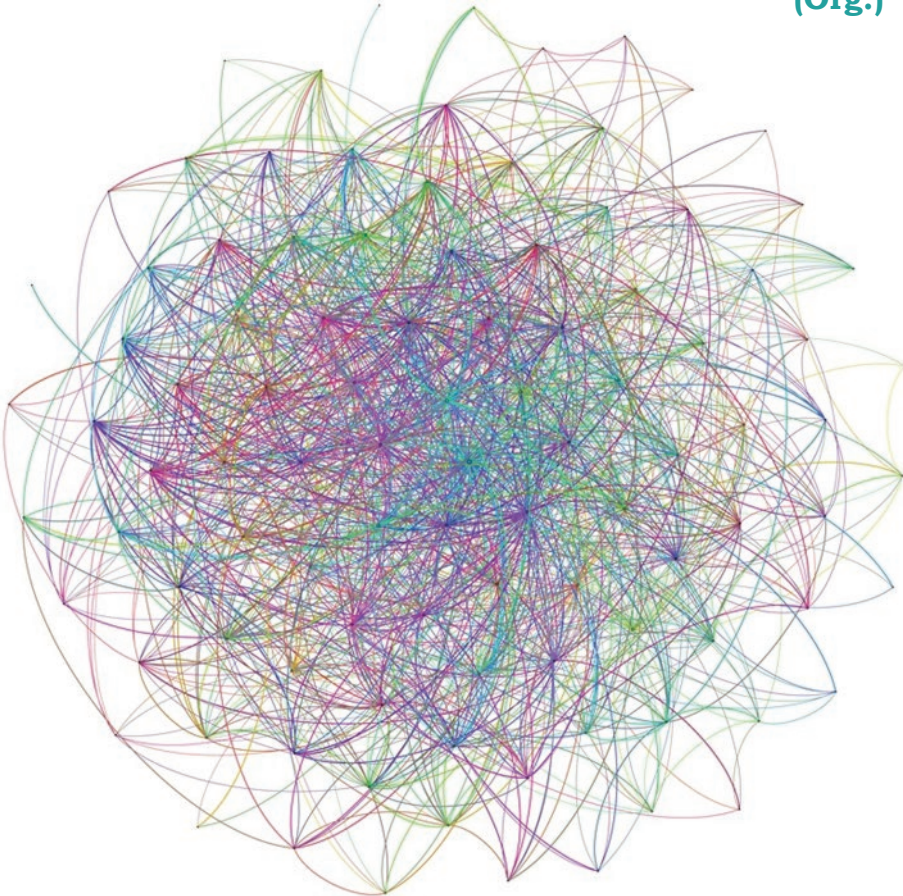


Philosophy of Science in the 21st Century Challenges and Tasks

**Olga Pombo and Gil Santos
(Org.)**



**Philosophy of Science in the
21st Century
– Challenges and Tasks –**

Olga Pombo and Gil Santos
(Org.)

Colecção Documenta

CFCUL

2016

© Centro de Filosofia das Ciências da Universidade de Lisboa

Colecção Documenta

Título: Philosophy of Science in the 21st Century – Challenges and Tasks

Organizadores: Olga Pombo e Gil Santos

Autores: Jan Sebestik, Nuno Fonseca, Angelo Cei, Angel Nepomuceno-Fernández, Dinis Pestana, Fernando Sequeira, Dina Mendonça, Fernando Rua, Luciano Boi, Ângela Dionísio, Éric Guichard, Filipe Varela, Paulo de Sousa Mendes, Bracinha Vieira, Zbigniew Kotowicz.

Data: Abril de 2016

Depósito legal: 408952/16

ISBN: 978-989-8247-72-8

Impressão: DPS - Digital Printing Services, Lda

Textos apresentados na *Lisbon International Conference: Philosophy of Science in the 21st Century – Challenges and Tasks*, realizada pelo Centro de Filosofia das Ciências da Universidade de Lisboa, entre 4 e 6 de Dezembro de 2013, na Faculdade de Ciências da Universidade de Lisboa.

Fundação para a Ciência e a Tecnologia
Projecto Estratégico UID/Fil/00678/2013

ÍNDICE

Introduction	
Olga Pombo e Gil Santos	7
1. Philosophy of Science and Metaphysics	
• Turning Points in the Development of Science	
Jan Sebestik	17
• Metaphysics and Science: With or Without? Clearing up for an inclusive disjunction	
Nuno Fonseca	37
• Carnap's Reconstruction of Theoretical Content and Structural Realism. A Reply to Friedman	
Angelo Cei	53
2. Logical and Epistemological Issues in the Contemporary Philosophy of Science	
• Quantum Logic from a Dynamic Perspective	
Nepomuceno-Fernández	77
• The Ways of Probable Truth	
Dinis Pestana and Fernando Sequeira	91
• The Headscarf Debate: Surprise and Meta-emotions in Argumentation	
Dina Mendonça	113
• Are Scientific Thought Experiments Objects of Fiction?	
Fernando Rua	139

3. Philosophy of Science Disciplinary Research

- **Imagination and Visualization of Geometrical and Topological Forms in Space. On Some Formal, Philosophical and Pictorial Aspects of Mathematics**
Luciano Boi 163
- **The Crisis in Economic Theory. Shifting to a New Paradigm in Economics?**
Ângela Dionísio 223
- **Philosophie de l'Internet**
Éric Guichard 257
- **Body, Topological Deformation, Desire**
Filipe Varela 289
- **The Good and the Goods in Philosophical Tradition and Contemporary Ethics**
Paulo de Sousa Mendes 311

4. Past and Future of the Philosophical and Scientific Rationality

- **Mito, Ciência, Literatura: A Deriva dos Continentes**
Bracinha Vieira 323
- **Gaston Bachelard: Epistemology, History**
Zbigniew Kotowicz 339

Metaphysics and Science: With or Without? Clearing Up For an Inclusive Disjunction

Nuno Fonseca
(IFILNOVA/FCSH/UNL
nunosmdafonseca@gmail.com)

Abstract:

This presentation will focus on the recent debate over the possibility of a 'scientific metaphysics' and the need for a 'metaphysics of science', keeping in mind the metaphysical tinge of certain contemporary trends of theoretical science. Both manifestations scramble the traditional demarcation criteria between science and metaphysics, such as the a posteriori nature of scientific inquiry versus the a priori speculative study of metaphysics. Despite the excommunication of metaphysics from philosophy of science and the scientific world conception of the Vienna Circle, subsequently confirmed by logical empiricism, the recent decades have seen a growing resurgence of metaphysics. The latter pertain mostly to criticism over the analytic/synthetic distinction, the development of semantic interpretations of modality, a realist and revisionary metaphysical attitude and the outbreak of dispositionalist views concerning the laws of nature, thus overthrowing the post-kantian prejudices against metaphysical ambitions towards the knowledge of nature. This repulsion-attraction dynamic between the two domains reveals they overlap on several subject matters, but they also distinguish themselves in the nature and practice of their inquiry. Nevertheless, in place of being (asymmetric) rivals, both have much to gain from a balanced - and occasionally therapeutic - complementarity.

The purpose of this presentation is, then, both to clarify the terms of this complementarity and to evaluate the dangers of defective or excessive mutual acquaintance.

Keywords; *A priori* knowledge; metaphysics of science; scientific metaphysics; scientism; system building

1. An old and passionate relationship between science and metaphysics

Metaphysics and science have a very long but also very controversial relationship, full of repulsive and attractive impulses and consequences from and on both parts. Historically, they share the same origin in ancient Greece, where the first metaphysicians were known as *physikoi* (φυσικοί) or *physiologoi* (φυσιολογοί), as these first philosophers were searching for the fundamental elements or natural causes of all phenomena that occur in nature (φύσις). In the early modern epistemological revolution, where we usually place the genesis of science (in the modern sense), the main actors of scientific knowledge still shared the same epistemic ambitions and subject matters with more speculative inquirers, in what was then called “natural philosophy”. But some tensions arose concerning different methods of inquiry and the sources of knowledge. While some remained faithful to the speculative powers of rational introspection and to *a priori* intuition of truths concerning the external world, others only trusted knowledge coming from experience and which could be confirmed with the use of the experimental method. Both were doing “natural philosophy” but the former – where we can easily include Descartes and Leibniz - were certainly entertaining a metaphysical approach, while the latter – Kepler, Huygens or Newton - were pursuing a more empirical endeavour, something that would later be assumedly *science*.

But soon some empiricists, namely Hume, presented fierce scepticism towards the possibility of acquiring any knowledge about the natural world through metaphysical speculation “[f]or it can contain nothing but sophistry and illusion”¹. The *Critique* of metaphysics by Kant was arguably able to provide epistemological justification for *a priori* substantial (non-trivial) knowledge concerning the empirical world – via synthetic *a priori* judgements – yet at high costs for the metaphysical endeavours, since it became limited to the way the natural world appeared and was experienced by us. That is to say those necessary truths about the world were always mind-dependent, restricting the possibility of metaphysics to a transcendental idealist or anti-realist perspective. On the other hand, science was safe, since it was limited by definition to the world of experience and built upon the epistemically grounded principles of this ‘deflationary’ metaphysics.

In the first half of the twentieth century, when philosophy of science properly arises as an independent discipline, the Humean and Kantian blows on metaphysics were inherited by scrupulous defenders of logical reason and positivist science, eliminating metaphysical speculation from their “scientific conception of the world” (*Wissenschaftliche Weltauffassung*). The definitive argument of logical positivism was that metaphysical propositions were meaningless (nonsensical), since they were neither tautologies nor empirical hypotheses, that is, they wouldn’t get through their semantic criterion, the *principle of verifiability*: all statements that could not be verified logically or empirically were pseudo-statements, neither true nor false, cognitively meaningless (at best, expressing emotion or first-person beliefs).

¹ “When we run over libraries, persuaded of these principles, what havoc must we make? If we take in our hand any volume; of divinity or school metaphysics, for instance; let us ask, *Does it contain any abstract reasoning concerning quantity or number?* No. *Does it contain any experimental reasoning concerning matter of fact and existence?* No. Commit it then to the flames: For it can contain nothing but sophistry and illusion.” (Hume 2007, *An Enquiry Concerning Human Understanding* [1748], section 12, § 34, p. 120)

Although the practical consequences of this logical empiricist verdict was to purge metaphysics from serious philosophy of science, later reflection and analysis of this perspective falsified it, insofar as it wouldn't survive its own demanding criterion for meaning, revealing how much of a metaphysical doctrine it also was. Logical empiricism was then subjected to finely tuned criticism by Quine, particularly over the analytic/synthetic distinction and the reductionist program of analysing meaningful sentences via logic and observational protocols (Quine 1963, pp. 20-46), discrediting its strong demarcation criterion. It can be said that Quine helped to pave the way for a resurgence of metaphysics, and one can actually read on 'Two Dogmas of Empiricism' that, under his view, "[o]ntological questions ... are on a par with questions of natural science (Quine 1963, p. 45)", but, to be sure, what Quine enabled was a new brand of naturalized metaphysics (we'll get to that later on) and not the traditional speculative aprioristic metaphysics.

Nevertheless, in the later decades of the twentieth century and in the beginning of the twenty-first we have seen a growing number of books, papers and research programs on metaphysics and ontology, devoted to classical topics like substances, essences, universals, properties, identity, modality, causation, time, as well as more up-to-date or even new issues, often informed by discoveries in science, such as the nature of space-time, the ontological status of fundamental particles, issues on reductionism, supervenience or emergence, etc. More strikingly, in philosophy of science, a discipline born with the 'elimination of metaphysics' (Ayer 1971) from what was expected to become a scientific philosophy, frequent papers on metaphysics have been written and a new sub-discipline, called "metaphysics of science", has been gaining momentum in the last few years (Mumford & Tugby 2013). Also something called "scientific metaphysics", which is not just a sub-discipline of philosophy of science, but a new way - and the only admissible at all for some - of doing metaphysics, has been emerging.

At the same time, new theoretical physics hypotheses – like string theories, the anthropic principle, parallel universes or the cosmological landscape - have seemed to acquire a speculative and metaphysical tinge (on occasion closer to science-fiction rather than actual science), insofar as they cannot be falsified by empirical evidence, and thus, apparently, blurring the boundaries between science and metaphysics. These are the intellectual phenomena that motivated this paper inasmuch as a clarification concerning the relationship between metaphysics and science seems necessary. We'll try to contribute to this, first giving a critical view on the main aspects of this new “scientific metaphysics” and then providing some positive input concerning the distinction and complementarity between science and metaphysics.

2. The idea of a Scientific Metaphysics

A provocative book, named *Every Thing Must Go*, was published in 2007, by James Ladyman and Don Ross², where the authors recommend that the way the large majority of contemporary (analytic) metaphysics – or “neo-scholastic metaphysics”, as they name it -, has been practiced, in universities and research units, should be discontinued, since it “fails to qualify as part of the enlightened pursuit of objective truth”, as it “contributes nothing to human knowledge”. The sub-title of the book is *Metaphysics Naturalized*, which reflects their adherence to a particularly ‘radical’ form of naturalistic metaphysics, exclusively motivated by attempts to unify serious hypotheses and theories that accord carefully to well-established contemporary science³, accusing most metaphysicians that try to “domesticate science” of

² With David Spurrett and John Collier (see Ladyman & Ross 2007).

³ There is an assumed naturalist constraint over metaphysical hypotheses, which they express with their *Principle of Naturalistic Closure* (PNC): “Any new metaphysical claim that is to be taken seriously at time *t* should be motivated by, and only by, the service it would perform, if true, in showing how two or more specific scientific hypotheses, at least one of which is drawn from fundamental physics, jointly explain more than the sum of what is explained by the two hypotheses taken separately” (Ladyman & Ross 2007, p. 37).

ignoring what science really says and conforming it to common sense intuitions and misrepresentations of the scientific picture of reality.

They unashamedly assume their “defence of Scientism” in the first chapter of the book and oppose all metaphysics that rely on intuitions and *a priori* conceptual analysis.

In 2013, the same authors, with Harold Kincaid, co-edited another book with a more explicit title, *Scientific Metaphysics*, where the introduction, written by Kincaid, presents what should be the nature and scope of naturalist metaphysics, which should be tied into the results and practices of science and that should be judged according to scientific standards. This perspective owes much to Reinchenbach’s notion of a ‘scientific philosophy’, one that uses “scientific methods and results to solve problems arising from science [but] that are roughly philosophical in nature” (Kincaid 2013, p. 2), however what counts as scientific methods and scientific results shall not be determined, in this new scientific metaphysics, by a semantic demarcation criterion between science and non-science as “that would reintroduce an unwanted and unwarranted *a priori* foundationalism” (Kincaid 2013, p. 4), alerts the historically aware philosopher of science. A pragmatic criterion would be preferable, something provided by justified and well-established institutional norms or ‘error filters’, such as “requirements for rigorous peer review before claims may be deposited in ‘serious’ registers of scientific belief, requirements governing representational rigour with respect to both theoretical claims and accounts of observations and experiments, and so on” (Ladyman & Ross 2007, p. 28). Thus science has no domain restrictions. Any rational activity that pursues objective truth about the world, as long as it respects the institutional error filters, may be characterized as science. And I believe this is why metaphysics, in this perspective, may also be considered part of science.

It should be noted though that, despite this pragmatic openness to different forms of science, there is a 'methodological' constraint that any metaphysical proposal should respect in order to be considered good science, one that establishes a (reductionistic) principle of *physics primacy* towards any other special science, physics being the fundamental science to which any other scientific hypotheses should conform to⁴.

But to sum it clearly and using the words of Harold Kincaid, the adopted version of naturalism or scientific metaphysics presupposes two main features:

"1) an extreme scepticism about metaphysics when it is based on conceptual analysis tested against intuition, and about any alleged a priori truths that such intuitions and analyses might yield; and

2) the belief that scientific results and scientific methods can be successfully applied to some problems that could be called metaphysical." (Kincaid 2013, p. 3)

This strong and, to some extent, dogmatic conception of a "scientific metaphysics" thus excludes most contemporary metaphysicians and philosophical work, not only in the analytic tradition but also in other traditions. In France, for instance, Claudine Tiercelin - recently elected to the chair of "Métaphysique et Philosophie de la Connaissance" at the highly regarded Collège de France, starting with lectures on "The Metaphysical knowledge of Nature" and publishing, in 2011, a book named *Le Ciment des choses: Petit traité de métaphysique scientifique réaliste* - adopted a "realist scientific

⁴ The more precise formulation of the Primacy of Physics Constraint (PPC): "*Special science hypotheses that conflict with fundamental physics, or such consensus as there is in fundamental physics, should be rejected for that reason alone. Fundamental physical hypotheses are not symmetrically hostage to the conclusions of the special sciences.*" (Ladyman & Ross 2007, p. 44) And this constraint is a consequence of the naturalistic constraint expressed by the already mentioned PNC, in the previous note.

metaphysics” of a different kind, inspiring herself in the pragmatist traditions of Peirce’s “scientific metaphysics”⁵ and Putnam’s late version of “[natural, pragmatic or common sense] realism”⁶. Although valuing and integrating science’s results and methods, which cannot be ignored by a serious practice of (scientific) metaphysics, Tiercelin conjointly points to the dangers of sinking into an extreme deference to science, or to ‘scientism’, as defined by Susan Haack in “Six signs of scientism”⁷: “a kind of over-enthusiastic and uncritically deferential attitude towards science, an inability to see or an unwillingness to acknowledge its fallibility, its limitations, and its potential dangers”. I shall invoke those ‘six signs’ now:

1. *Using the words “science,” “scientific,” “scientifically,” “scientist,” honorifically.* Instead of being descriptive terms, they are used in order to bring some epistemic prestige to the activity or perspective that is assumed as “scientific”;

⁵ In the words of Albert Atkin: “Peirce’s metaphysics, commonly labeled “scientific metaphysics,” attempts to explain the reality of the phenomenological categories and of the methods and principles of inquiry as expounded in the normative sciences. (...) Peirce’s pragmatism means that he is at odds with this kind [the one conducted by a priori reasoning] of metaphysical endeavor. Since a concept’s meaning relies upon its practical bearings, and the bulk of a priori metaphysics make no difference to practice or experience, the bulk of a priori metaphysics is meaningless. Again, this is similar to the verificationist’s anti-metaphysical arguments, but where the logical positivists take this to mean the death of metaphysics, Peirce takes this to mean that a worthwhile metaphysics must be scientific, fallible, cautiously approached, and sub-ordinate to logic.” (Atkin 2005). Also see (Nubiola 2012): “Haack adds —and I firmly agree with her— that it would be a misunderstanding to think of Peirce’s aspiration to make philosophy scientific in a scientific or reductionist way: ‘Peirce expressly denies that philosophical issues could be resolved within, and certainly never suggests that philosophy ought to be replaced by, the natural sciences’.”

⁶ Although committing itself to a sophisticated account of scientific realism and, particularly, defending dispositionalism (*dispositional realism*). See (Tiercelin 2011, particularly chapter 4).

⁷ The paper was delivered as an oral presentation at a conference on *Traditions and Contemporary Culture* at Beijing Normal University in 2009, later translated and published as a chapter or a foreword to other Haacks’ books.

2. *Adopting the manners, the trappings, the technical terminology of the sciences, irrespective of their real usefulness.*

As if the mere use of these technicalities would make any research more objective or more efficient [the social sciences, psychology and even some philosophy have (sadly) often taken this step];

3. *A preoccupation with demarcation, i.e., with drawing a sharp line between genuine science, the real thing, and "pseudo-scientific" imposters.*

A point that may certainly be linked with the first 'sign', since clearing up what's actually science and what just feigns it to be reveals the belief that science is the only true way to produce knowledge;

4. *A corresponding preoccupation with identifying the "scientific method," presumed to explain how the sciences have been so successful;*

5. *Looking to the sciences for answers to questions beyond their scope; this happens not only with philosophical (metaphysical) questions but also to issues (of a judicial, political or artistic nature) that not only involve ethical or aesthetical considerations but demand a kind of deliberation that cannot be a scientific decision [that is not to say that scientific expertise won't be helpful to provide an enlightened decision, just that it is not enough to produce a decision]; finally,*

6. *Denying or denigrating the legitimacy or the worth of other kinds of inquiry besides the scientific, or the value of human activities other than inquiry, such as literature or art or even other systems of practical knowledge.*

In their project for a 'scientific metaphysics', Ladyman, Ross and Kincaid argue in a well-reasoned and sophisticated fashion for their own version of 'scientism', one that avoids some of the errors and shortcomings of previous naïve versions.

Notwithstanding, in one way or another their 'scientific philosophy' doesn't elude a more traditional label of 'scientism', which is evident in the obvious asymmetry between science and other forms

of inquiry, namely metaphysics, possible if and only if it is 'scientific'⁸ (which here is also a characterization that confers epistemic praise).

3. Dangers of defective or excessive mutual acquaintance

This strong view is not just a rare or extreme radicalization among contemporary philosophers of science, although it is by no means consensual. There are other philosophers (Maudlin 2007), particularly those with (post-quinean) naturalistic views, who defend an *a posteriori* metaphysics (see Mumford 2008, p. 33) one that would be no longer a 'first philosophy' (as it was for Aristotle or Descartes), but a 'second philosophy' (Maddy 2007), a continuous, more abstract, extension of science, as if it was its 'handmaiden', one that would eventually provide a reinterpretation of the main findings of empirical science and would help to understand and to integrate the new explanations in a unified and coherent scientific view of the world.

To be fair, this position is often motivated by its extreme opposite, where metaphysicians consider doing something that is epistemologically prior to science and immune to the tests of experience, claiming sometimes to occupy themselves *only* with what is *metaphysically possible* or *metaphysically necessary* (Conee & Sider 2005, p. 203)⁹ and not, necessarily, with what *actually* exists.

⁸ Again, according to this view: "Any new metaphysical claim that is to be taken seriously should be motivated by, and only by, the service it would perform, if true, in showing how two or more specific scientific hypotheses jointly explain more than the sum of what is explained by the two hypotheses taken separately, where a 'scientific hypothesis' is understood as an hypothesis that is taken seriously by institutionally bona fide current science." (Ladyman & Ross 2007, p. 30)

⁹ "...metaphysics is about the most explanatorily basic necessities and possibilities. Metaphysics is about what could be and what must be. Except incidentally, metaphysics is not about explanatorily ultimate aspects of reality that are actual, but need not have existed. Metaphysics is about some actual things, only because whatever is necessary has got to be actual and whatever is possible might happen to be actual. This allows us to say that physics pursues the question of what the basic constitution of reality actually is, while metaphysics is about what it must be and what it could have been." (Conee & Sider 2005, p. 203)

So, metaphysics would not be involved with empirical contingencies, but only with abstract and conceptual intuitions, *a priori* knowledge concerning questions of metaphysical modality, of what *could* be and what *must* be. In this way distinguishing itself from science, which is solely concerned with the (contingent) way things actually are, metaphysics would not be competing with science and would have earned a kind of epistemological domain and autonomy. The cost of this autonomy, though, is that it may become irrelevant and easily produce vain, esoteric and otherworldly inquiries like: *is there a new object that is brought into the world, namely a fist, when I simply bend my fingers and my hand into one? Are two roads that merge for a while one road or still two roads? Or are rabbit-like distributions of fur and organs at a time rabbits or just temporal parts of rabbits?* (Examples reported in Callender 2011, p. 38) Similar speculative and bizarre questions have in the past earned a bad reputation to scholastics and it is certainly why some philosophers, like Ladyman & Ross, abhor what they now call a “neo-scholastic metaphysics”. And often the results of such undeterred speculation overlook warranted scientific facts and explanations that would easily contradict them, risking themselves to become ridiculous or superfluous.

It seems to me that neither position is desirable. A metaphysics that immodestly ignores science (or other forms of serious inquiry about the actual world) and proudly takes refuge in an elaborated constellation of possible (and sometimes bizarre) worlds or an esoteric set of unresolvable and superfluous questions will become a frivolous intellectual exercise and an irrelevant form of inquiry.¹⁰

A metaphysics that is extremely deferential to science, limiting itself to give some help in the interpretation of scientific discoveries and theories and become a subsequent commentary or a footnote to science would only have a residual epistemic role.

¹⁰ Metaphysical modality is not immune to the test of actual empirical reality.

In an alternative and more moderate position, one philosopher, Thomas Hofweber, defends an “ambitious, yet modest, metaphysics” (Hofweber 2009), that would have an exclusive domain of inquiry but where philosophy should have the modesty of not claiming authority to overrule the results of the sciences - for instance to avoid concluding, in ontological issues, that, metaphysically, there are no such entities that, in fact, are immediately implied by confirmed scientific theories – such modesty sounds pretty reasonable. Nevertheless, when it comes to delineate the promised metaphysical domain, this modest metaphysics, according to his proponent, should settle for the questions that were left unanswered by the sciences (p. 284). Despite the apparent charitable nature of this moderate position, it has the same pernicious consequence of relegating metaphysics to a residual role, relative to science. Moreover, it fails to provide a positive set of questions that would embody an autonomous metaphysical domain.

4. An inclusive disjunction

From what has been said, it seems now obvious that metaphysics should neither arrogantly ignore or overrule science – metaphysics is not the “queen of the sciences” - nor submit to it uncritically and wane itself behind its glorious achievements, particularly, when their subject matters overlap. Metaphysics is, of course, not just an inquiry about nature – it concerns itself with those very general and abstract questions like identity, personhood, the nature of freedom, existence or modality, questions about which science is not busy with – but it is also about the laws of nature, the natural kinds, causation, the nature and structure of fundamental reality, matters that obviously penetrate the core of science. How, then, to properly address the relationship between science and metaphysics when their paths are crossed?

Instead of being (asymmetric) rivals, I believe there should be some sort of balanced - and certainly sometimes therapeutic -

complementarity between the two distinct domains. They are different intellectual practices but working towards a similar goal: a better understanding and a deeper knowledge concerning the nature and structure of the world. Science has a large variety of methods that have been proven to be quite effective at delving deeper into the structure of matter and reach further in the history and spectrum of the universe, and being able to make systematic predictions and to provide explanations to new facts. Nevertheless, it often works on unstated assumptions and concepts that need to be clarified and revealed, in order to provide a better understanding on the perspective that it assumes and how future discoveries shall be interpreted according to it. Recent metaphysics of science claims, for instance, the responsibility to produce what they call 'system building', which consists in building ontological systems that account for the several concepts used in science and that underpin the entire body of scientific statements (Mumford & Tugby 2013, p. 5 and also Stroll 2012, pp. 215-18). Moreover, as far as science goes deeper and further in the nature of the cosmos and matter, the findings tend to be rather counter-intuitive and frequently devastating not only towards the common sense picture of the world but even towards previous and parallel scientific views. Metaphysics should work harder on these results to produce, neither a domesticated nor a popular or commonsensical translation of the scientific explanations, but a better, more unified picture of the world, that would even serve scientific cohesion and integration. For this, it has, of course, to be properly informed about science and, why not, work together with scientists.

But metaphysics is only a science in the general sense of aspiring to better knowledge about reality.

It is not a special science in the modern institutional understanding of the word, it doesn't have to mimic scientific mannerisms nor use its methods, as if it was the only way to produce objective and reasonable results.

It shall of course be rational, logical, rigorous and precise in its concepts and inferences, but also needs to be creative, even speculative and intuitive, in a “context of discovery” (to use a once popular expression in philosophy of science), to produce new concepts and new possible explanations. Still, these shall certainly be subjected to properly rigorous and well-reasoned analysis that would prove them to have the expected intellectual virtues of empirical adequacy, simplicity, novel predictions, unification and consilience (Callender 2011, p. 46) that makes it an epistemically worthy enterprise. So, there is an *a priori* aspect of metaphysics insofar as it must resort to intuitions and conceptual analysis, but also an *a posteriori* aspect, as it should ultimately be empirically informed and adequate. *A priori* intuitions and conceptual analysis are not unwarranted as sometimes is argued but ultimately based on a philosophical tradition and a collective practice of rational debate, revisability and intellectual development.

One of the challenges for the 21st century would then be to find a balanced mutual acquaintance between metaphysics and science and I believe that completing this task may hopefully avoid the nefarious consequences of four excessive attitudes: the disdain of science by arrogant philosophers – it has not been rare, particularly during the second half of the XXth century, to read ferocious rants against scientific discoveries and applied science (confusing it often with the political or ideological use of technology) -, the philistinism of overconfident and oblivious scientific practices – often confusing metaphysics with a pre-scientific view of the world, a subjective, vague and unwarranted discourse that leads nowhere or, even worse, a sort of magical thinking or otherwise ignoring that an important amount of scientific concepts and inferences grow on metaphysical assumptions -, the scientism of “naturalized metaphysics” - with all the prejudice and dogmatism we abundantly noticed - or the undeterred speculative impulse of some theoretical scientists – mesmerized by their beautiful and complex mathematical structures and models.

References:

- Atkin, A.** (2005) "Charles Sanders Peirce: Architectonic Philosophy" in *Internet Encyclopedia of Philosophy*, ISSN 2161-0002, <http://www.iep.utm.edu/peircear/#SH3c>, accessed 29-11-2013.
- Ayer, A. J.** (1971) *Language, Truth and Logic*, London – New York: Penguin Books.
- Bird, A.** (2007) *Nature's Metaphysics: Laws and Properties*, Oxford – New York: Oxford University Press.
- Callender, C.** (2011) "Philosophy of Science and Metaphysics" in French, S. & Saatsi, J. (Eds), *The Continuum Companion to the Philosophy of Science*, London & New York: Continuum International Publishing Group, pp. 33-54.
- Conee, E. & Sider, T.** (2005), *Riddles of Existence: A Guided Tour of Metaphysics*, Oxford: Oxford University Press.
- Haack, S.** (2009) "Six Signs of Scientism", an oral presentation at the conference *Traditions and Contemporary Culture* at Beijing Normal University, available online <<http://www.uta.edu/philosophy/faculty/burgess-jackson/Haack,%20Six%20Signs%20of%20Scientism.pdf>>
- Hofweber, T.** (2009) "Ambitious, Yet Modest, Metaphysics" in Chalmers, D., Manley, D. and Wasserman, R. (Eds.) *Metametaphysics: New essays on the foundations of ontology*, Oxford – New York: Oxford University Press, pp. 260-289.
- Hume, D.** (2007) *An Enquiry Concerning Human Understanding*, Edited with an Introduction and Notes by Peter Millican, Oxford World's Classics, Oxford: Oxford University Press.
- Ladyman, J.** (2007) "Ontological, epistemological and methodological positions" in Kuipers, T (ed.) *General Philosophy of Science: Focal Issues*, Handbook of the Philosophy of Science, Amsterdam & London: Elsevier B. V., pp. 303-376.

Ladyman, J., Ross, D. et al (2007) *Every Thing Must Go – Metaphysics Naturalized*, Oxford: Oxford University Press.

Le Poidevin, R., Simons, P. et al (eds.) (2012) *The Routledge Companion to Metaphysics*, London & New York : Routledge Taylor and Francis Group.

Kincaid, H. (2013) “Introduction: Pursuing a Naturalist Metaphysics” in Ross, D., Ladyman, J. & Kincaid, H., *Scientific Metaphysics*, Oxford: Oxford University Press, pp. 1-25.

Mumford, S. (2008) “Metaphysics” in Psillos, S. & Curd, M. (Eds), *The Routledge Companion to Philosophy of Science*, London – New York: Routledge Taylor and Francis Group, pp. 26-34.

Mumford, S. & Tugby, M. (2013) “What is the Metaphysics of Science?” in Mumford & Tugby (Eds.), *Metaphysics and Science*, Oxford: Oxford University Press, pp. 3-27.

Nubiola, J., (2012) “What a scientific metaphysics really mean (according to C. S. Peirce)” an oral presentation given at the *First European Pragmatism Conference* at Università Roma Tre.

Ortoli, S. & Pharabod, J.-P. (2011) *Métaphysique Quantique: Les Nouveaux mystères de l’espace et du temps*, Cahiers Libres, Paris: La Découverte.

Quine, W. V. O. (1963), “Two Dogmas of Empiricism” in *From a Logical Point of View*, 2nd edition revised, New York – Hagerstown: Harper & Row Publishers.

Seager, W. (2001) “Metaphysics, Role in Science” in Newton-Smith, W. H. (Ed.) *A Companion to the Philosophy of Science*, Blackwell Companions to Philosophy, Malden, MA – Oxford, UK: Blackwell Publishers Ltd., pp. 283-292.

Smolin, L. (2006) *The Trouble with Physics: The Rise of String Theory, The Fall of Science and What Comes Next*, Boston – New York: Houghton Mifflin Company.

Stroll, A. (2012) “Metaphysics revified” in Le Poidevin, R., Simons, P. et al, *The Routledge Companion to Metaphysics*, London & New York : Routledge Taylor and Francis Group, pp. 209-218.

Tiercelin, C. (2011) *Le Ciment des Choses – Petit traité de métaphysique scientifique réaliste*, Science & Métaphysique, Paris : Les Éditions d’Ithaque.

Este Livro foi impresso em Lisboa,
Em Abril de 2016, pela VASP DPS
Miolo: 354 páginas / papel IOR 80g / 16x23cm.
Capa: Cartolina 300g / Plastificação mate.
Acabamento: colado com PUR.
Principais Letras utilizadas:
Palatino Linotype / Bookman Old Style

The Second Lisbon International Conference on Philosophy of Science, **Philosophy of Science in the 21st Century – Challenges and Tasks**, took place at the Faculty of Sciences of the University of Lisbon, Portugal, in December 4th to 6th, 2013. The conference was intended to identify and to discuss the main problems, questions and research lines that Philosophy of Science faces today or will be forced to face in the near future."



CFCUL
Centro de Filosofia das Ciências
da Universidade de Lisboa
<http://cfcul.fc.ul.pt>



Fundação para a Ciência e a Tecnologia
MINISTÉRIO DA EDUCAÇÃO E CIÊNCIA

ISBN 978-989-8247-72-8



9 789898 247728