cause. . . . The knowledge of the cause being derived solely from the effect, they must be exactly adjusted to each other; and the one can never refer to anything farther, or be the foundation of any new inference and conclusion" (2000, 11.14). Knowledge of nature and human nature and knowledge of God and his purposes are separate issues, and even by extending the best philosophical method of analysis-synthesis to the latter field, there is not much hope for making cognitive progress there.

<A>Concluding Remarks for the Practice of Teaching

I have tried here to illustrate how methodological ideas can provide a starting point for an integrated discussion of early modern natural and moral philosophies. Even if they were

eventually abandoned, the questions of analysis and synthesis had been more central to philosophical controversies between Descartes and Kant than it is usually acknowledged, especially in classrooms.[7] In the case of Hume, for example, the issue is almost entirely neglected despite the fact that without understanding his methodological commitments the project of his *Treatise* can hardly be adequately reconstructed.

Focusing on methodological ideas has a comparative advantage over focusing directly on central figures or central topics. The latter approaches threaten to represent the project of early modern philosophy as more disunited than it actually was. In different authors centrally important problems may appear with different emphases, and in different conceptual environments as parts of different philosophical projects. Without methodological consciousness, conflicting stances on central problems—for example on substance, causation, final causes, the source of moral value, and the existence of God—may easily seem not to be sufficiently motivated.

A focus on methodological ideas can provide a guideline for discussing the emergence and philosophical treatment of characteristic problems in early modern philosophy, and it also serves as a good starting point for highlighting the continuities and discontinuities with the preceding Aristotelian tradition. It also provides a unified framework for different philosophical projects within which the significance of metaphysical, epistemological, moral, and theological issues can be perceived and their interconnections can be more easily explored. Methodology also opens up the possibility of embedding abstract philosophical questions into the context of scientific and cultural practices, and given the vast literature that exposes the political and religious commitments and purposes underlying various philosophical debates, into historical and social contexts as well.

If one turns to the practicalities of introductory teaching, then focusing on methodology

[7] For an illuminating discussion of how this method had been abandoned in the human sciences see Sturm 2015.

can serve as a guideline for introducing canonical figures and texts, asking how the philosopher's methodological pronouncements and commitments are actually reflected in philosophical reasoning. One could reconstruct, for example, Hume's *Treatise* by arguing that in the first steps Hume sets up an analytical framework of ideas, impressions, and their relations, and relying on this he analyses the mind.[8] Having established explanatory principles as a result of this analysis, he turns to the explanation of various phenomena of human psychology and sociability. The focus thus will be on how these phenomena are analyzed into impressions and ideas, and if there is no obvious way then how the apparent problem can be explained away with the same method. This analysis gives access not only to more advanced themes in Hume but also to the central topics for introductory courses, such as causation, personal identity, and sympathy.

Of course, the methodological focus can serve didactic purposes beyond the horizons of Scottish Newtonianism. Spinoza's *Ethics* is a very influential and self-proclaimed application of the geometrical, that is, synthetic, method in the early modern period that can be contextualized in various ways. It finds its natural place in the context of Cartesianism and Newtonianism as well, so it can be used for setting up various contrasts between dominant strands in early modern philosophy. Just as Spinoza ventured to present large parts of Descartes's *Principles of Philosophy* in a synthetic manner, one could try to do the same with Spinoza's *Ethics* and present it in an analytic manner.[9] And it is also possible to connect Spinoza with Newtonians in moral and natural philosophy through methodological issues leading to rather substantive differences.

One way to do this can, again, be illustrated through Scottish Newtonianism. As Eric Schliesser (2012) has argued, Colin Maclaurin in his attack on Spinoza exemplifies an argumentative strategy that Schliesser labels as one form of "Newton's Challenge": Maclaurin uses the authority of Newton's empirical success to undermine those (by Newton's standards:

[8] For a similar recent suggestion see Hazony and Schliesser 2015.

[9] Albeit Spinoza's attempt may have arisen from a misunderstanding of Descartes; see Curley 1977.

speculative) philosophers interested in "the big picture," that is, Descartes, Spinoza, and Leibniz.[10] Maclaurin criticizes their projects on methodological grounds discussing metaphysical topics central in Spinozistic thought, like the status of final causes, the existence and essence of substance, the infinity of the universe. Maclaurin presents Spinoza's system as a *reductio* of the Cartesian system, and he advocates instead piecemeal progress by mathematical-empirical research that he, in a Newtonian manner, makes subservient to moral and theological purposes—an aspiration that Hume has influentially challenged.

So, a methodological outlook gives a chance to structure the course material in a way that facilitates discussion on oppositions such as rationalism and empiricism, experimental and speculative philosophy, Newtonianism and anti-Newtonianism, mechanism and vitalism, and so on. These distinctions, even if they turn out to be less than clear-cut and frequently untenable on closer scrutiny, are useful didactic devices in drawing an initial map in order to orient students and to sketch large-scale intellectual developments. Methodological considerations are central in these oppositions, and their traces are perceivable in various fields of early modern inquiry. These traces are visible in several controversies that can be introduced through a discussion of methodological commitments as in the case of Descartes and the adherents of the Aristotelianism,[11] or in the Hobbes-Boyle controversy,[12] or in the controversies surrounding Newton's natural philosophy (see Zemplén and Demeter 2010).

Newton's case already illustrates how a methodological focus can be helpful in reconstructing not only interconnections and controversies but also the internal development of a philosopher's thought, but further illustrations can also be cited. As Peter Machamer and J. E. McGuire reconstruct the development of Descartes's thought, it turns out that his intellectual

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[10] On the contrast between experimental and speculative philosophy see Anstey 2005.

[11] For a contextual discussion see Ariew 2011.

[12] The classic discussion is, of course, Shapin and Schaffer 1985.

journey starts from a sensory-based methodology focused on analysis into "simple natures" from which explanations can be deductively construed. Simple natures are divided into two kinds and can be ascribed to spiritual or corporeal existences. The former kind includes volition and knowledge, the latter includes shape, extension, and body; and there are other simple natures like existence, unity, and duration that can belong to both kinds of existence (Machamer and McGuire 2009, 165–68). At this early stage Cartesian human knowledge, construed by the synthesis of such simple natures, is potentially exhaustive and certain: it is based on the power of the intellect to intuit all the simple natures by abstraction from sensory experience.

But Descartes's journey ends with a much more limited conception of human knowledge, embedded in a context of metaphysical views. Instead of being focused on certainty and exhaustiveness, its final focus is teleological: human knowledge serves the preservation of the mind-body union. At this later stage we cannot know the nature of the things themselves, only some of their attributes and modes, namely, those that are relevant for humans in the context of divine creation. God's final causes are unknowable, but both the world and human beings are created according to a certain design. In order for human knowledge to be possible both the world and human beings must have been created so as to ascertain some cognitive fit, which is essential for the preservation of the mind-body union, that is, for ensuring our survival.

As the cases of Descartes, Newton, and Hume have shown, focusing on methodological ideas naturally leads to the discussion of canonical figures and central topics, and at the same time this approach can present these discussions as exhibiting a deeper unity. I hope the case study and the concluding remarks presented here are enough to convince the reader that focusing on methodology can preserve all the virtues of more traditional approaches centered upon figures and themes, and contributes to them a further one: the chance to present early modern philosophy as a unity.

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<FOOTNOTES>