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Sommaire

At the same time as a purported renewal of metaphysics is taking place in analytical philosophy, criticism of metaphysics has also increased. Criticism of metaphysics is usually made by naturalistic metaphysicians and is aimed at non-naturalistic metaphysics. Without endorsing any of the above schools, in this essay I undertake, not a criticism of metaphysics, but a criticism of the current criticism of metaphysics. I therefore review some of the most important issues at stake in this criticism, which merely recycles centuries-old criticism of metaphysics in general: the alleged sterility and futility of metaphysics, its vagueness, the propensity for fantasy, the lack of imagination and foresight, its alleged dependence on intuition and, above all, its independence from experience. I conclude that all these criticisms supply an inaccurate image of metaphysics and a concomitant inaccurate image of science rooted in a refusal to recognize that a strict separation between a priori and a posteriori cannot be achieved.

Key words: metaphysics, criticism, intuition, assumptions, experience

1 – Introduction

The positivist legacy still looms large in philosophy of science and 'metaphysics' remains a discredited word, most often used with reluctance. This essay aims at revising what I see as the unjustified criticism of metaphysics that is now being recycled by naturalistic metaphysicians against non-naturalistic metaphysicians. In fact, most of the criticism directed at 'analytical' non-naturalistic metaphysics is centuries-old criticism that has been directed at metaphysics in general. I begin with the minor charges and then move on to the major charge: the independence of experience, from which the minor charges actually derive.

I do not intend, in any way, to undertake a defence of 'analytic' non-naturalistic metaphysics. I am much more interested in a metaphysics that clearly states its relationship with science, though I disagree with the way many naturalistic metaphysicians conceive that relationship. I believe that metaphysics, as its name suggests, is defined by its close relationship with physics, with science. I thus suspect that even 'analytical' non-naturalistic metaphysics does maintain a link with science, since both are interested in the nature of reality.

2 – Sterility, Futility

One of the oldest accusations against metaphysics is that it is a sterile, futile or empty practice. Nowadays naturalistic metaphysicians recycle this accusation by stating that if the content of metaphysical theories does not come from science, they are doomed to sterility and emptiness. For instance, Craig Callender writes that

> (...) many metaphysicians have adopted an approach to the field that makes it more or less autonomous from science. Not only is this a shame, given the current context within science, but it is also a bad idea, for it occasionally results in debates in metaphysics becoming sterile or even empty. (Callender 2011, p. 34).

There are two main reasons behind this old accusation: firstly, left alone, metaphysics supposedly devotes its time to irrelevant issues, as suggested by Callender's quote; secondly, in a metaphysical debate, there are no winners or losers. Nothing is decided once and for all, while in science, and due to its empirical experiments, the opposite supposedly happens. As early as 1955, in his book *The Structure of Metaphysics*, Morris Lazerowitz pointed out the chronic lack of precise conclusions in metaphysical debates. And though Lazerowitz recognized the power of metaphysics as an intellectual phe-

REVUE
DE LA SOCIÉTÉ
DE PHILOSOPHIE
DES SCIENCES

nomenon, he found it misleading and even mysterious: nobody seems to know very well what metaphysics is. We only know that it is not what it seems: it seems deep and wide, but its results are fragile and debatable. Lazerowitz recognized, however, something far more important: that there is a bond between 'solid' science and sterile metaphysics. Strangely enough, 'solid' science stands on bold and shaky metaphysical assumptions, such as that nature is uniform:

> Metaphysics presents us with an intellectual phenomenon that is both remarkable and mystifying. It is without doubt one of the highest of man's cultural achievements, combining both grandeur of conception and subtlety of thought. But what it is, its nature, remains unknown to us. It looks to be the deepest of the sciences, in which the attempt is made to arrive at an understanding of the ultimate constitution of the world, its basic material and structure, and of the nature and limits of our knowledge. Further, metaphysics has a scope, by comparison with which the ordinary sciences, with their laboratory techniques, appear to comprehend only the surface mechanics of the material universe, while, moreover, resting on tremendous assumptions that are the proper province of metaphysics, e.g., that nature is uniform. But although metaphysics looks like science, it differs from science in an important aspect. (...) No one, except a person who must for some reason blind himself to the facts, can fail to contrast the special sciences, with their imposing edifices of solid results, and metaphysics, with its chronic condition of endless and unresolved debates. (Lazerowitz 1955, p. 23)

Even though, according to Lazerowitz, metaphysics 'looks like a science', and this was what Rudolf Carnap most disliked about it (1932), we have to agree that with metaphysics alone, airplanes cannot be built and livers cannot be healed. It is science, with its 'laboratory techniques', that is able to do these things. However, as Lazerowitz stresses, science's 'solid' results are not possible without metaphysics, without 'tremendous' metaphysical assumptions.

I wish to emphasise this point: no special science can be performed without metaphysical assumptions. And, since science rests on metaphysical assumptions, it is an illusion to suppose that it can then operate as if it was independent from them. Even though I concede that scientific activity exhibits a considerable degree of autonomy, it does not exhibit a total independence from metaphysics. It is metaphysical assumptions that outline the range of ontological possibilities and enable the formulation of scientific hypotheses that can be empirically tested. Moreover, what is considered as reliable by empirical evidence and the very nature of that evidence, as well as the questions and answers that science deems acceptable, depends on metaphysical assumptions. Science's empirical content cannot simply be separated from its theoretical and metaphysical content.

There are therefore two opposing positions on how metaphysics should face the findings of science. Naturalists believe that there is a risk for metaphysics if it does not take into account the 'results of science'. Metaphysical success can only be achieved by sheepishly following the success of science. Metaphysicians have no authority to tell scientists that they are mistaken. The other position is that scientific theories rest on metaphysical assumptions and metaphysicians thus have the right not only to criticize those assumptions but to think beyond science.

That scientific theories rest on metaphysical assumptions is also acknowledged by some naturalistic metaphysicians, such as Anjan Chakravartty and Craig Callender. Callender even describes the presence of metaphysics in science as being from top to bottom: 'Indeed, I think that what we conventionally call science in ordinary affairs is inextricably infused with metaphysics from top (theory) to bottom (experiment).'(Callender 2011, p. 48).

I fully agree with Callender's statement. And I also agree with the naturalists on the importance for metaphysics of not exhibiting an indifferent attitude towards the findings of science. It seems a good strategy to start theorizing after being well informed about the available knowledge of our time. But this does not mean a total submission to that knowledge. Metaphysicians have the right not only to criticize the metaphysical assumptions of science but also to think beyond science.

Contrary to the neo-kantians who are quite rightly classified as 'false friends' of metaphysics by E. J. Lowe (1998), I believe that metaphysics cannot be reduced to the merely descriptive task of reproducing the so-called 'results of science', and for at least three reasons. Firstly, *stricto sensu*, 'the results of science' do not exist. The 'results of science' are never 'neutral' but always subject to interpretation. They are therefore rarely consensual. Secondly, because scientific knowledge is based on assumptions that are metaphysical, and that therefore go beyond what science itself can legitimize. And thirdly, because scientific knowledge is subject to error and revision and philosophies that take science as a source of certainty are obsolete.

Science as a territory of certainty is seen today as a naive belief. The ideal of science as a finished, necessary, true, system has been revised and fallen out of favour. It has been replaced by the idea that there is no scientific access to certain knowledge, not only because knowledge is acquired by making mistakes, but also because of the very nature of the world: probabilism seems to reign over necessity, and it is therefore difficult to get accurate measurements and clear distinctions.

REVUE
DE LA SOCIÉTÉ
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DES SCIENCES

3 – Vagueness

Another old charge against metaphysics is that it is too 'vague'. For instance, Rudolf Carnap wrote: 'this word [metaphysics], through its historical past, contains for many a suggestion of the vague and speculative' (1928, p. 295). And Paul Weiss described in this way the prevailing image of metaphysics of his time, largely influenced by logical positivism: 'It is common today to say that metaphysical assertions are at best poetic and at worst nonsensical, and surely vague and unverifiable' (1970, p. 12). That metaphysics is impossibly vague is also a reiterated accusation to be found in the texts written nowadays by naturalistic metaphysicians.

In his entry for 'vague' written for the 1902 *Dictionary of Philosophy and Psychology*, C. S Peirce defined the term as follows: 'A proposition is vague when there are possible states of things concerning which it is intrinsically uncertain whether, had they been contemplated by the speaker, he would have regarded them as excluded or allowed by the proposition.' (Peirce 1902, p. 748). According to this technical sense, X is vague if there are cases in which we cannot determine whether some particular y is X or not. These are called borderline cases. For instance, when does a seed start being a tree? When does a person start being old, or tall, or bald? When does temperature start being warm? Because no sharp lines can be drawn, the problem with sentences where borderline cases occur is that they resist the attempt to settle whether they are true or false. There is no way, empirical or conceptual, to settle if y is X or not.

There is a lively debate on whether vagueness is linguistic or metaphysical. In his 1923 article 'Vagueness', Bertrand Russell acknowledged, like many others, that vagueness pervades all language; language is intrinsically vague. Even our scientific vocabulary is vague. However, Russell suggested that we cannot conclude that the world is vague from the fact that the language we use to describe the world is vague. Vagueness is linguistic, a mere feature of our language, not of the world. Others (J. R. G. Williams, E. Barnes) maintain that vagueness is metaphysical, that it is an objective feature of reality: some objects of the world have vague properties; or, more radically, there are vague objects in the world (maps, some music, mental imagery all seem to be vague). In the event that we are scientific realists, i.e., if we support the view that there are good reasons to believe that our best scientific theories are, at least, approximately true, and if those theories require the use of vague terms (for instance, 'species') to refer certain objects or properties, then we are allowed to posit the actual existence of such vague objects or properties.

Many words used extensively by metaphysicians are indeed vague. In his *Überwindung*..., (1932) Rudolf Carnap remarked that no truth conditions can be given to terms found in the alleged metaphysical propositions, such as 'the absolute', 'nothing', 'being', 'spirit', 'freedom', 'awareness', 'life', 'manifestation, 'non-being', 'thing in itself', etc. The same applies to concepts such as 'entelechy' or 'vital force' which can be found in texts written by the vitalist biologists. Since there are no laws subject to empirical testing occurring in these terms, Carnap concluded they were devoid of meaning. But Carnap's conclusion can hardly be sustained, as W. O. Quine showed in his 'Two Dogmas of Empiricism' (1951) and Karl Popper in his 'The Demarcation Between Science and Metaphysics' (1955), later a chapter of *Conjectures and Refutations* (1963), and I shall not dwell longer on this topic here.

In texts criticizing metaphysics, the term 'vague' may also mean abnormally general. In the 'Conclusion' of his book *L'activité rationaliste de la physique contemporaine*, French philosopher Gaston Bachelard states that traditional philosophy and metaphysics are presumptuous due to the fact that they dispense with experimental activity and endorse generalities. Metaphysicians dare to speak of things they do not understand. With no recourse to experience, they deliver absolute formulas about the Whole. Bachelard picks up some isolated sentences as examples: "the universe is a unified whole', 'everything is in everything', 'nothing comes out of nothing,' etc. The metaphysicians' idea of 'Whole', says Bachelard, differs from the scientists' idea of 'all', which is limited to a list of objects from a collection: 'all atoms', 'all cells', etc. Instead of endorsing the scientific idea of 'all', metaphysicians endorse the vague, indefinite and obscure idea of a 'whole' (Bachelard 1951).

However, I believe 'vagueness' should not always be envisaged as a pejorative term or as an inferior quality, and indeed there are good reasons to believe in 'metaphysical vagueness'. Even though, as we have seen, scientific language cannot escape vagueness, let's concede that metaphysical vocabulary and theories are vaguer than scientific ones. The special sciences are sciences of the particular, and thus have a much more precise nature than metaphysics. The 'vague' nature of metaphysical theories stems largely from their degree of universality and abstraction. Since they are less rich in content than scientific theories, their degree of generality is very high, and their vocabulary is often vague, metaphysical theories cannot be directly falsified (we will see later that they may be indirectly falsified).

What should be taken into account is that the work of the special sciences rests on vague and general metaphysical hypotheses about the nature of the world. These hypotheses guide scientific research in its effort to become more elaborate, precise and systematic. When science becomes the main character of the plot, its observational and experimental work transforms those vague hypotheses into ideas that are much more accurate, localized and rich in detail. The findings of science are elaborations, specifications, developments of those very general, vague hypotheses; they are the heir of the

original conception, albeit highly enriched by the whole process.

The idea of the world as 'a whole' to which objects belong, 'though vague' or impossibly general, is essential for the recognition and interpretation of those objects. It is this idea of a global whole that allows the perception of the world not as a collection of discontinuities, of independent objects, but as a unity whose parts interact with one another. Hence it follows that the importance of vagueness is far from negligible. Without those vague metaphysical ideas observation could not even take place. They lie behind science's layers of precision, accuracy and exact measurement. Scientific activity departs from a metaphysical scheme that decides the observations and their interpretation within a research field; and it is a systematic development of that scheme. The sciences thus define the problems and refine the methods suggested by metaphysics.

4 – Fantasy

Metaphysical theories have often been confused with fantasies and fictions. Even the prolific Argentinean philosopher Mario Bunge concurs in this imprecision. While recognizing that atomistic physics descends from atomistic metaphysics, the latter was, in its inception, a great 'fantasy':

> Ancient atomistics was, moreover, the first thoroughly naturalistic ontology. However, it was also a grand fantasy, since its upholders, who claimed to explain everything, did not account in detail for anything in particular. The transmutation of atomistics from a metaphysics into atomic physics took two millennia. (Bunge 2006, p. 156)

But then, if Bunge is right, it would follow that fantasies can eventually become part of physics, no matter how many centuries we have to wait for such a miracle. Bunge readily acknowledges that science also creates fictions (let me add that non-realistic philosophers even tend to look at scientific theories as great fictions) where they play an important heuristic role. But even though, apparently, wild fantasies are more likely to pop up in metaphysical territory, Bunge recognizes that once in a while quite bizarre fictions with no apparent usefulness also arise in science:

> Amazingly, one of the wildest fantasies about parallel worlds is the brain-child of a physicist, Hugh Everet III (1957), and his thesis adviser John A. Wheeler. This is the many-worlds interpretation of quantum mechanics. According to it, every calculated possibility is realized in some physical world. (Bunge 2006, p. 210)

But, according to Bunge, in speculative metaphysics, fiction is not part of the heuristics; it is rather a constitutive feature of the discipline itself. Speculative metaphysics, therefore, consists in the construction of idle fictions. Fiction is an end in itself, not a mere detour designed to achieve knowledge of reality.

At the root of Bunge's confusion between metaphysics and fantasy is what he understands by the term 'fantasy': explanations whose degree of generality is so high that they do not refer in detail to anything particular and lack empirical import and testability. We cannot find out whether they are true or, at least, false.

However, the content of fantasies and fictions can be very detailed and particular. The *Lord of the Rings* by JRR Tolkien is very detailed and particular. By contrast, as we have seen, the degree of generality of metaphysical claims is in fact very high. As Kit Fine says, in metaphysics we do not talk about dogs and cats or electrons and protons but of material particulars; we do not talk of thunder and lightning or wars and battles but of events (2012, p. 16). But just because they do not apply specifically to anything in particular, general statements cannot be deemed to be fantasy; generality only means that they apply to a very large number of individuals.

Similarly to scientists, metaphysicians and philosophers do occasionally create fictions as thought experiments, as detours serving the investigation of reality. And these do have a heuristic role (for instance, Descartes' evil genius). But metaphysics is an investigation of the nature of reality, and is far from the realm of fantasy and fiction. We know that fantasies and fictions are not true, in the sense that they do not exist or take place in the space-time we inhabit (though they take place in a fictional space-time). They are not true and do not claim to be. We can therefore state their truth value. On the contrary, and even though metaphysics purports to be true, we cannot state the truth value of its claims.

But does this entail idleness or uselessness? As we have seen in the previous section, the answer is no. Let me recall here that Richard Feynman chose the 'ancient atomistic' hypothesis as the perfect legacy for future generations:

> If, in some cataclysm, all of scientific knowledge were to be destroyed, and only one sentence passed on to the next generations of creatures, what statement would contain the most information in the fewest words? I believe it is the atomic hypothesis (or the atomic fact, or whatever you wish to call it) that all things are made of atoms - little particles that move around in perpetual motion, attracting each other when they are a little distance apart, but repelling upon being squeezed into one another. In that one sentence, you will see, there is an enormous amount of information about the world, if just a little imagination and thinking are applied... (1963, p. 4)

Indeed, with imagination and reflection, a huge amount of information about the world can be extracted from the 'atomic hypothesis', even though, at its inception, it exhibited a high degree of generality, was 'vague' and lacking in detail, and had no empirical import. This hypothesis proposed that all things in the world are made up of atoms. But apart from stating the mere existence of atoms, something was said about their motion: that it is perpetual; and that atoms attract each other when they are a little distance apart, but repel each other upon being squeezed into one another. Now, starting from this brief description of their motion, we can foresee, for example, that atoms can be joined together to form large structures without collapsing at the same point.

Moreover, and contrary to what Bunge says, the transmutation of atomistics from a metaphysics into atomic physics did not actually take two millennia. Even though it was born in ancient Greece with Leucippus, Democritus and Epicurus, atomism was a doctrine *maudite* throughout most of its history. It was only widely accepted from the 17th century, albeit reluctantly. Seventeenth-century natural philosophers craved a mathematical description of all phenomena based on an atomistic or corpuscular theory of matter. Although this would be achieved only by the end of the 19th century, the new programme soon started paying off: it was philosophically inspiring, offering a radically new approach of the understanding of nature. It conveyed a cohesive conception of the world, could replace Aristotelian physics and metaphysics, had enormous explanatory power and held the promise of endless discoveries.

Hence, Feynman's trust in the 'atomic hypothesis' stemmed from the fact that it inspired a research programme of formidable reach. He expressed the hope that the same successful research programme could be repeated by the cataclysm survivors.

In fact, if metaphysical theories are not analyzed by isolating their propositions, and if their unobservable entities and processes are not surgically excised as naturalistic metaphysicians do, they typically exhibit an indirect relevance to empirical findings. To understand their richness, metaphysical theories should be taken in their entirety.

In 'Metaphysics and Science' (1959), C. H. Whiteley gave two examples, among others, to show the difference between evaluating metaphysical entities and propositions in isolation and understanding them in their context: Spinoza and Plato. For Spinoza, there was only one substance in the universe, mind and matter being its separate attributes. Given this isolated statement, notes Whiteley, it seems that we cannot really go very far. However, if taken in the context of Spinoza's complete theory, we can formulate the hypothesis that there is a set of laws statable in terms of physical concepts by which every physical event can be fully explained; that there is a set of laws statable in terms of mental concepts by which every mental event can be fully explained; and that there is a corresponding mental event and a corresponding mental law to every physical event and to every physical law.

For Plato, a horse was a horse because it participated in the Form 'horse' that existed independently of all horses. Taken this way, no observation can confirm or refute this claim and, therefore, at first glance, it seems totally irrelevant. But if we place it within the whole of Plato's thought, we can draw from it a rule regarding the correct method for the investigation of nature: things should be classified according to their types. So, since each individual is but an imperfect instance of a type, we must start by understanding the types, ignoring the individual incidents and anomalies.

5 – Lack of Imagination

Curiously enough, metaphysics is accused, at the same time, of lacking imagination. The 'imagination' of metaphysicians has fallen far short of the complexity of scientific theories and the natural world revealed by science. Metaphysicians lose in the imagination contest. For instance, Lawrence Sklar underlines the lack of imagination of philosophers who dare to think independently of 'the results of physics'. Science ultimately proves they are mistaken, putting them in an awkward position:

> Time and time again philosophy that tries to reason a priori, without reliance on the data of observation and experiment, and to come to conclusions about how the world must be has seen itself embarrassed by the revelations of science. This has shown us that the aprioristic philosophers have been quite limited in their imaginations when they attempted to delimit the realm of possibilities for the nature of the world. Without the results of physics, what philosopher would have considered the wide variety of possibilities for the nature of space and time, of causation, and of the kinds of objectivity and its lack that the radical new theories of physics have posed as possibilities for our consideration? (Sklar 1992, p. 230)

Now, metaphysicians are damned if they do and damned if they don't: on the one hand, they are criticized for being too imaginative, for creating worlds of fantasy which are very different from the world described by 'the science of the day'; on the other hand, they are criticized for being unable to match the imaginative worlds described by scientists: the quantum realm, black holes, superstrings, multi-dimensionality...

But is this so? If imagination, creativity and weirdness are the only issues in play here, then Leibniz's universe of monads or the universe of Hegel or Plato can surely compete with the quantum world. In addition, let us not forget that imaginative

REVUE
DE LA SOCIÉTÉ
DE PHILOSOPHIE
DES SCIENCES

scientific theories typically entail metaphysical parts.

The case of quantum physics is, perhaps, the best example to show how science provides the most creative and amazing ideas or that science discovers worlds whose uniqueness goes beyond all that metaphysicians can imagine. And 'quantum leaps' are one of the most striking and 'imaginative' features of quantum mechanics. According to Maxwell's electromagnetic theory, any charged particle moving in a curved trajectory has to radiate electromagnetic energy. Such particles will therefore end up losing energy and fall spiralling in the direction of a core. But Rutherford's model of the atom had brought to light a particularly intriguing problem: the electrons revolved around the nucleus indefinitely without emitting radiation. To solve the problem, Bohr proposed the quantization of atomic electrons: electrons can occupy certain fixed orbits of energy without emitting radiation, i.e., without energy loss. They leap from a 'privileged' orbit to another without having the possibility of ever being in the space between those orbits, i.e., without passing through a continuous series of intermediate states. But, one may ask, where are the electrons between one orbit and the other? Strictly speaking, the answer is: nowhere. The electron leaps from one orbit to another, but in this interval there is no motion, which implies a discontinuous variation in the atoms of time. When leaping, i.e., when passing from a stationary state to another, the electrons emit or absorb electromagnetic energy in discrete quantities, the photons, and the state of the electron is only subject to considerations of possibility. It is as if the electron in a stationary state could 'choose' between several possibilities of transition to other stationary states. Bohr emphasized that this was a game of chance.

Bohr's electron leaps aroused much criticism. Louis de Broglie, for example, remarked that it was a bizarre alliance of concepts and formulas from classical dynamics with quantum methods. The electron is seen at first as a material point of classical mechanics that clearly describes its orbit under the influence of the Coulomb force. But then quantifying conditions are abruptly introduced leading to electron leaps that cannot be described by classical concepts, when these were the starting point. Erwin Schrödinger also thought it was absurd that no explanation was provided for the lack of electron radiation in the stationary state; but then there was radiation when it leaped from one orbit to another. 'If one has to stick to these damned quantum jumping, then I regret ever having been involved in this thing!', declared Schrödinger in 1926 when Bohr tried to persuade him to support his idea (Jammer 1974, p. 324). However, the correctness or not of Bohr's proposal does not concern me here. What matters is the feeling of strangeness that it caused since it contradicted the maxim that, among other philosophers, Leibniz followed: *natura non facit saltus*, 'nature does not make leaps'.

But was Bohr's proposal as unique as it seems at first sight? Is it appropriate to say that philosophers cannot compete in 'imagination' with physicists? In fact, an equally strange theory was advanced more than twenty centuries ago by the philosopher Epicurus. For Epicurus, movement, quantity and time are discontinuous. Movement is performed in jerks covering the total number of space units in a total number of time units. According to Simplicius, Epicurus stated that one cannot say that an atom is moving in a minimum interval, but only that it has already been moving (Konstan 1989). Atoms can never 'be in motion', but 'have always been in motion'. A body moving along a line moves along the whole line without moving over the indivisible parts in which that line consists; rather it has always already moved. This implies that something may have already gone over a distance without ever going over it or may have completed a walk without having previously walked. Epicurus assumed that the time it takes for an atom to travel a minimum distance, i.e., a minimum length, is the minimum temporal length. As the atom is the minimal discrete body and consists of minimal parts, time is also divisible and consists of minimum continuous periods consisting of indivisible temporal units, time distinguishable only in thought (Epicurus, 062). Being indivisible, a temporal extension is not such that a movement can take place in it. 'Has been moving' and not 'is moving' is therefore the relationship that a moving body has with the unit-parts in which space and time consist. As Aristotle saw, this theory entails that movement is made by jerks (*Physica*, VI, 231b25-232a17). The atom has to jump from one set of spatial units to another, given that there is neither space nor time in which its progression between one unit and the other can occur.

Placed side by side, Epicurus' ideas seem to be a spectacular anticipation of Bohr's atom model. But we need not go that far. Perhaps there are only a limited number of theoretical views when the human mind focuses on key issues, humans therefore being doomed to repeat themselves. Have we not often felt that everything has already been thought by the ancient Greeks?

However, there is more at stake here. What lies behind many of the accusations of lack of imagination in metaphysics is the belief that real novelty is best propelled by empirical research. Indeed, we often find the following view regarding the history of atomism and other philosophical theories: how wrong are the 'mere speculations' of metaphysicians! No wonder, they dare to speak without performing empirical experiments. The upshot is that science subsequently corrects them, pointing out all their mistakes. Atoms, for instance, had nothing to do with what Democritus and Epicurus supposed; they are actually incomparably more complex.

However, this is a very simplistic view. Firstly, those who believed in hard and incorruptible atoms were not only Democritus and Epicurus, but generations of scientists, including the most eminent. Secondly, when the science of an era shows

the flaws of a metaphysical theory, it typically means that the same science adopted a different metaphysics. Thirdly, and curiously enough, Feynman would not leave as a legacy for the cataclysm survivors the findings of contemporary science, its complex and divisible atoms; he would leave them the atomistic programme of the ancient Greeks and of Newton, the programme that is now faced with so many problems. The reason is that Feynman knew that it was by following the path proposed by this programme, albeit a 'wrong' one, that we got to where we have arrived today. The atomistic programme is perhaps showing symptoms of fatal illness, but we cannot close our eyes to the fact that the outdated atomistic conceptions, even though now considered misleading and inaccurate, enabled over the centuries a tremendous increase of knowledge as they paved the way for their own renewal.

It is nonetheless true that some accepted metaphysical theories may act as obstacles for the advancement of science. All metaphysical theories are limited and imperfect, as are all our theories and is all our knowledge - but they are also open to criticism; and one of the metaphysicians' missions is precisely to criticise them and learn from their mistakes.

6 – Lack of Foresight

A similar charge to that of Lawrence Sklar occurs in James Ladyman and Don Ross's 'In Defence of Scientism' (2007). Ladyman and Ross, presumptive heirs of David Hume and the logical positivists, proved to be two of the most strident voices speaking out against non-naturalistic metaphysics, which they quite rightly describe as a 'neo-scholasticism'.

Ladyman and Ross defend a naturalistic metaphysics meticulously informed by science. Their naturalistic metaphysics is interested, most of all, in the ontology of the universe; and the science, above all the physics, of a time is held to be the main source of information about the ontology. However, what is the science or physics 'of a time'? Here we have what may be considered a vague expression: the physics of a time. As I have already stated, the putative 'results of science of a time' are subject to interpretation. For example, is the quantum physics of our time the Copenhagen interpretation, Louis de Broglie's interpretation or David Bohm's interpretation? Which one should a naturalistic metaphysics informed by quantum physics follow? Should it follow the dominant school? But what are the assumptions behind this prescription?

Due to an alleged brotherhood between metaphysics and common sense, Ladyman and Ross conclude that metaphysics is made to declare as impossible states, entities or processes that science later admits as possible:

> Philosophers have often regarded as impossible states of affairs that science has come to entertain. For example, metaphysicians confidently pronounced that non-Euclidean geometry is impossible as a model of physical space, that it is impossible that there not be deterministic causation, that non-absolute time is impossible, and so on. Physicists learned to be comfortable with each of these ideas, along with others that confound the expectations of common sense more profoundly. (Ladyman and Ross 2007, pp. 16-17)

Because this is intended as a statement of fact, it is subject to a counterexample. In fact, as Marie Cariou states, a metaphysician like Leibniz devised a non-Euclidean space *avant la lettre*, a space where everything is contained and where everything is reflected to infinity, a true 'geometry of deepness' (Cariou 1978, p. 100; see also Giust 1990). Furthermore, as the French physicist Bernard Pullman notes, the use of the word 'impossible' is far from exclusive to philosophers:

> It is surprising to see how many thinkers and scientists, even very prominent, have used the word 'impossible', unfortunately and ultimately in a wrong way. Often, as modern chemist Ch. Weizmann (1874-1952) said, 'the impossible takes a long time', a statement which is especially strong in the field of atomic and molecular structures.[1] (Pullman 1995, p. 180).

Indeed, counterexamples do include scientists themselves, since generations of scientists believed in nothing but Euclidean geometry, in deterministic causality, in absolute time! Claiming to know that it is impossible that non-naturalistic theories about possible worlds, universals or modalities may someday have some empirical usefulness, Ladyman and Ross, and other naturalistic philosophers, actually make the same mistake as the philosophers they admonish for declaring as impossible states of things that science would accept later. Without mentioning the remarkable case of atomism, let me here recall E. A. Burtt's *The Metaphysical Foundations of Modern Physical Science* (1924), where he shows that metaphysical concepts such as substance, essence and form were essential in Kepler's work and the concepts of space, time and mass in Newton's.

The truth is that the benefit of the doubt is always given to mathematics, but not to metaphysics: "There are parts of mathematics that clearly don't seem to be describing anything physical, but let us never forget Kant's embarrassment over non-Euclidean geometry", write Ladyman and Ross (2010, p. 182). Therefore, even though mathematics creates worlds or 'mathematical entities' that apparently have no connexion with the physical world, we cannot exclude the possibility that, in the future, we will be proved wrong. Who knows if these worlds and 'entities' that are nothing today but mathematical will not become physical tomorrow, as happened with the positron? Let us not behave like the philosopher

1 - "Il est surprenant d'observer combien de penseurs et de savants, même très éminents, ont utilisé, malencontreusement et finalement à tort, le mot "impossible". Souvent, comme l'a dit Ch. Weizmann, chimiste moderne (1874-1952), "l'impossible prend plus longtemps", affirmation qui revêt toute sa force dans le domaine des structures atomiques et moléculaires."

REVUE
DE LA SOCIÉTÉ
DE PHILOSOPHIE
DES SCIENCES

Kant who did not foresee that Euclidean geometry was going to be surpassed by non-Euclidean geometry. Unfortunately, this open-mindedness is rarely extended to metaphysics...

As for Kant's case regarding Euclidean geometry, Joseph Agassi touched a sore spot when he wrote that:

> Much scorn has been poured on Kant's head on account of his inability to foretell that Gauss and Einstein were going to break away from his aprioristic adherence to Euclid. Everybody before Kant, including Newton, held similar views, but this only makes the need for a scapegoat all the more intense. And the scapegoat is Kant. The need for scapegoats is based on the view that scientists should be able to avoid error. (1969, p. 5)

This is particularly significant as the passage is taken from an essay where Agassi argues that Kant himself is in a way the source of non-Euclidean geometry, as it was in opposition to him that Gauss was thinking. Agassi also shows the relevance of Leibniz's and Kant's programmes for both Einstein's theory of relativity and the theory of fields.

It is clear that Kant is chosen as the scapegoat because he is a philosopher. Not even Newton the Scientist was able to foresee what future was reserved for Euclidean geometry. Moreover, ultimately, what was Kant doing? He was following Ladyman and Ross's advice: he chose to philosophize based on the 'results of the science of his time'! As those results were, as they typically are, imperfect, perhaps it would have been better not to do so. Now, it is not fair that, once more, philosophers are damned if they do and damned if they don't. On the one hand, they are to blame for not submitting to the 'science of their time'. On the other, they are to blame when they submit to it, instead of anticipating the science of the future!

Aren't scientists fortunate for always being remembered for their success, even when they believed they had already arrived at the fundamental level, or that there was something like the phlogiston? It can be argued that the ontology of outdated physical theories such as the theory of phlogiston, the ether theory of light and the theory of the caloric were not simply discarded, as they described modal relationships between phenomena that were subsumed in later scientific theories. I agree. Mistakes often contain some truth and Lavoisier's chemistry was, to a certain extent, a sequel of the chemistry of phlogiston (Vihalemm 2000).[2] However, the phlogiston theory was very inaccurate and phlogiston did not exist. Also, in defence of Kant and the legions of scientists who believed in Euclidean geometry: Euclidean geometry was not completely discarded neither. At low speeds and small physical distances space remains Euclidean at first sight.

Finally, we can still ask whether it is true that, today, as Ladyman and Ross state, only physicists are comfortable with non-Euclidean geometry, indeterminism, or non-absolute time; and if they actually are comfortable. Did not scientists, metaphysicians, and curious laypeople alike have to adapt their way of thinking to these discoveries? And if scientists are indeed comfortable with them now, perhaps this comfort should not be praised. Comfort may always betray a mere acceptance, a withdrawal from understanding, as seems to be the case of quantum physics.

Furthermore, non-Euclidean geometry, non-absolute time and indeterminism were at first out of the scientists' comfort zone as well. Their common sense was also disturbed. In particular, acceptance of the quantum world was (and still is) a disturbing process. It was a difficult theory to accept, as would have been expected by, for instance, Thomas Kuhn who described scientists as very conservative. It was in fact so hard to accept that some of the physicists involved turned to the Eastern religions and ways of thinking in an attempt to achieve a better understanding of quantum phenomena and relativity. Austrian scientist Fritjof Capra, who was once Heisenberg's assistant, reported in his book *Uncommon Wisdom: Conversations with Remarkable People*:

> In 1929 Heisenberg spent some time in India as the guest of celebrated Indian poet Rabindranath Tagore, with whom he had long conversations about science and Indian philosophy. This introduction of Indian science brought Heisenberg great vision, he told me. He began to see that the recognition of relativity, interconnectedness, and impermanence as fundamental aspects of physical reality, which had been so difficult for himself and his fellow physicists, was the very basis of the Indian spiritual traditions. 'After these conversations with Tagore', he said, 'some of the ideas that had seemed so crazy suddenly made more sense. That was a great help for me.' (1988, pp. 42-43)

The surprise and shock that relativity and quantum mechanics caused aroused deep metaphysical and even religious concerns in the scientists involved. Niels Bohr found analogies between complementarity and the Chinese metaphysics of yin-yang. Schrödinger took an interest in the Vedanta. Planck, Schrödinger and Heisenberg devoted chapters of their writings to the relation of science and religion (but not Dirac, who was a fierce atheist). Einstein's meditations on this subject are also well known. His God, he said, was Spinoza's God, the one that dwells in the harmony of all things, and his religion was 'cosmic'.

7 – The Problem of Intuition

Intuition is a vast, complex and controversial issue. The term has been used both by the layman and by philosophers and scientists in so many different ways that it is plunged into

2 - Vihalemm shows how both the chemistry of phlogiston and Lavoisier's chemistry were based on the scientific image of the Newtonian world, even though the former had a qualitative nature and the latter had a quantitative nature. But this quantitative approach to chemistry was a sequel of qualitative chemical investigations formed in the context of the phlogiston theory.

deep confusion. Intuition in its common (and etymological) sense as a direct and immediate vision does not explain what that vision is and how it works. Moreover, the cognitive value of such a vision has not been settled.

The core of the charge Ladyman and Ross make against the alleged methodology of non-naturalistic metaphysicians lies in the kind of argument these metaphysicians use: the constant appeal to intuition. Worse than that, non-naturalistic metaphysicians trust those intuitions more than they trust the 'results of science'. The intuitionist methodology is viewed with suspicion by scientists. For Ladyman and Ross, as for many of the empiricists and naturalistic metaphysicians who are critical of non-naturalistic metaphysics, the problem with 'intuition' is that it is not subject to empirical verification; intuitions cannot be subject to scientific scrutiny. Thus, we are doomed to remain ignorant of their accuracy.

Not that Ladyman and Ross refuse to recognize 'intuition' in science. They admit that it is often said of a good physicist that he had a solid intuition. But, in this case, the use of the word intuition is different, because it refers 'to the experienced practitioner's trained ability to see at a glance how their abstract theoretical structure probably – in advance of essential careful checking – maps onto a problem space' (Ladyman and Ross 2007, p. 15). Intuition in science is usually seen as an anticipation of results prior to their discovery, the steps and the details leading to them, a guessing of subliminal connections between things or events, as when Newton saw the apple fall.

But intuition occurring in metaphysics is often seen, strangely enough, as something close to the mystics' revelation, as a personal experience of a simple presence in consciousness, so splendid that it does not require any further steps. And it is a presence of something that, by its very nature, cannot be present: it is invisible and ineffable. Now, all knowledge can be conveyed in words, as the positivists argued. It thus follows that there can be no knowledge stemming from metaphysical intuitions. The attack of the positivists against metaphysics stemmed largely from this weird identification of metaphysics with the mystical or the religious, fuelled by the mystical bent in philosophers such as Schopenhauer and Bergson.

Similarly to the positivists, Ladyman and Ross declare that metaphysical intuitions have no epistemic value. Science, precisely, has shown that many of the intuitions of common sense about the world were wrong. They also advance an evolutionary argument against the reliability of intuitions: these evolved in the medium size world; they are adapted neither to the macro nor to the micro scale. It is thus highly implausible that intuition can lead us to the knowledge of realities whose scale differs so much from the one we are used to.

To understand Ladyman and Ross's criticism we need to recall that, since the 1960s, a phenomenon has occurred in 'analytic' philosophy' that has spread like a virus: the use and abuse, by many 'analytical' philosophers (David Chalmers, David Lewis, Saul Kripke) of the term 'intuition' or 'intuitively' in their arguments. The upshot was a real misfortune for philosophy in general because it is now usually assumed that the philosophical method par excellence is intuition. There is the idea that philosophers (the case is, of course, more severe with metaphysicians) turn to 'intuition' when their arguments are exhausted; that, when a philosophical dispute is carried far enough, it will reach a point where nothing else is at play than competing intuitions about the arguments' assumptions, for example, that 'intuitively', the outside world exists or that, 'intuitively', only my mind exists.

Now, how can anyone claim that we can switch from 'intuitively, the outside world exists' to 'intuition of the reality of the external world is true'? What kind of authority can be ascribed to 'intuitions' once they claim self-legitimation and do not face 'the court of experience'?

As we are all uncertain of what exactly 'intuition' is and the degree of confidence it deserves, many other philosophers feel disturbed with this image of their discipline. This image, created largely by some of the discipline's own practitioners themselves, contributes significantly to its caricature as 'armchair speculation', a mere conceptual analysis distant from any form of empirical inquiry.

One of the troubled philosophers is Herman Cappelen. In 'Philosophy Without Intuitions' (2012) and even more recently (due to the responses obtained in defence of the use of intuition in philosophy, for example, by David Chalmers, 2014), in 'X-Phi Without Intuitions' (2014) Cappelen rebelled against this prevailing image. In his essays, he criticizes what he calls the metaphilosophical thesis of 'Centralization': contemporary analytic philosophers rely on intuitions as evidence for their philosophical theories. Through a linguistic and textual analysis of (unfortunately numerous) philosophical excerpts where the term 'intuition' and its derivatives occur, Cappelen comes to the conclusion that 'Centralization' is false. Its authors have mistaken beliefs about their own methods. Most of the time, reference to 'intuition' can be removed (Cappelen 2012, pp. 63-64). It describes statements obtained with little thought (Cappelen 2012, pp. 65-68) or signals a proposition which can either be justified or has already been justified, without taking a stance on the issue (Cappelen 2012, pp. 68-71).

Cappelen also analyzed several mental experiments developed by philosophers and concluded that, in these cases as well, they are not actually based on intuitions. What happens is precisely the opposite: philosophers are interested in the reasons behind the answers. If the answers are not justified by reasons and arguments they are deemed uninteresting.

REVUE
DE LA SOCIÉTÉ
DE PHILOSOPHIE
DES SCIENCES

What philosophers do is to provide reasons, to argue and to detect precisely those beliefs or judgments that were not justified and are mistakenly called 'intuitions' (Cappelen 2012, chap. 8).

It is most unfortunate that philosophers have made a poor choice of words when the least one might expect from them is the careful use of language.

But though I suspect that Cappelen is right with regard to 'analytical' non-naturalistic metaphysics, i.e., that it is largely a problem of the reckless use of vocabulary, intuition is a much deeper problem than a mere lack of terminological marksmanship. The question cannot be addressed so lightly. The association of philosophy and metaphysics with intuition has a long and persistent history. Philosophers have been mentioning intuition since the beginning of their discipline. The phenomenon did not start with the 'analytical' metaphysicians, nor with Bergson, Schelling, Husserl, not even with Kant or Descartes, all of them philosophers for whom intuition played a crucial role. Aristotle and Plato already mentioned intuition in connection with philosophy.

But the problem of ancient intuitionist philosophers was their defence that it is possible to have beliefs justified by intuition. However, nowadays, fallibilism is widespread: such beliefs can no longer be seen as solid.

In a recent paper, Jiri Benowsky (2013) acknowledges that science (physics, experimental psychology, cognitive science) may be useful in assessing the value of some metaphysical theories, those closer to empirical investigation (we may think of determinism and indeterminism), but not the value of those which are too distant from an empirical basis because 'intuition' is all that we have (concerning tropes, universals, mereological composition, etc.). He focuses on this latter case. Many metaphysical theories are counter-intuitive, but he believes that many intuitive theories are based on our everyday contingent phenomenal experience. He thus rightly stresses the fact that metaphysics is not far from all kinds of experience, is not a product of a 'pure reason', or 'armchair speculation'. Benowsky analyses four examples of such metaphysical reasoning. He concludes that, from the same phenomenological experience, two competing metaphysical theories may arise and that our experience of the world is neutral with respect to both of them. For instance, from seeing an apple changing over time from red and juicy to brown and rotten, we can endorse either Endurantism and Perdurantism. Our experience of the world does not decide in favour of one or the other. Therefore, according to Benowsky, we should be extremely careful when appealing to these kinds of 'intuitions' while doing metaphysics, as they are, more often than not, misleading and illusory. Benowsky's final and controversial proposal is the endorsement of a kind of anti-realism whereby metaphysics is understood as the inquiry into the world as it is given to us (it tells us what our concepts are like) and not as it is. However, I believe there is no need to go this far.

I rather believe that the putative source of a metaphysical theory should not be confused with its method. It is one thing to mention intuition in a philosophical theory; it is quite another thing to say that intuition is the method used in metaphysics. The method of metaphysics is none other than the philosophical, rational method, in which the architecture of the arguments is subject to critical scrutiny and which obeys the criterion of clarity. And the real source of a metaphysical theory, as also the source of a scientific theory, is a *problem* that needs to be solved. If in the process of solving it there are appeals to intuition they have to be submitted to criticism or to tests. What matters is the theories' explanatory power and their resilience to criticism and tests. This criticism is not confined to claims purportedly based on intuition, but to claims based on the senses, reason, evidence, etc. All of them fail. There is no source of certain knowledge.

Most criticism of metaphysics is based on these kinds of shaky assumptions: that there is a source of certain knowledge; that there is a rigid partition between *a priori* and *a posteriori*; and the subsequent belief in a reliable knowledge (*a posteriori*) and a pseudo or presumptive knowledge (*a priori*).

In addition, the fact that there is no source of certain knowledge does not entail the endorsement of anti-realism. We can learn about the world if we criticize and test our claims, whether they are based on the senses, reason, evidence or intuition...But I do not wish to join the realism or non-realism debate here.

Philosophy is a critical and dialogic activity. Both in science and in metaphysics, before being accepted, intuitions are investigated and their consequences analyzed, if not by their protagonists then by someone else. To say, like Ladyman and Ross, that the difference is that metaphysical intuitions are taken as evidence while intuitions in science have only a heuristic value, is unacceptable. If intuition does play an important role in knowledge, that role is heuristic both in science and metaphysics and not dogmatic in any case, particularly since it rarely can be trusted - problems are usually more complicated than intuition supposes.

So, for the third time, metaphysicians are damned if they do and damned if they don't: they are criticized for putting forward arguments that are claimed to be indisputable, 'dogmatic'...; and they are also criticized for their endless disputes and their failure to reach a consensus.

REVUE
DE LA SOCIÉTÉ
DE PHILOSOPHIE
DES SCIENCES

8 – Independence from Experience

Basically, all charges mentioned above are derived from a single big problem: the problem of metaphysics' independence from experience. Despite the verification principle of the logical positivists ceasing to be invoked in order to debunk metaphysical propositions, these continue to be regarded as unreliable due to their exemption from empirical testing (in fact, the problem concerns all philosophy and not only metaphysics). What are metaphysical theories for if we cannot even figure out if they are true or, at least, false? And if we cannot even know if they are false, as no empirical test can decide this, how can we choose between metaphysical theories, especially when, as we have seen, appeals to 'intuition' cannot justify *per se* any assertion?

But in what way is metaphysics independent from experience? Is this true? If metaphysics is in some way linked to experience, what is the nature of that link? In fact, and typically, metaphysical theories are underdetermined by empirical data; it is always possible to conceive, for each one of them, an opposite theory that is also consistent with the empirical data. Anything that exists or happens is compatible with both the metaphysical thesis of the reality of space-time and with the metaphysical thesis of its unreality; as it is compatible with both the existence of Platonic Ideas and the absence of Platonic Ideas. Therefore, coherence with empirical data cannot determine which one is true.

Moreover, the findings of science cannot act as verdicts on or rebuttals of metaphysical theories. To assert that quantum physics *proves* that the thesis that all events have a cause is wrong or that relativity *proves* that the nature of space is this way and not that way is an illusion. First, metaphysical theories have such a high degree of generality that experience (which is, by its very nature, limited and localized) cannot decide for or against them. Second, the so-called 'results of science', as I already pointed out, are often interpreted according to different and contradictory metaphysical views.

But let us not forget that the association with truth is a problem not only for philosophy and metaphysics but for science as well, in spite of the latter's connection with empirical evidence. Firstly, scientific theories, like metaphysical ones, are underdetermined by empirical data. They are far from being fully verified or corroborated by empirical tests; otherwise they would not be theories. All theories are theories precisely because they are an attempt to see beyond what is empirically given. Secondly, if the impossibility of knowing 'for sure' the truth value of metaphysical theories is a problem, the 'court of experience', so often invoked to decide the truth value of scientific theories, is also a problem; it is not, as empiricists think, an unequivocal guarantee and a source of authority. The truth is that the empirical basis of science is itself hypothetical. It is, as we have seen, subject to interpretation and even though empirical experiences do not take place in metaphysics but in science, falsification in science is not conclusive.

Nevertheless, it is possible to choose rationally between rival metaphysical theories, despite the fact that the findings of science cannot directly falsify them through an empirical experiment and despite the fact that it cannot be proved that our favourite metaphysical theory is true.

That choice often takes place in scientific contexts. Many metaphysical theories were abandoned by science as they became too difficult to maintain. For example, Descartes' theory of 'swirling vortices' was abandoned in favour of atomism. The reason behind this choice was that atomism proved to be much more manageable and fertile when transferred to the language of science. The vortices hypothesis did not succeed, while atomism was able to launch an incredibly successful research programme. Similarly, metaphysical theories of the 'one universe without generation and corruption', defended by the ancient Greeks and Descartes, Leibniz, Spinoza, were eventually abandoned in favour of theories of the universe as an evolutionary and corruptible system.

Granted, falsification is not conclusive even for scientific theories, but we nevertheless prefer not to use the term 'falsification' when metaphysical theories are at play, as falsifications typically involve crucial experiments. I believe that, for the sake of clarity, the terms 'refute', 'rebut' should be adopted when scientific theories are involved, but not when metaphysical hypothesis and theories are involved. I prefer to say that metaphysical theories, when judged as inaccurate, are 'indirectly falsified', or 'abandoned'. The reason is metaphysical theories are not directly refutable, and are not discarded as scientific theories are: by direct refutation. The plum pudding atom model hypothesized by J.J. Thomson was refuted by Rutherford with his gold foil experiment. Later, Rutherford's atom was also rendered obsolete by direct refutation.

But that is not the case with metaphysical theories. Although quantum physics seems to argue strongly in favour of indeterminism, there was also the theory that defended that if all the initial conditions could be known, then we would find out that the universe is deterministic; even to this day, different interpretations of the so-called 'results' of quantum physics subsist. A metaphysical theory can be abandoned by science in favour of another, but it doesn't simply disappear. Even when they sound bizarre to the ears and the science of today, for instance, Plato's Forms, metaphysical theories keep all their appeal and never cease to be inspiring (for Heisenberg, quantum physics had in fact decided in favour of Plato's Forms. Heisenberg 1958, pp 71-72). And we never know if they will play an important role in the future.

REVUE
DE LA SOCIÉTÉ
DE PHILOSOPHIE
DES SCIENCES

By inspiring research programmes, some metaphysical theses become part of science, i.e., some metaphysical theses become partly empirically tractable. That in nature determinism or indeterminism reigns, that something remains unchanged through change, that the whole equals the sum of its parts, these are all theses that remain metaphysical even if the science of an era adopts them and acts according to what they stipulate, and even if experiments do corroborate them to some extent. As Craig Callender notes (2011), testable theories typically involve metaphysical parts, for example, the hypothesis of the continuity or discontinuity of time. These non-testable parts are validated indirectly through the testable parts of the theories in which they operate: 'Through experiment, confirmation and disconfirmation seeps upward through theory, but some bits – such as spatiotemporal continuity – are fairly well insulated' (Callender 2011, p. 47).

Therefore, metaphysics is far from being as alienated from the empirical world and scientific research as many seem to believe. Metaphysical theories also pertain to objects of experience and, together with science, investigate space and time, causality, possible worlds... And some metaphysical theses create even more bonds with experience when inserted into testable theories. Therefore, even though natural sciences relate to experience in a direct way, and metaphysics relates to experience indirectly through the sciences, both science and metaphysics are speculative-empirical activities.

However, this does not make science the judge of philosophy. It does not do so because, firstly, as we have seen, science does not completely falsify metaphysical theories; and secondly, because when science seems to threaten a metaphysical theory, it is because another one was adopted, even if in an implicit way.

But even if we move further away from the scientific context it is still possible to choose between metaphysical theories. As Popper states (1982), it is possible to evaluate an irrefutable theory, unless it is simply an isolated proposition that entails acceptance or refusal without further ado. But this would also be the case if a scientific proposition was involved: why should we accept the equations of classical mechanics if we were not aware of the problems underlying them and the issues they address?

A metaphysical or scientific theory is rational because it is part of a chain of problems which it is trying to solve. Therefore, it can be discussed rationally by taking these problems into account. Critical discussions consist, precisely, in assessing the quality of the offered solutions, in evaluating whether one particular solution is superior to the others or not; if it is inspiring and fruitful; if it has the ability to suggest new problems; and, finally, if it can be empirically tested. If it is a scientific theory, the answer to this last question will be positive. But empirical testing cannot decide if a theory is true. It can only decide if it is, in principle, false or if falsity was not proven. If it is a philosophical theory, the answer to the same question will be negative. All the others, however, can be applied to it. (Popper 1982, pp. 159–211)

Human knowledge, all of it, is always hypothetical. There are no absolute truths. Therefore, the real issue is not to know for sure and immediately if philosophical or metaphysical theories - and the same goes for scientific theories - are true or false. The real issue is to investigate whether and how a theory can make a contribution in the search for truth.

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REVUE
DE LA SOCIÉTÉ
DE PHILOSOPHIE
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