

## Hume on unobservable entities

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**Abstract:** It is generally acknowledged by both philosophers of science and by Hume scholars that Hume's classic analysis of perceptions and knowledge of matters of fact push strongly toward scepticism about unobservable entities, such as those typically postulated in theories of the natural sciences. Intriguingly, though, Hume has not only written approvingly of certain scientific theories referring to unobservable objects, but also introduced himself several hypotheses about unobservable entities and processes in his own "science of man". This article aims to pinpoint and comment some of the main passages of his works in which Hume appears to take a positive stance toward unobservables, in certain particular instances. If correct, this analysis would constitute a piece of evidence against the usual belief that the empiricist epistemological theory developed by Hume would constitute an impeditive framework for any form of scientific realism.

**Key-words:** David Hume; empiricism; scientific hypotheses; scientific realism; unobservable entities; natural philosophy.

### *Hume sobre entidades inobserváveis*

**Resumo:** Constitui opinião comum entre filósofos da ciência e historiadores da filosofia moderna que a clássica análise de Hume da percepção e do conhecimento de questões de fato que escapam ao testemunho dos sentidos aponta fortemente para o ceticismo quanto ao conhecimento de entidades inobserváveis, como as que são tipicamente postuladas por teorias das ciências naturais. Não obstante, Hume não apenas expressou aprovação a certas teorias científicas que putativamente se referem a itens inobserváveis como também introduziu, ele próprio, diversas hipóteses sobre entidades e processos inobserváveis em sua "ciência do homem". Este artigo objetiva a identificar e comentar algumas das passagens de suas obras em que Hume parece, de fato, assumir uma posição positiva quanto a inobserváveis, em casos particulares. Se assim for, a presente análise contribuirá para por em questão a crença usual de que a teoria epistemológica empirista desenvolvida por Hume forma um referencial hostil a qualquer forma de realismo científico.

**Palavras-chave:** David Hume, empirismo, hipóteses científicas, realismo científico, entidades inobserváveis, filosofia natural.

### 1. Introduction. Empiricism and scientific realism.

Scientific realism was one of the main subjects of debate in philosophy of science in the last decades of the 20<sup>th</sup> century. The work that, individually, contributed the most to bring this issue to the forefront of philosophical analysis was Bas van Fraassen's *The Scientific Image* (1980). Preliminary to the defence of a new form of scientific *anti*-realism, the book offers, in chap. 2, a survey several proposals in the literature for the proper characterization of scientific realism. Quite independently of one's opinion about van Fraassen's specific theses and arguments, it must be acknowledged that this survey represents a valuable contribution

Recebido em 27 de dezembro de 2017. Aceito em 29 de maio de 2018.



to the clarification of the conceptual contours of the discussion. In particular, his definition of scientific realism seems to capture the core of this doctrine, without burdening it with misleading accessories.

According to van Fraassen, by scientific realism we are to understand the view that “[s]cience aims to give us, in its theories, a literally true story of what the world is like; and acceptance of a scientific theory involves the belief that it is true” (VAN FRAASSEN, 1980, p. 8). This definition has the merit of focusing on the aim of science – purportedly, truth –, and not on the epistemic credentials of any of its particular theories for claiming that this aim has been reached. Also, it avoids clothing the position in linguistic dressings, as was done in decades of largely inconclusive debate between the logical positivists and their critics. That old debate, let us recall, hinged on whether it was possible (and, if possible, desirable) to cleanse the language of science of the so-called “theoretical terms”. Typically, the defenders of this procedure – the anti-scientific realists of the day – assumed that, in contrast with the “empirical”, or “observational” terms, such terms would be destitute of legitimate meaning; and in holding this view they believed they were simply adopting a theory of meaning whose roots dated back to the classical “empiricists”, in particular, David Hume<sup>1</sup>. Several strategies for eliminating theoretical terms from scientific theories have been proposed. With the advantage of hindsight, we can see that none of them have done much headway in advancing the anti-realist project.

Instead of entering into this worn out debate, van Fraassen has convincingly argued that the whole eliminative enterprise of the logical positivists is misguided, since all terms in the language of science are, in certain a sense, theoretical. It is, therefore, vain to try to defend an anti-scientific realist position on the basis of a supposed line separating the theoretical from the empirical terms. Furthermore, van Fraassen has shown that what the anti-realist needs is not such an impossible line, but an *epistemological* criterion for distinguishing the items, in a theory, deserving to be *believed*, in contrast with those about which she would recommend an agnostic stance. And the criterion proposed by van Fraassen is, in a word, *observability*: entities and processes referred to by a scientific theory, literally construed, could be legitimate object of belief *only if they are in principle observable*. Thus, according to this suggestion, the epistemic appraisal of a scientific theory would hinge solely on its “empirical adequacy”, i.e. its capacity to fit the observable data, not on its truth *simpliciter* (which includes the theory’s fit to *any* aspect of the world, observable or not). Accordingly, van Fraassen expressed his own position – which he named “constructive empiricism” – in these words: “Science aims to give us theories which are empirically adequate; and acceptance of a theory involves as belief only that it is empirically adequate” (VAN FRAASSEN, 1980, p. 12).

It is easy to see that van Fraassen philosophical move bypasses the problem of sorting out the terms of the language of science into theoretical and non-theoretical (or empirical), but only at the price of generating a (seemingly) new problem, that of sorting out the observable from the unobservable entities and processes in science. He was aware of this crucial problem, of course, but has surprisingly given only a perfunctory solution to it in his ground-breaking book: he holds that we should count as observable the items that could *in principle* be observed *by unaided human sensorial organs*. As expected, critics were quick to point out the existence of many difficulties and paradoxes in this apparently crude, anthropocentric observability criterion; and it is a matter of dispute whether van Fraassen has succeeded in countering these criticisms<sup>2</sup>.

It does not belong to the scope of this paper to discuss the still alive debate on this important topic. I will simply assume, for the sake of advancing my views on a related, but less explored issue, that van Fraassen’s observability criterion is a viable option. An additional motivation for adopting this criterion is the fact that the whole history of science (or, in earlier times, “natural philosophy”) is marked by a clear awareness, on the part of its main protagonists, that, in the epistemological analysis of a theory, its assertions about the unobservable aspects of the world require a treatment differing substantially from that of its statements



about empirical matters. At least from Descartes onwards, virtually all the main scientists who contributed to the development of the natural sciences have offered some epistemological justification for their ambition to transcend the limits of human senses, whether by appealing to magnifying devices or by arguing that their very theories constituted appropriate intellectual tools for probing deeper into the natural world.

What is little noticed in the literature is that many, if not most, of the leading figures the so-called “empiricist” school of philosophy, such as Locke, Berkeley and Hume, did not see their epistemological position as *necessarily* ruling out this age-old goal of science. In contrast with their classical predecessors, however, contemporary empiricists tend to assume that empiricism would automatically render impossible any defence of scientific realism. I have argued elsewhere that this is a mistake (CHIBENI, 1997). Empiricism should be taken as a thesis on the *foundations* of knowledge, whereas realism is a thesis on its limits, or *extension*. But the association of empiricism with anti-realism is now so widespread in the literature in the philosophy of science that scientific anti-realism is often called “empiricism”. Such misleading use of the term is common not only among the *anti-scientific* realists (e.g. van Fraassen’s “constructive *empiricism*”), but also among the scientific realists themselves (see e.g. BOYD, 1984). This is quite surprising, for if the “empiricists” are identified, in the debate, with the anti-realists, the scientific realists would be left in the uncomfortable position of being, perhaps, identified with the *rationalists* – the classical, and proper, opponents of the empiricists. But nowadays apparently nobody would feel comfortable in being classed as a “rationalist” in philosophy of science<sup>3</sup>.

I will not resume here my former analyses of these issues. My present goal is to explore, if only tentatively, some aspects of the work of one of the leading figures of classical empiricism, David Hume, in order to show that, contrary to his self-declared followers in contemporary philosophy of science – from the logical positivists to van Fraassen<sup>4</sup> – he did *not* see his positions on the issue of the foundations of knowledge (“empiricism”, in the proper sense of the word) as *automatically* ruling out any scientific theory purporting to describe what is behind the observable aspects of the world (i.e. the *phenomena*). My choice of Hume as an object of analysis has three motives. First, Hume is generally acknowledged as the most important empiricist philosopher of all times. Second and third, Hume not only acknowledged the unprecedented achievements of the new natural philosophers, but also sought to inaugurate a new approach to the study of human nature *explicitly* inspired by the methods and values of natural philosophy<sup>5</sup>.

It is generally acknowledged, both by Hume scholars and by philosophers of science, that Hume’s analysis of perceptions and knowledge of matters of fact pushes toward scepticism about any theory postulating unobservable entities. I do *not* deny this; on the contrary, I have elsewhere examined and fully acknowledged the existence of several serious difficulties in making room for scientific realism in a general Humean epistemological framework (CHIBENI, 2005). There is, first, the fact that Hume’s theory of ideas does not seem to allow the existence of *ideas* of unobservable entities. Ideas are, let us recall, the basic materials of any kind of knowledge, and should, according to Hume, be “copied” from preceding “impressions”. Thus, the very *talk* of such entities risks of becoming meaningless, by Hume’s influential criterion of meaning (see footnote 1, above), which associates the meaning of a word to the existence of an idea in the mind. Secondly, the inferential based on causal relations, essential, according to Hume, to justify belief in anything that has not been observed, is *a fortiori* inapplicable to the case of unobservable matters of fact, as Hume noticed in his discussion of realism about ordinary bodies (which, let us recall, are *also* unobservables, if construed metaphysically, as “substances”).

Furthermore, Hume himself issued explicit warnings against hypotheses going beyond what can, in principle, be observed. Perhaps the most conspicuous of these warnings is the passage in the *Abstract* in which Hume remarks, famously, that “the author of the *Treatise*” (i.e. Hume himself)

proposes to anatomize human nature in a regular manner, and promises to draw no conclusions but where he is authorized by experience. He talks with contempt of hypotheses; and insinuates, that such of our countrymen as have banished them from moral philosophy, have done a more signal service to the world, than *my Lord Bacon*, whom he considers as the father of experimental physicks. (*Abs.* 2; see also THN 1.4.6.23.).

Particularly interesting in this quotation is the parallel drawn by Hume between the “science of man”, or “science of human nature” – his grand project for the study of the mind –, and anatomy, which is (or was, at that time) a *phenomenological* branch of natural science. In the *Enquiry* we find a similar instance of the same point, this time involving a comparison with another phenomenological scientific discipline, geography:

And if we can go no farther than this mental geography, or delineation of the distinct parts and powers of the mind, it is at least a satisfaction to go so far; and the more obvious this science may appear (and it is by no means obvious) the more contemptible still must the ignorance of it be esteemed, in all pretenders to learning and philosophy. (EHU 1.13; see also EHU 4.4).

These passages *may* suggest that Hume’s intention was to restrict the enquiries and principles of the “science of man” to the phenomenological level, rejecting any conjecture about unobservable mental mechanisms and processes. But, as I will try to show in the sequel, Hume’s sceptical remarks on hypotheses, especially those involving unobservable entities, should be taken *cum grano salis*. It is arguable that the parallel of his own science of man with anatomy and geography is actually intended to indicate *the epistemic priority, not the exclusivity*, of the phenomenological level in the sciences generally, as compared with theoretical conjectures going beyond experience; the latter being important, however, when deeper explanations of the phenomena are sought for.

## 2. Unobservable entities in Hume’s “science of man”.

As a starting point, I will take a passage from the *Enquiry* coming just two paragraphs below the paragraph partly quoted above, in which Hume seems to be ready to consider seriously the possibility of an extension of the science of man beyond the observational level:

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?* Astronomers had long contented themselves with proving, from the phaenomena, the true motions, order, and magnitude of the heavenly bodies: Till a philosopher, at last, arose, who seems, from the happiest reasoning, to have also determined the laws and forces, by which the revolutions of the planets are governed and directed. The like has been performed with regard to other parts of nature. *And there is no reason to despair of equal success in our enquiries concerning the mental powers and oeconomy*, if prosecuted with equal capacity and caution. (EHU 1.15; my italics).

If taken at face value, these words suggest that Hume’s indictments on hypotheses should be construed as deliberate overstatements, intended to underline the epistemic priority of experience over theorizations on unobservables. Close attention to his epistemological works, and to what Hume has effectively done as a scientist of the human nature, indicates, indeed, that his stand toward hypotheses does *not* seem to be uniformly contemptuous. When Hume discusses several *specific* cases belonging to the scope of the natural sciences – his explicitly avowed methodological model – he seems to relax the strict constraints imposed by his theories of ideas and causal inferences, in order to make room for the successful explanatory hypotheses already devised by the scientists of the seventeenth and early eighteenth centuries. This topic will be examined in the next section. Furthermore, in constructing his own science of human nature Hume put forward a series of hypotheses on the functioning of the mind. Arguably, some, or perhaps all, of them postulate the existence of unobservable mental processes. Elsewhere, I have discussed some relevant cases of use of hypotheses in Hume’s science of man (CHIBENI, 2005, sect. 5). I concluded that hypotheses



going beyond the empirical level play essential roles in his epistemological theory. The most important cases in which *Hume himself* says he is framing, or endorsing, hypotheses are:

- i) The explanation of the function of general terms (THN 1.1.7.1 and 16);
- ii) The “system of the double existence” (THN 1.4.2.52);
- iii) The thesis that custom is the determinant of causal inferences (EHU 5.5);
- iv) The reason of animals (THN 1.3.16.2)<sup>6</sup>;
- v) An explanation of the nature of belief (THN 1.3.7.3);
- vi) Purported attempts to solve certain problems related personal identity (THN, Appendix, 21).

The analysis of these quite complex cases will not be resumed here. I wish now to focus on another, more peculiar set of passages in which Hume discusses the epistemological status of hypotheses *explicitly* involving unobservables. Let us consider, first, what Hume says in a seldom-noticed paragraph in the middle of his rather lengthy and technical discussion of the paradoxes involving space, time and infinity (THN 1.2.5.20). In order to explain certain “mistakes and sophisms” related to this issue, he is led to devise a series of hypotheses on the physiological correlates of the phenomenological principles of association of ideas. When first presenting the all-important principles of association of ideas, Hume compares them to “a gentle force” connecting our ideas, without which they would be “entirely loose and unconnected” (THN 1.1.4.1). He adds that although their “effects are every where conspicuous” (i.e. we can directly discover the phenomenological pattern according to which the principles operate, namely, resemblance, contiguity and causation), their causes “are mostly unknown, and must be resolv’d into *original* qualities of human nature, which I pretend not to explain” (THN 1.1.4.6). Notwithstanding these remarks, in the mentioned passage of part 2, book 1 of the *Treatise* Hume *does* frame hypotheses on the possible neurological, causal mechanisms of the principles of association:

When [in THN 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. ’Twould 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 rouze 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. [...] (THN 1.2.5.20).

It is, of course, arguable that this reference to the hypothetical material counterparts of the mental processes is merely metaphorical. But a more literal reading should not be ruled out without further examination. The hypotheses put forward by Hume in this paragraph – deriving from Descartes’ and Malebranche’s psychophysical theories – are explicitly considered by him as providing a “plausible” explanation for the phenomenological laws of the association of ideas. Furthermore, similar conjectures on unobservable entities and mechanisms in the nervous system can be found in several other passages of Hume’s works. One of them is intended to explain the phenomenological “maxim” according to which “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” (THN 1.3.8.2). Hume’s initial justification of this maxim (under which the important principle of habit is subsumed) is framed in terms



of the same set of hypotheses employed in the explanation of the association of ideas, namely, neurological hypotheses on the “elevation” of the animal spirits, their assuming “a new direction”, etc. (THN 1.3.8.2).

Notice, however, that in the following paragraph Hume acknowledges – consistently with his general epistemic hierarchy – that in order to “prove” the maxim he “place[s] [his] chief confidence in experience”. It follows, then, the enumeration of six “experiments” designed to support this maxim. Thus, we may perhaps conclude that, similarly to the principles of association of ideas, the maxim of the transfusion of vivacity from impressions to ideas has a “dual” character: mental-phenomenological and physical-ontological (the latter getting into the unobservable level).

A third passage in which Hume speculates about the brain’s minute “pipes or canals”, though which the animal spirits would flow, occurs two sections ahead, in THN 1.3.10.7 and 9, again in an effort to supplement and explain certain phenomenological laws which regulate the workings of the mind.

### 3. Unobservable entities in natural philosophy.

I will now consider some of the many passages in which Hume refers to unobservable entities and processes in the realm of natural philosophy<sup>8</sup>. Several of them involve the attempt – central in Hume’s philosophical project – to draw parallels between the methods of natural philosophy and those that should, according to him, be employed in the study of human nature. Let us begin resuming the already partly quoted paragraph 15 of *EHU* 1. In that paragraph, as we saw, Hume expresses his view that we can reasonably hope that the science of man may possibly go beyond the descriptive level of the “mental geography”, in order to “discover, at least in some degree, the secret springs and principles by which the human mind is actuated in its operations”. This remark is followed by an explicit reference to similar advances which, he thought, *had already been achieved* by the natural philosophers:

Astronomers had long contented themselves with proving, from the phaenomena, the true motions, order, and magnitude of the heavenly bodies: Till a philosopher, at last, arose, who seems, from the happiest reasoning, to have also determined the laws *and forces*, by which the revolutions of the planets are governed and directed. The like *has been performed* with regard to other parts of nature. (*EHU* 1.15; my italics).

The “philosopher” to whom Hume refers is, of course, Newton. Notice the explicit distinction between the phenomenological level (the motions of the celestial bodies) and the hypothetical level (the “forces by which the revolutions of the planets are governed”). Forces, let us recall, are unobservable, hypothetical entities par excellence (if interpreted realistically). But, in apparent contrast with this view, we may cite a passage of the *Treatise* in which Hume draws a sceptical, general philosophical lesson from the study of the principles of association of ideas:

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 would be much better employ’d in examining the effects than the causes of his principle. (THN 1.1.4.6).

This is one of the many passages explored by commentators who defend that Hume is entirely sceptical about any attempt to extend human knowledge beyond experience. But there is an alternative reading that favours my interpretive option. Indeed, Hume’s qualms about going beyond what the experiments directly show are *not* unqualified: “(…) *when he sees a farther examination would lead him into obscure and uncertain speculations*”. Notice that this important proviso is perfectly adequate to accommodate the case in natural philosophy that inspired Hume to write the above paragraph: Newton’s quest for the cause of gravitation.



As is well known, Newton believed that he had discovered the common cause of countless terrestrial and celestial phenomena, namely, the force of gravity. But, in the *Principia*, he warned that he would not frame hypotheses on the cause of the gravitational force<sup>9</sup>. This is generally acknowledged by Newton scholars as being only a cautious, “official” expression of his position, since he *did* hope to make further progress in the discovery of causes of gravitation. In fact, as we came to know from his correspondence, he actually toiled with some curious hypotheses, generally evoking invisible and imponderable fluids, to explain gravitation mechanically. Being, however, aware of their crudeness – seeing perhaps that they “would lead him into obscure and uncertain speculations” – he refrained to present them in his *magnum opus*.

Notice, now, that even if we stop scientific inquiry at the point indicated by Hume we shall have already gone beyond the merely phenomenological regularities, since forces are not observable, as I have already remarked. The parallel between Newton and Hume, according to the construal favoured in this paper, is, thus, complete<sup>10</sup>.

Several other passages also seem to disavow the present interpretation. I begin with one found in *THN* 1.2.5.26 and part of its footnote, added in the *Appendix* to the *Treatise*:

[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. (*THN* 1.2.5.26; my italics).

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. [...] If we carry our enquiry beyond the appearance of the objects to the senses, I am afraid, that *most* of our conclusions will be full of scepticism and uncertainty. [...] Nothing is more suitable to that [Newtonian] philosophy than a *modest scepticism to a certain degree*, and a fair confession of ignorance in subjects, that exceed human capacity. (*THN* 1.2.5.26, footnote, *Appendix*; my italics).

These statements are repeated in almost the same words in *THN* 2.3.1.3-4 and in the *Abstract* 32. Similar remarks are made by Philo, Hume’s fictional spokesman in the *Dialogues concerning Natural Religion*, on the principles of reason, instinct, generation and vegetation<sup>11</sup>. Returning now to the *Enquiry*, in the paragraph immediately before the one of the last quoted passage, we read:

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. (*EHU* 4.16).

Thus, according to Hume, the causes of nutrition and inertia would be unknown, and perhaps also unknowable to us. I submit that the sceptical remarks in all the above passages concern the *particular* cases Hume is discussing, since, as we have also seen, in *other* cases he adopts a positive stance toward unobservables. Thus, he seems, quite sensibly, to have adopted a case-by-case strategy for examining the epistemic credentials of the many scientific hypotheses of the natural sciences of his time. Such strategy is, of course, the one adopted by any sensible scientific realist, since scientific realism does not imply that



all hypotheses and theories of science are equally qualified for being true. It is interesting now to test this interpretive proposal against what Hume writes in EHU 4.12:

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. (EHU 4.12; my italics).

At first sight, this passage seems to insist on the same sceptical themes as those of EHU 4.16. However, what Hume says here deserves closer scrutiny. The principles productive of natural phenomena to which Hume refers are, obviously, their inner, unobservable causal mechanisms. As Hume remarks in the Introduction to the *Treatise*, one of the typical methodological principles of science is precisely the continued attempt to “reduce” principles of a lower level of generality to more general principles. In the passage we are now considering, Hume apparently introduces an epistemological cut just after the *first* step in this process of reduction. But there seems to be no *principled* reason for placing the cut at this point, since in many of the cases allowed as legitimate by Hume, here and elsewhere, the first explanatory step *is already a step into the unobservable* (gravitational and elastic forces, inertia, etc.). It is tempting, therefore, to take Hume’s cut as a *contingent* one, determined by the actual development of science of his time. The fact that Newton and the vast majority of natural scientists did not at all let their research to be curtailed by philosophical qualms about unobservables lends further plausibility to this view.

In connection with this point, it is worth examining other passages in Hume’s writings in which he does not seem to be embarrassed by sceptical restraints. Very little noticed by commentators, but relevant to the present analysis, is, for instance, a set of paragraphs in the *Dialogues concerning Natural Religion* (D 136-137), where Cleanthes (the moderator) defends a robust realist construal of the “minute anatomy of the rays of light” made by Newton in the corpuscularian theory put forward in the *Opticks*, as well as of the Copernican astronomical system, which also involves unobservable items, such as epicycles, the absolute motion of the Earth, etc. In face of this defence, Hume’s spokesman, Philo, remains completely silent. This atypical reaction may suggest that he had no objections to Cleanthes realist position.

But perhaps the most striking passages upholding the interpretive possibility I am proposing in this paper are those in which Hume endeavours to defend the thesis – central in his philosophy as a whole – that “chance is nothing real in itself” (THN 1.3.11.4), or that “there [is] no such thing as Chance in the world” (E 6.1)<sup>12</sup>. His argument takes as a starting point the fact that, in his time, natural philosophy had *already* exhibited considerable success in discovering “secret causes” in the operation of bodies. The search for such causes was motivated precisely by the desire to explain why apparently random events happen. Rhubarb, for instance, does not always purge, nor opium make sleep (EHU 6.4). But once sufficiently deep, generally unobservable, causes are discovered and taken into account, complete regularity is recovered. This view is expressed in a passage of the *Treatise* (1.3.12.5), reproduced *ipsis litteris* 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



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an exact scrutiny, a contrariety of effects always betrays a contrariety of causes, and proceeds from their mutual hindrance and opposition. (THN 1.3.12.5; EHU 8.13; my italics).

Thus, the “operation of secret causes” is at first judged *possible* by the scientists. Then, through “farther observation” this possibility is “converted into certainty”. What could these additional observations be? The reality of “secret” causes cannot, on pain of inconsistency, be established by direct experience, since by ‘secret’ Hume means ‘unobservable’. Thus, some *inferential* process would necessarily be involved here. But what kind of inference would this be? Since logical and inductive inferences are of no avail in this case, the only remaining possibility seems to be *abductive inferences*<sup>13</sup>. 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, and in particular, in the defence of his own hypotheses involving unobservables, constitutes a topic of its own, which will not be pursued here<sup>14</sup>.

#### 4. Concluding remarks.

In one of his many cunning comments on the epistemological status of his own theories of the microscopic structure of bodies, Descartes said that “we greatly wrong human reason [ ... ] if we suppose that it does not go beyond the eye-sight”<sup>15</sup>. Centuries before this issue became known by its present name, Descartes was, in this passage and in several other of *The Principles of Philosophy*, effectively discussing scientific realism. He was, of course, particularly well equipped to enter (in fact, to inaugurate) the debate, being one of the founding fathers of both modern epistemology and modern science. Nowadays, the rich historical roots of the issue are generally neglected in the specialized literature in the philosophy of science. Having examined Descartes’ arguments pro and con scientific realism elsewhere (CHIBENI, 1993), in the present paper I tried to shed additional light on the debate by analysing the position of another important philosopher of the modern period, David Hume.

Being one of the classic references in empiricist epistemology, Hume’s work is particularly worth reviewing, since contemporary authors often assume, without much historical or philosophical discussion, that scientific realism is incompatible with empiricism. My main goal here has been to call this assumption into question, not by a purely analytical approach (which I believe is also necessary and fruitful), but by a direct examination of Hume’s own position about a series of particular cases in which the natural philosophers of his time posited unobservable entities and processes, in an effort to explain phenomena of the natural world. I have also considered a number of Hume’s own hypotheses involving unobservables, introduced in his “science of man” with similar explanatory purposes. I do not intend, of course, that this interpretive exercise would constitute, if taken in isolation of other arguments, a sufficient basis for defending scientific realism. But I do believe that it should at least give us pause to consider more critically the usual assumption that empiricism would, *per se*, be an impassable barrier to any hope of human mind to transcend the narrow limits of sense perception.

As I remarked in the Introduction, and as we saw throughout the text, Hume was fully aware that empiricism represented, indeed, a serious challenge to scientific realism. But to the extent that there seems to be no viable option for empiricism, as a doctrine on the foundations of scientific knowledge, anyone wishing to avoid Descartes’ indictment (i.e. to restrict knowledge to the narrow limits of the senses) must face that challenge. Many, if not most, of the leading figures of modern science and epistemology have effectively worked on this front. Descartes, Locke, Berkeley and Hume, for example, have all contributed to the debate<sup>16</sup>. In Hume’s works, there isn’t – as in the other three cases – an explicit, separate discussion of the topic. Notwithstanding, as we have seen, he stumbled into the problem in many specific instances,



both in natural philosophy and in the “science of man”. And, when he did, he did *not* refrain to consider seriously any hypothesis about unobservables. Like any good natural philosopher, he did take them as *bona fide candidates* for expressing knowledge. This conclusion goes against two traditional interpretive positions, according to which Hume was a complete sceptic with respect to anything transcending sense experience; and that, in any event, a robust adhesion to any empiricist epistemology would render scientific realism wholly untenable.

We could perhaps close this article in Humean-style, saying that Hume’s texts on the issue of the epistemological status of unobservable entities exhibit an oscillation – typical in his analyses of several other subjects – between a sceptical stance, informed by a strictly empiricist epistemological analysis, and a more positive stance, informed by the theoretical achievements of the natural sciences, which were already rather impressive in Hume’s time. Here we have, therefore, another nice instance of what Hume aptly, and famously, called “mitigated scepticism” (EHU 12.24)<sup>17</sup>.

## NOTES

1. The usual reference to Hume’s theory of meaning is the last paragraph of section 2 of the *Enquiry concerning Human Understanding*. In this paper I will adopt the usual convention to refer to Hume’s books, that is: ‘THN x.y.z.t’ stands for the *Treatise of Human Nature*, book x, part y, chapter z, paragraph t, as numbered in the standard OUP edition by Norton & Norton; ‘EHU p.q’ stands for the *Enquiry concerning Human Understanding*, section p, paragraph q, as numbered in the standard OUP edition by Tom Beauchamp; and ‘Abs. r’ denotes the *Abstract* to the *Treatise*, paragraph r, again, in the Norton & Norton edition. References to the *Dialogues* will be given by page numbers of Kemp Smith’s classic edition.

2. For a sample of the many works in the literature devoted to the analysis and criticism of van Fraassen’s positions, see CHURCHLAND; HOOKER, 1985, and LEPLIN, 1984. The former collection contains a substantial reply by van Fraassen. Among the more recent books containing original defences of scientific realism, as against van Fraassen’s constructive empiricism, are, for instance, LEPLIN, 1997, PSILLOS, 1999 and LIPTON, 2004.

3. The titles of a paper and of another book by van Fraassen (“Empiricism in the philosophy of science”, 1985, and *The Empirical Stance*, 2002) are apt to lead us to think that, in these works, he would offer an extensive analysis *and justification* of his deliberate conflation of “empiricism” with anti-scientific realism (of the sort, at least, that he favours). But, unfortunately, he does not.

4. In this respect it is worth remarking that in the 1929 Vienna Circle manifesto Hume is explicitly included in the list of “precursors” of the logical positivist.

5. Besides many well-known laudatory references to natural philosophy throughout his works, let us just recall that this point is indicated already in the subtitle of his main book: “*A Treatise of Human Nature. Being an attempt to introduce the experimental method of reasoning into the moral subjects*”.

6. On this case, see CHIBENI, 2014.

7. In the seventeenth and eighteenth centuries, let us recall, animal spirits were widely held to be the material components of certain subtle, invisible fluids performing a series of important physiological functions in human and animal bodies.

8. For a more general discussion of Hume’s stance toward natural philosophy, see CHIBENI, 2003.

9. Newton, *Mathematical Principles of Natural Philosophy*, General Scholium, p. 457. For a discussion of Newton’s position on the role of hypothesis in natural philosophy, see CHIBENI, 2013.



10. The influence of Newton on Hume is a topic of perennial debate amongst Hume scholars. For a robust defence of the existence of methodological and philosophical parallels between Newton and Hume, see CAPALDI, 1975; for the contrary position, see JONES, 1982. Angela Coventry (2005) adopts a middle-term position; her paper contains several updated references to the interpretive debate. Notice that in principle these parallels could be sought in a direction completely different from that which I am taking here, if one assumes that both Newton and Hume adopted a purely phenomenological, or “inductivist” approach to science. I believe that this view is no longer tenable, although it has seduced several historians of science and of philosophy in the past. It results mainly from a de-contextualised reading of Newton’s famous declaration that he “frame[d] no hypotheses” (*Principia*, General Scholium, p. 547), and from Hume’s similar declaration in the *Abstract*, as quoted in the Introduction of this paper. For a relatively recent defence of the interpretation of Hume as a phenomenalist, and therefore, a scientific anti-realist, see ROSENBERG, 1993.

11. Referring to these principles, Philo – Hume’s spokesman – 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).

12. For a detailed analysis of Hume’s stance on this issue, see CHIBENI, 2012.

13. Although effectively present in philosophical argumentation from time immemorial, this kind of inference was brought to the front of philosophical analysis only by Charles S. Peirce (see PEIRCE, 1934-1935). Later, Gilbert Harman (1965, 1968) proposed to call these inferences simply “inferences to the best explanation”. This suggestion became widely accepted in the literature on the philosophy of science.

14. I have elsewhere (CHIBENI, 2005) examined, and suggested tentative solutions to the difficulties involving the attempt to legitimise abductive inferences in the framework of Hume’s epistemological theory. The main problem is the fact that this kind of inference depend crucially on the notion of explanation, which in its turn is classically conceived as involving the notion of cause; but in the present case there is, as pointed out in the text, a fundamental problem in establishing causal relations between putative unobservable entities and phenomena.

15. *Les Principes de la Philosophie*, Book IV, paragraph 201.

16. For an examination of Locke’s and Berkeley’s positions on the epistemological status science, see CHIBENI, 2005 and 2010.

17. I wish to thank Claudiney Jose de Sousa for several useful comments on a previous draft of this text.

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