

HUME ON THE PRINCIPLES OF NATURAL PHILOSOPHY

SILVIO SENO CHIBENI

Department of Philosophy
State University of Campinas
P.O. Box 6110
13083-050 Campinas, SP
BRAZIL
chibeni@unicamp.br

Abstract: Both in the Introduction to the *Treatise of Human Nature* and in the *Abstract*, Hume expressly declared that his goal was to contribute to the development of a “science of man” methodologically akin to the natural sciences, and capable of emulating their “accuracy” and explanatory success. He regarded these sciences as starting from careful observation of phenomena, and proceeding to the establishment of “principles” of increasing generality. Although rejecting as vain any hope of discovering “the ultimate principles” of any science, he did not make clear what exactly he thought the principles actually involved in natural philosophy are. This article aims to shed some light on this issue through a survey and examination of the principles of Hume’s “science of man”, and of the most representative examples of principles of natural philosophy considered by Hume.

Key-words: Hume. Principles. Natural philosophy. Scepticism. Scientific realism.

1. INTRODUCTION

The most perfect philosophy of the natural kind only staves off our ignorance a little longer: as perhaps the most perfect philosophy of the moral or metaphysical kind serves only to discover larger portions of it. HUME¹

It may at first look odd that while moderate John Locke “suspect[ed] that natural philosophy is not capable of being made a science”, and that it was “lost labour” to seek after “a perfect science of natural bodies” (*Essay* 4.12.10 and 4.3.29), David Hume, who, according to a well-known opinion, would have led empiricism to its ultimate sceptical consequences, had no qualms to use the word ‘science’ to qualify his philosophical theory. Both in the introduction to the *Treatise* and in the *Abstract*, he expressly declared that his main goal was to contribute to the inception of a “science of human nature”, sharing several methodological and epistemological traits with the natural sciences, among which their precision and explanatory power (see also *E* 1). The general investigation of this intended parallel lies beyond the scope of the present article. Its aim is to inquiry on the nature of that which Hume himself called the “principles” of both kinds of science.

Unfortunately, Hume did not bother to make explicit what he meant by the word ‘principle’. Apparently, he used the term in two

¹ *An Enquiry concerning Human Understanding*, section 4, paragraph 12. We shall hereafter follow the notation adopted by the new Oxford edition, according to which this reference is shortened to ‘*E* 4.12’. Similar notation will be used for the *Treatise of Human Nature* and the *Abstract*. References to the *Dialogues concerning Natural Religion* will be according to page numbers of Kemp Smith’s edition.

different, if related senses, both of which deeply rooted in philosophical tradition. In the first sense, principles are propositions that play a central role in the sciences, their fundamental laws. In the second sense, the word denotes certain basic entities, mechanisms or processes of the world, which may be either apparent or postulated as hypotheses in the body of a particular theory. We shall hereafter refer to these two kinds of principles as *nomological* and *ontological principles*, respectively. The link between them is clear: to the extent in which a fundamental entity (ontological principle) may be known, the statement of its behaviour may constitute a principle, in the nomological acceptance of the term.²

Before examining this distinction in Hume's "moral science" and in his account of the natural sciences, let us recall what, according to him, principles *cannot* be. Beginning with a trivial case, Hume never missed an opportunity to repudiate principles instilled merely by "education" (*T* 1.3.9.19), or "taken upon trust" (*T* Intr. 1); although they "are every where to be met with in the systems of the most eminent philosophers", they only served to draw "disgrace upon philosophy" (*ibid.*). Here are some of Hume's favourite examples of this class of principles: "principles of substantial forms, and accidents, and faculties, [which] are not in reality any of the known properties of bodies, but are perfectly unintelligible and inexplicable" (*T* 1.3.14.7; see

² By characterizing the ontological principles in terms of *fundamental* entities or mechanisms we do not imply that they are *ultimate*, in some metaphysical sense of the word. We just mean that they play some important role in the structure of the world. The same remark applies, *mutatis mutandis*, to the characterization of the nomological principles as *fundamental* laws. We hope this point will become clearer when examples considered by Hume are examined below.

also 1.4.3.8); the Peripatetics' "*sympathies, antipathies, and horrors of a vacuum*" (T 1.4.3.11); the "shocking" scholastic "*totum in toto & totum in qualibet parte*" (T 1.4.5.13); "*Spinoza*[s ...] doctrine of the simplicity of the universe, and the unity of that substance, in which he supposes both thought and matter to inhere", which Hume mocks as Spinoza's "fundamental principle of atheism" (T 1.4.5.18); and the very distinction between primary and secondary qualities, which Hume calls "the fundamental principle" of modern philosophy (T 1.4.4.3,5).

Besides these traditional "principles", Hume also emphatically rejects "ultimate principles" generally; or, to be more precise, what he rejects is the supposition that these principles (assuming that there are any) are epistemically accessible. We cannot rationally expect to discover ultimate ontological or nomological principles, neither in the natural sciences, nor in the science of man (T Intr. 8-10, A 1, E 12.3), because the scientific enterprise is open-ended. Thus, although any science involves – as Hume emphasised³ – the gradual process of establishment of (nomological) principles of growing generality, starting from crude experience, we have no reason to believe that this process will come to a natural terminus.

It is important to notice here that, according to Hume, the indefinite search for more and more general principles is motivated not only by reasons of simplicity and economy of thought, but also by the

³ In a passage of the *Dialogues concerning Natural Religion*, for instance, Philo asserts that "from our earliest infancy we make continual advances in forming more general principles of conduct and reasoning; that the larger experience we acquire, and the stronger reason we are endued with, we always render our principles the more general and comprehensive; and that what we call *philosophy* is nothing but a more regular and methodical operation of the same kind" (D 134; see also T Intr. 8, A 1, E 1.2,15; 3.3; 5.13).

fact that the more general a principle is, the greater its *explanatory power* (*T* Intr. 8, App. 3). As it happens, however, it is precisely the justification of certain kinds of general principles – those transcending the empirical level – that generates some of the main internal tensions in Hume’s epistemology, as we shall see below.

Another central function of principles is, according to Hume, to transfer precision and epistemic assurance from the simpler propositions upon which they rest to the more complex and less evident propositions that follow deductively from them. Pronouncing specifically on the principles of geometry, for instance, Hume says: “But since these fundamental principles depend on the easiest and least deceitful appearances, they bestow on their consequences a degree of exactness, of which these consequences are singly incapable” (*T* 1.3.1.6). The point is illustrated by the true, but non-evident proposition that the sum of the internal angles of a chiliagon is equal to 1996 right angles. It can be proved from easier propositions such as that, given two points, there is one, and only one straight line passing through them (one of the postulates or “principles” of Euclidean geometry).

Thus, though rejecting the possibility of establishing ultimate principles (nomological or ontological), Hume shares with his typical opponents the ideal of hierarchic organization of knowledge, in which certain propositions play a central role – being thus nomological “principles” –, to the extent in which they condense, explain or coordinate certain other, generally simpler propositions.

2. THE PRINCIPLES OF THE “SCIENCE OF HUMAN NATURE”

What we have seen so far is not particularly original to Hume. Let us now survey and examine briefly some of the main propositions belonging to his “moral philosophy, or the science of human nature” (*E* 1.1) that he explicitly classified as “principles”. There are two

reasons why this preliminary task is important for the understanding of his position on the principles of *natural* philosophy. First, Hume's "science of man" (*T* Intr. 4) takes its inspiration in natural philosophy, as he stressed. And, second, this "science" encompasses, as an essential part, an epistemological theory, through which issues related to knowledge of the natural world are obviously to be discussed.

There is no point in discussing systematically here Hume's theory of human nature. We shall just underline some of its aspects which are more directly related to the theme of the present article. It is useful to begin by giving a sample of the principles of this theory (explicitly stated as such by him). The following three are classified as "obvious" or "evident" by Hume:

- a) "That reason alone can never give rise to any original idea" (*T* 1.3.14.5);
- b) "that reason, as distinguish'd from experience, can never make us conclude, that a cause or productive quality is absolutely requisite to every beginning of existence (*ibid.*);
- c) "that whatever we can imagine, is possible" (*T* 1.4.5.35).

These examples indicate that by 'obvious' and 'evident' Hume does not necessarily mean *self*-evident, or independent from the experience. Other principles are also treated as evident by Hume, although he does not explicitly says so; here are three of them:

- d) "that all ideas, which are different, are separable" (*T* 1.1.7.17; see also 1.3.3.3);
- e) "the liberty of the imagination to transpose and change its ideas" – this is the "second principle" of the science of man (*T* 1.1.3.4);
- f) "the priority of impressions to ideas" (*T* 1.1.1.11).

Some other principles are explicitly said to "derive from experience", as for instance:

- g) “that when any impression becomes present to us, it not only transports the mind to such ideas as are related to it, but likewise communicates to them a share of its force and vivacity” (T 1.3.8.2);
- h) “The same cause always produces the same effect, and the same effect never arises but from the same cause” (T 1.3.15.6).

The latter principle is Hume’s fourth “rule by which to judge of causes and effects”. The fifth and sixtieth rules are also classified as principles; hinging on the fourth, they too ultimately derive from experience.

Other principles, whose links with experience are not explicitly discussed by Hume, clearly depend on rather complex philosophical argumentations. Here are four important cases:

- i) “that every thing in nature is individual” (T 1.1.7.6), and, in particular, “that general or abstract ideas are nothing but individual ones taken in a certain light” (T 1.3.14.13);
- j) “That there is nothing in any object, consider’d in itself, which can afford us a reason for drawing a conclusion beyond it” (T 1.3.12.20);
- k) “That even after the observation of the frequent or constant conjunction of objects, we have no reason to draw any inference concerning any object beyond those of which we have had experience” (*ibid.*; see also A 15);
- l) “That all our simple ideas in their first appearance are deriv’d from simple impressions, which are correspondent to them, and which they exactly represent” (T 1.1.1.7) – this is “the first principle ... in the science of human nature” (T 1.1.1.12; see also 1.3.1.7; 1.3.8.15; 1.3.14.10,16).

All the above principles express either laws that would, according to Hume, regulate the functioning of the mind, or general philosophical maxims, being thus, all of them, nomological principles, according to the distinction proposed in the previous section. But there are principles whose status *vis-à-vis* that distinction is more complex. Two typical and important examples are:

- m) the principles of association of ideas (*T* 1.1.4, E 3);
- n) habit, or custom (*T* 1.3.7.6; 1.3.10.1; E 5.5-6).

Although these principles undeniably are taken by Hume to express certain phenomenological patterns, being thus nomological, it is arguable that his texts offer support for the view that the principles are *also* meant by Hume to denote certain mental mechanisms, being thus ontological. The following considerations help to render this interpretation plausible.

When first presenting the principles of association of ideas, Hume says they are “a gentle force” connecting our ideas, without which they would be “entirely loose and unconnected” (*T* 1.1.4.1). He adds that although its “effects are every where conspicuous”, i.e. we can know the pattern according to which it operates (namely, by resemblance, contiguity and causation), “its causes ... are mostly unknown, and must be resolv’d into the *original* qualities of human nature, which I pretend not to explain” (*T* 1.1.4.6). Notwithstanding these sceptical remarks, in a seldom-noticed passage of part 2, book 1 of the *Treatise*, Hume affords to speculate on the possible neurophysiological causal mechanism of the principles of association:

When [in *T* 1.1.4] I receiv’d the relations of *resemblance*, *contiguity* and *causation*, as principles of union among ideas, without examining into their causes, ’twas more in prosecution of my first maxim, that we must in the end rest contented with experience, than for want of something specious and plausible, which I might have display’d on that subject. ’Twou’d have been easy to have made an imaginary dissection of the brain, and have shewn, why upon our conception of any idea, the animal spirits run into all the contiguous traces, and rouse up the other ideas, that are related to it. But tho’ I have neglected any advantage, which I might have drawn from this topic in explaining the relations of ideas, I am afraid I must here have recourse to it, in order to account for the mistakes that arise from these relations. I shall therefore observe, that as the mind is endow’d with a power of

exciting any idea it pleases; whenever it dispatches the spirits into that region of the brain, in which the idea is plac'd; these spirits always excite the idea, when they run precisely into the proper traces, and rummage that cell, which belongs to the idea. But as their motion is seldom direct, and naturally turns a little to the one side or the other; for this reason the animal spirits, falling into the contiguous traces, present other related ideas in lieu of that, which the mind desir'd at first to survey. This change we are not always sensible of; but continuing still the same train of thought, make use of the related idea, which is presented to us, and employ it in our reasoning, as if it were the same with what we demanded. This is the cause of many mistakes and sophisms in philosophy; as will naturally be imagin'd, and as it wou'd be easy to show, if there was occasion. (*T* 1.2.5.20)

It is, of course, possible to interpret this reference to the hypothetical material counterpart of the mental processes as simply metaphorical. But a more literal reading does not appear to be entirely ruled out. The proposal – which evidently follows the lines laid down by Descartes in the *Passions* and Malebranche in the *Recherche* – is here taken as “plausible”, and as helping to explain the relations of ideas and certain mistakes that arise from them. Furthermore, similar conjectures on unobservable entities and mechanisms are found in several other passages of Hume’s work. One of them is about the explanation of principle *g*, under which the important principle of habit is subsumed. It is perhaps noteworthy that Hume’s first justification of principle *g*, put forward in *T* 1.3.8.2, is framed in terms of this ontological, material level (the “elevation” of the animal spirits, their assuming “a new direction”, etc.). The phenomenological approach – epistemically more trustful, Hume rightly acknowledges – comes immediately after, in *T* 1.3.8.3 ff. Not surprisingly, thus, principle *g* appears also to have the same “dual” character (nomological and ontological) as principles *m* and *n* themselves, to which it is closely related.

Still another passage in which Hume speculates about the brain’s “pipes or canals”, though which the animal spirits would flow, occurs

two sections later (*T* 1.3.10.7 and 9), again in an effort to supplement and explain certain phenomenological laws regulating the mind. Other, more general references to ontological principles are, for instance: “principles productive of natural phaenomena” (*E* 1.12); “an object, which exists for any time in its full perfection without producing another, is not its sole cause; but is assisted by some other principle, which pushes it from its state of inactivity, and makes it exert that energy, of which it was secretly possest” (*T* 1.3.2.7); “’tis evident this reflection and premeditation would so disturb the operation of my natural principles” (*T* Intr. 10); etc.

Notice, finally, that the word ‘principles’ often comes in conjunction with ‘springs’, which strengthens the ontological reference: “But may we not hope, that philosophy, if cultivated with care, and encouraged by the attention of the public, may carry its researches still farther, and discover, at least in some degree, the secret springs and principles, by which the human mind is actuated in its operations?” (*E* 1.15); “These ultimate springs and principles are totally shut up from human curiosity and enquiry” (*E* 4.12); “But philosophers observing, that almost in every part of nature there is contain’d a vast variety of springs and principles, which are hid, by reason of their minuteness or remoteness, find that ’tis at least possible the contrariety of events may not proceed from any contingency in the cause, but from the secret operation of contrary causes” (*T* 1.3.12.5; see also *E* 8.13); “Thought, design, intelligence, such as we discover in men and other animals, is no more than one of the springs and principles of the universe, as well as heat or cold, attraction or repulsion, and a hundred others, which fall under daily observation” (*D* 147, words of Philo).

Ontological principles naturally bring epistemological difficulties for Hume, as in general any incursion into metaphysics. We may indeed notice that in most of the cases Hume’s references to ontological

principles are tempered with sceptical considerations. In the next section we shall meet several important examples in the domain of natural philosophy. Let us by now quote a famous sceptical passage which occurs just in the context of the principles of association of ideas. At the end of section 4, part 1, book 1 of the *Treatise*, having relegated the *causes* of association to the inscrutable “qualities of human nature”, Hume adds (6):

Nothing is more requisite for a true philosopher, than to restrain the intemperate desire of searching into causes, and having establish'd any doctrine upon a sufficient number of experiments, rest contented with that, when he sees a farther examination would lead him into obscure and uncertain speculations. In that case his enquiry wou'd be much better employ'd in examining the effects than the causes of his principle.

It is clear from the context, as well from other similar passages (e.g. *T* Intr. 9-10; *E* 5.5n), that the said “effects” of the principles are their *observational* consequences. So much so that Hume often talks of “proving” his principles experimentally (*T* 1.3.8.3, 8; *E* 5.15-19).

Another important case of severe cognitive limitation in the science of man concerns the mind-body problem. Not unexpectedly, Hume joins here the chorus of virtually all his contemporaries and predecessors: “is there any principle in all nature more mysterious than the union of soul with body; by which a supposed spiritual substance acquires such an influence over a material one, that the most refined thought is able to actuate the grossest matter?” (*E* 7.11).

Such sceptical considerations contrast sharply with Hume’s flirtation with speculations about “hidden” mental mechanisms, referred to above. As is well known, the traditional stand on Hume’s philosophy takes the former as largely outweighing the latter (when at all noticed). More recent scholarly work, however, has tended to be

more sensitive to the presence of realist elements in Hume's writings.⁴ But this controversy broadly outstrips the boundaries of the present article. We shall, in the next section, encounter other instances of the tension between the sceptical and the realist strands in Hume's thought.

3. THE PRINCIPLES OF NATURAL PHILOSOPHY

We saw in the preceding section that the principles of Hume's science of man are not restricted to empirical generalizations. The same holds with regard to natural philosophy, such as understood by Hume. Before analysing this central topic, let us examine briefly, in the context of the present work, an epistemological difficulty that arises even in the case of phenomenological principles (i.e., those referring exclusively to observable items). In the nomological acceptation, indicated in the Introduction, principles are *general* propositions. But how can general propositions be justified on the basis of experience? It would be out of place, of course, to offer a general discussion of this well-known philosophical problem here. We just want to call attention to the *sui generis* nature of Hume's solution (if a solution at all). Hume begins by noticing that even when we are unable to subsume a certain general phenomenological proposition under a more fundamental theoretical principle we may come to believe in the universality of the regularities expressed by the proposition:

⁴ Wright (1983), Craig (1987) and Strawson (1989), for instance, have underscored these elements, exploring different angles of the dispute. Monteiro (1981) argues that Hume's epistemological theory did make room for hypotheses on unobservable causes and mechanisms.

But notwithstanding this ignorance of natural powers* and principles, we always presume, when we see like sensible qualities, that they have like secret powers, and expect that effects, similar to those which we have experienced, will follow from them. If a body of like colour and consistence with that bread, which we have formerly eat, be presented to us, we make no scruple of repeating the experiment, and foresee, with certainty, like nourishment and support. Now this is a process of the mind or thought, of which I would willingly know the foundation. (E 4.16)

Although, as Hume argues, “the mind is not engaged by argument” to make this kind of generalization, it must, he proposes, be induced to it “by some other principle of equal weight and authority” (E 5.2). And Hume’s resolute answer is: “This principle is *custom* or *habit*” (E 5.5; see also T 1.3.8.10). This solution to the so-called “problem of induction” is disconcertingly new. What kind of foundation could habit, a species of “instinct or mechanical tendency” (E 5.22) afford? As is well known, this answer has traditionally been interpreted as a *reductio*: such foundation is indeed no foundation at all, it has no epistemic credentials whatsoever. It was only in the twentieth century that this tradition begun to be questioned. Kemp Smith and Nelson Goodman were among the pioneers in proposing that when Hume said that habit is a “principle of equal weight and authority” as reason and argument he was not kidding (Smith, 1905, 1941; Goodman, 1983).

If this interpretation is correct, the phenomenological principles – which constitute, of course, an important class of principles in natural philosophy – neither have the naive status of truths provable directly from experience, nor fall into the realm of complete scepticism. Rather, they would find their ground in an instinctive natural mechanism of extrapolating uniform empirical evidence.

As to the *non*-phenomenological principles, it is plain that Hume expressed scepticism concerning them in many passages, as, for

instance, at the beginning of the one just quoted. Here are other two typical sceptical assertions. In the *Treatise*, 1.2.5.26, we read:

[M]y intention never was to penetrate into the nature of bodies, or explain the secret causes of their operations. For besides that this belongs not to my present purpose, I am afraid, that such an enterprize is beyond the reach of human understanding, and that we can never pretend to know body otherwise than by those external properties, which discover themselves to the senses. As to those who attempt any thing farther, I cannot approve of their ambition, till I see, in some one instance at least, that they have met with success. But at present I content myself with knowing perfectly the manner in which objects affect my senses, and their connections with each other, as far as experience informs me of them. This suffices for the conduct of life; and this also suffices for my philosophy, which pretends only to explain the nature and causes of our perceptions, or impressions and ideas.

And in the Appendix Hume adds:

As long as we confine our speculations to the *appearances* of objects to our senses, without entering into disquisitions concerning their real nature and operations, we are safe from all difficulties, and can never be embarrass'd by any question.

These statements are repeated in almost the same words in *T* 2.3.1.3-4 and A 32. In the *Dialogues*, referring to the principles of reason, instinct, generation and vegetation, Philo comments: "The effects of these principles are all known to us from experience: But the principles themselves, and their manner of operation are totally unknown..." (*D* 178). Returning to the *Enquiry*, immediately before the passage just quoted we find:

It must certainly be allowed, that nature has kept us at a great distance from all her secrets, and has afforded us only the knowledge of a few superficial qualities of objects; while she conceals from us those

powers and principles on which the influence of those objects entirely depends. Our senses inform us of the colour, weight, and consistence of bread; but neither sense nor reason can ever inform us of those qualities which fit it for the nourishment and support of a human body. Sight or feeling conveys an idea of the actual motion of bodies; but as to that wonderful force or power, which would carry on a moving body for ever in a continued change of place, and which bodies never lose but by communicating it to others; of this we cannot form the most distant conception. (*E* 4.16)

Thus, according to Hume, nutrition and inertia would be unknown ontological principles.⁵ But let us compare these assertions with what Hume writes four paragraphs earlier:

It is confessed, that the utmost effort of human reason is to reduce the principles, productive of natural phenomena, 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. But as to the causes of these general causes, we should in vain attempt their discovery; nor shall we ever be able to satisfy ourselves, by any particular explication of them. These ultimate springs and principles are totally shut up from human curiosity and enquiry. Elasticity, gravity, cohesion of parts, communication of motion by impulse; these are probably the ultimate causes and principles which we shall ever discover in nature; and we may esteem ourselves sufficiently happy, if, by accurate enquiry and reasoning, we can trace up the particular phenomena to, or near to, these general principles. (*E* 4.12)

⁵ By the way, reference to the “principle” of nutrition is recurrent in Hume’s writings. As to inertia, we see here that a trait of medieval and ancient dynamics was still lurking behind Hume’s thought: the old idea that every motion requires a cause (force). The rejection of this idea is just one of the hallmarks of the new dynamics of Galileo, Descartes and Newton. But this is just a historical curiosity. What matters here is that inertia would also be an ontological, unknown principle.

At first sight, this passage seems to insist on the same sceptical themes as those of *E* 4.16. However, what is said here deserves closer scrutiny. The principles productive of natural phenomena to which Hume refers are, obviously, their causal mechanisms. As mentioned in the Introduction, one of the methodological principles which, according to Hume, would characterise science (“of man” or natural) is precisely the continued attempt to “reduce” principles of a lower level of generality to still more general principles. But here Hume introduces an epistemological cut just after the first step!

What would have led Hume to disregard that methodological rule? It is hard to say for sure, but it is plausible to assume that at this point Hume may have been influenced by Newton’s own stand concerning his law of gravitation. As is well known, the great scientist believed that he had discovered the common cause of countless terrestrial and celestial phenomena, namely, the force of gravitation. Through the specification of this force, unified, simple, causal explanations would be given to such varied phenomena as the motion of the planets and other celestial bodies, the tides, the fall of stones, the oscillation of pendulums, etc. However, at the same time Newton famously warned that he would not frame hypotheses on the cause of the gravitational force (*Principia*, General Scholium, 547).

This seems to be exactly the stand assumed by Hume in the above passage of the *Enquiry* 4.12: “But as to the causes of these general causes, we should in vain attempt their discovery...”. But if Newton served indeed as a model here, we are still left with two big problems. First, Newton himself clearly hoped to make further steps in the discovery of causes of gravitation, and he actually toiled with certain explanatory hypotheses. Being, however, aware of their crudeness, he refrained to present them in print. Furthermore, the ulterior development of physics, specially in the twentieth century, did

not at all respect Newton's supposed ban on hypotheses concerning the nature of gravitation. The same holds, and even more clearly, for the case of the elastic force – another of Hume's examples –, which is now universally taken as being of electromagnetic origin.

Secondly, even if we stop scientific inquiry at the point indicated by Hume, we shall have gone beyond mere phenomenological regularities already. Forces should not count among observable entities, as persuasively shown by many modern and contemporary philosophers. But the point seems to have escaped Hume, despite the availability, since 1720, of one of the best analyses ever made of the metaphysical status of forces, namely, Berkeley's *De Motu*. Knowing or not this work, Hume probably was one of the many who, bedazzled by the success of the new physics, forgot about stern philosophical limits of observability. Scientific realists would, of course, rejoice at episodes like this. According to them, strong explanatory and predictive power constitute legitimate ground for belief even in unobservable items of scientific theories.

Now, if one crucial step into the unobservable was effectively made by the best scientists of the time, why to proscribe further steps? The fact that Newton and his contemporaries did not at all let their research to be curtailed by philosophical qualms about unobservables has not, apparently, been fully appreciated or understood by Hume. Notwithstanding, given his just admiration for the natural scientists, this may have acted as a factor pushing him beyond the sceptical consequences of his theory of ideas and causal inferences, if only unconsciously.

In connection with this point, it is worth examining other passages in Hume's writings in which he seems to ignore those sceptical conclusions. Among these passages, perhaps the most striking are those in which he attempts to defend his claim that "chance is

nothing real in itself" (T 1.3.11.4), that "there [is] no such thing as Chance in the world" (E 6.1). Hume observes, to this end, that modern natural philosophy had been meeting with increasing success in discovering "secret causes" in the operation of bodies. The search for such causes was motivated precisely by the urge to explain why apparently random events happen. Rhubarb, for instance, does not always purge, nor opium make sleep (E 6.4). Once sufficiently deep causes are specified, however, complete regularity is recovered. This point is expressed in a telling passage of the *Treatise* (1.3.12.5), reproduced *ipsis literis* in the *Enquiry* (8.13):

The vulgar, who take things according to their first appearance, attribute the uncertainty of events to such an uncertainty in the causes, as makes them often fail of their usual influence, tho' they meet with no obstacle nor impediment in their operation. But philosophers, observing that almost in every part of nature there is contain'd a vast variety of springs and principles, which are hid, by reason of their minuteness or remoteness, find that 'tis at least possible the contrariety of events may not proceed from any contingency in the cause, but from the secret operation of contrary causes. This possibility is converted into certainty by farther observation, when they remark, that upon an exact scrutiny, a contrariety of effects always betrays a contrariety of causes, and proceeds from their mutual hindrance and opposition. (T 1.3.12.5; E 8.13)

Thus, the "operation of secret causes" is at first judged *possible* by the scientists. Then, through "farther observation" this possibility is "converted into certainty". Bewildering! What could these additional observations be? The reality of such "secret" causes cannot, on pain of inconsistency, be established by direct experience, since by 'secret' Hume means 'unobservable'. Thus, inferential processes would necessarily be involved here. But what kind of inference? Since logical and inductive inferences are of no help in this case, the only remaining

possibility seems to be abductive inferences. As every philosopher of science knows, abduction is indeed the main tool explored by scientific realists to argue that the limits of direct perception can be transcended. Investigation of the presence of this form of inference in Hume's thought constitutes a topic of its own, which will not be pursued here. We shall just bring into consideration a passage of the *Dialogues* that concerns directly the issue of the possibility of transcending the phenomenological level. At a certain point (*D* 136), Cleanthes asks to Philo:

In reality, would not a man be ridiculous, who pretended to reject Newton's explication of the wonderful phenomenon of the rainbow, because that explication gives a minute anatomy of the rays of light; a subject, forsooth, too refined for human comprehension? And what would you say to one, who having nothing particular to object to the arguments of Copernicus and Galilaeo for the motion of the earth, should with-hold his assent, on that general principle, That these subjects were too magnificent and remote to be explained by the narrow and fallacious reason of mankind?

The obvious answers are left implicit. Notice now that the former case, and perhaps the latter too, involves unobservable entities: the "minute anatomy of the rays of light" evidently refers to the luminiferous corpuscles of Newton's optical theory. And Cleanthes goes on:

There is indeed a kind of brutish and ignorant scepticism, as you well observed, which gives the vulgar a general prejudice against what they do not easily understand, and makes them reject every principle, which requires elaborate reasoning to prove and establish it. ... They [the sceptics] push their researches into the most abstruse corners of science; and their assent attends them in every step, proportioned to the evidence, which they meet with. They are even obliged to acknowledge, that the most abstruse and remote objects are those, which are best explained by philosophy. Light is in reality anatomized: The true system of the heavenly bodies is discovered and ascertained.

But the nourishment of bodies by food is *still* an inexplicable mystery:
The cohesion of the parts of matter is *still* incomprehensible. (D 136-7)

We stressed the word ‘still’ in the last sentence, as it implies that even the hidden mechanisms of nutrition and cohesion are regarded as *in principle* discoverable by further scientific research. Notice also that Cleanthes puts the whole issue under the aegis of the principle of proportioning belief to evidence, to which Hume emphatically subscribed. Furthermore, what Cleanthes holds here is entirely in line with mid-eighteenth-century scientific knowledge: there was then strong evidence (but not too narrowly construed, of course) for the reality of Newton’s light corpuscles and for the Copernican astronomical system (which also involved unobservable items, such as epicycles, the absolute motion of the Earth, etc). But there were no satisfactory scientific explanations for nutrition and the cohesion of bodies.

It is a shame, the realist interpreter of Hume will complain, that these are words of Cleanthes, who often is, but sometimes isn’t, Hume spokesman. A further difficulty is that this discussion occurs in the context of a sceptical attack of Philo to the principles of religion, which explores exactly the fact that they transcend the level of experience. Cleanthes’ reply consists, as we see, in arguing that if natural philosophy is successfully transcending the empirical level, why couldn’t religion do the same, at least in principle? We are left with two options: Either Hume expresses itself exclusively through Philo, Cleanthes being a real adversary; or this is just another instance of the alternation, typical in Hume’s writings, between scepticism and a discrete movement towards the possibility of knowing some unobservable aspects of the world.

4. CONCLUDING REMARKS

The problem of determining what kinds of principles are, according to Hume, to be allowed in the natural sciences apparently does not admit of a clear-cut solution. We saw in the last section that Hume's texts often point to opposite directions. Furthermore, Hume's stand concerning his own "science of human nature" also appears to be somewhat indefinite, as we indicated in section 2. To extricate ourselves from these difficulties of interpretation, we could try to determine what implications, after all, Hume's epistemological theory has concerning the issue of the limits of human knowledge. But even though this was a central concern for Hume, his theory is not as clear in this respect as one might wish.

It is undeniable that the main trend of Hume's analysis of perceptions and knowledge of matters of fact push strongly toward scepticism. There is, first, the fact that Hume's theory of ideas (which hinges on principle 1 of section 2) does not even *seem* to leave room for *ideas* of unobservable entities. Secondly, the inferences based on causal relations, essential, according to Hume, to extend knowledge to what has not been observed, is clearly inapplicable to the case of *unobservable* matters of fact, as Hume himself noticed in his discussion of realism about ordinary bodies.

On the other hand, when Hume gets closer to what actually happens in the natural sciences – his explicitly avowed methodological model – he seems to loosen the strict constraints imposed by his theories of ideas and causal inferences. There we find Hume at home with principles and hypotheses involving unobservable entities and processes. A quick survey of his own "science of man" reveals (perhaps surprisingly to superficial readers) a widespread use of hypotheses, some of them at certain key points of his theory. And

many of these hypotheses clearly go much beyond what could plausibly be taken as being empirical (i.e. directly observable). It is only to be hoped that further research on this relatively unexplored aspect of Hume's thought may shed more light on the intriguing issues discussed in the present article.^{6, 7}

REFERENCES

- CHIBENI, Silvio S. "A Humean Analysis of Scientific Realism".
Forthcoming in *Epistémologiques* (France).
- CRAIG, Edward. *The Mind of God and the Works of Man*. Oxford: Clarendon Press, 1987.
- GOODMAN, Nelson. The new riddle of induction. In: *Fact, Fiction and Forecast*. 4th. edition. Cambridge, MA: Harvard University Press, 1983.
- HUME, David. *A Treatise of Human Nature*. D.F. Norton and M.J. Norton (eds.). Oxford: Oxford University Press, 2002. (Includes the *Abstract*.)
- . *An Enquiry concerning Human Understanding*. T.L. Beuchamp (ed.). Oxford: Oxford University Press, 1999.
- . *Dialogues concerning Natural Religion*. N.K. Smith (ed.). New York: Macmillan, 1947.

⁶ For a further exploration of the tension, in Hume's work, between these two stands on the issue of scientific realism, see my forthcoming "A Humean analysis of scientific realism".

⁷ I would like to thank two anonymous referees for *Manuscrito* for helpful comments on an earlier version of this paper.

- LOCKE, John. *An Essay concerning Human Understanding*. P.H. Nidditch (ed.). Oxford: Clarendon Press, 1975.
- MONTEIRO, João Paulo. "Hume's Conception of Science". *Journal of the History of Philosophy*, 19, pp. 327-42, 1981.
- NEWTON, Isaac. *Mathematical Principles of Natural Philosophy*. A. Motte (transl.) and F. Cajori (ed.). Berkeley and Los Angeles: University of California Press, 1934.
- SMITH, Norman Kemp. "The naturalism of Hume". *Mind*, 14, pp. 149-73 and 335-47, 1905.
- . *The Philosophy of David Hume*. London: Macmillan, 1941.
- STRAWSON, Galen. *The Secret Connexion*. Oxford: Clarendon Press, 1989.
- WRIGHT, John P. *The Sceptical Realism of David Hume*. Minneapolis: University of Minnesota Press, 1983.