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An introduction to a metaphysics of nature: Representation, realism and scientific laws

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To cite this version:

Ricardo Batista Dos Santos, Daniel Laskowski Tozzini. An introduction to a metaphysics of nature: Representation, realism and scientific laws. Transversal: International Journal for the Historiography of Science, 2016, 1, 10.24117/2526-2270.2016.i1.14 . halshs-01631005

HAL Id: halshs-01631005

https://shs.hal.science/halshs-01631005

Submitted on 11 Jan 2018

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Transversal
International Journal for the Historiography of Science

Transversal: International Journal for the Historiography of Science, 1 (2016) 120-124
ISSN 2526-2270
www.historiographyofscience.org
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Book Review

Ghins, Michel. *Introdução a uma metafísica da natureza: Representação, realismo e leis científicas* (*An introduction to a metaphysics of nature: Representation, realism and scientific laws*). Transl. Eduardo Barra e Ronei Clécio Mocellin. Editora UFPR, 2013. 96 pp. R$ 35,00 – ISBN- 9788565888356.

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Received: 28 June 2016. Reviewed: 04 October 2016. Accepted: 16 November 2016

Michel Ghins is a well-known Belgian philosopher of science who works for several years in Brazil, in the eighties. He also works in the University of Pittsburgh, in the Catholic University of America and in the Catholic University of Louvain (Belgium), in which recently he became emeritus professor. Over the years he published a variety of subjects in philosophy of science, many of them related to the defence of scientific realism.

The book now under review is the result of a series of lectures prepared for the first edition of the *Paranaense School of History and Philosophy of Science* (*Escola Paranaense de História e Filosofia da Ciência*), accomplished in 2011 in the Federal University of Paraná (UFPR), Brazil, in which the author delivered the main course. The original notes in french were translated into portuguese by the professors Eduardo Barra and Ronei Clécio Mocellin, both from UFPR, allowing the publication of the lectures.

In the book, professor Ghins discusses concisely many of the main themes and problems that have been debated in contemporary philosophy of science: the nature of representations, theories and scientific laws; the truth of scientific theories; scientificity criteria; the nature of causal explanations; the existence of laws of nature, among other subjects. For this reason, the book is an excellent resource for undergraduate students, and also graduate students who intend to get acquainted with the current issues of philosophy of science. But not only for them. The book is also interesting for specialists, since it presents an overview of the Ghins's academic career, bringing one of the most matures versions of scientific realism that he defended over the past few years, in debate with several recognized contemporary philosophers of science, as Bas Van Fraassen.

One of the topics that stands out in Ghins's book is the subject of scientific laws. This is a well-established theme in philosophy of science. It is notorious that scientific theories of several fields make

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use of propositions that have a nomological form, or, in other words, take the form of *laws*. This is often the sense when we speak about laws of economics, biology, chemistry or physics. They are called scientific laws. But what characterize these laws? What is its distinctive features? It is not hard to see that a scientific law generally takes the form of a universal proposition: "all metals dilate when heated." Sometimes it takes the form of some necessity: "this or that always happens in certain conditions." Put simply, one could say that a scientific law is a universal proposition supposedly true. There would be no problem with this characterization if we could clarify unequivocally the criterion of truth of these laws. What would justify the supposed truth of this universal statement? How could someone reach the conclusion about the truth of this universality?

Undoubtedly, this is an old question in philosophy of science and lead us back to the famous problem of induction. The universal statements would be inferred from observed regularities of particular instances. If we watch the sun rise for many times, from these observations we conclude the Sun always rises or the Sun will rise tomorrow. If we observe metals, of varied types, dilating in the presence of heat, from these observations we conclude all metals expand in the presence of heat. The universal propositions would be founded on inductive inferences. However, David Hume showed that these inferences are unjustified from a logical point of view. Specifically, he showed that what we call *cause* cannot be empirically perceptible. From this perspective, it follows that the criterion of truth of these universal propositions is seriously compromised. In fact, scientific laws are universal propositions, but the criterion of truth of this universality cannot be justified by induction.

The recognized problem of induction led contemporary philosophers of science to seek a more satisfactory characterization of scientific laws. Initially, it was considered to abandon the search for a criterion of truth of the nomological statements. Scientific laws would be only universal propositions based on observed regularities in nature. End point. In order to characterize these laws, it would not be necessary to establish the truth of those propositions. The problem with this conception is there are universal propositions based on observed regularities that do not have the status of scientific laws. For example, "all crows are black." It is a universal proposition based on a regularity of nature that does not figure as law in any scientific theory. In *Conterfactuals* (1973), David Lewis sought to solve this problem defending an additional nomological criterion: a universal proposition is a scientific law only if, besides having a universal logical form, it also belongs to an axiomatic system. However, there are only few theories axiomatized in the way Lewis suggests, and there are others not even axiomatizable. Bas Van Fraassen called this difficulty in characterizing the scientific laws as "the identification problem": the difficulty in identifying, among the universal statements, which of them are scientific laws and which are not. On the other hand, in *What is a Law of Nature* (1983), David Armstrong held that it is possible to establish the necessity of scientific laws without resorting to induction or axiomatization, approaching the formulation of these laws to the way we construct the general terms of language. But Van Fraassen, again, showed that the relation of necessity between universals does not trivially imply a relation of necessity between individuals and, therefore, that approach creates another problem: “the inference problem", as he called. Faced with these problems, Van Fraassen proposed a radical solution: abandoning the notion of scientific laws, replacing it by an approach that focuses mainly on "scientific models".

Michel Ghins did not agree with Van Fraassen’s suggestion. Although he has consented with several of his criticisms about the characterizations of scientific laws, he could not agree with the elimination of this notion. And mainly due his commitment with "scientific practice". If we take into account the actual practice of science, we could never consider abandoning the notion of laws, which is so rooted in this practice. But what is the alternative proposed by Ghins? For the Belgian philosopher, a scientific law can be properly identified if it is considered as a proposition of universal logical form, true (at least approximately), integrated in an explanatory and empirically successful scientific theory. Throughout his book, Ghins explains, in detail, each aspect of this conception of scientific laws. He defines precisely what is a "scientific theory", what is an "explanation", what is an "empirically successful" theory and, finally, he presents his characterization of laws. However, unlike Van Fraassen's approach (who is an instrumentalist), all Ghins's delineation of science and scientific laws is based on the foundation of realism, or rather, on the possibility of defending the truth of scientific theories. The greatest challenge of the book is to support this foundation.

It is possible to present Ghins's book from two main the theses. The first thesis holds that our best scientific theories can be considered true (at least approximately) – a realist thesis called "fallibilist realism", by the author. It is a kind of moderate realism, since the truth of these theories can be admited as partial and our beliefs as revisable, conceding that not everything in the theories is true, and that not every theory is true (only the "best"). Despite these caveats, we would have reasons to believe in the truth, at least approximately, of these "best theories". The second thesis argues that we have good reasons to believe that scientific laws contained in our best theories can be regarded as genuine *laws of nature*. And this is the moment when Ghins exceeds the borders of the empiricist philosophy that dominates the most part of this research field, and enters in the territory of metaphysics, building a neoaristotelic ontology of dispositional properties to support his thesis. Although, as it was said, these arguments are not new in Ghins's work, they are offered now inserted in a broader framework of the scientific enterprise and, in addition, they bring an original and unpublished argument about the truth of scientific theories, which - as the author tells us - is not based on the acknowledged "miracle argument".

Scientific realism was often defended as the most natural opinion about the truth of scientific theories, and the closer to common sense. When we observe fire and heat always in conjunction, we theorize the former as the cause of the latter, and we believe in the truth of this theorization. Similarly, we tend to believe in the truth of scientific theories. But scientific realism is surrounded by several problems, as shown by Ghins, which drives the emergence of his anti-realist opponents. From Ghins's presentation it is possible to surmise three significant problems faced by realists: (1) the problem of "underdetermination of theory by empirical data": it may occur that there are several competing theories, all with high degrees of empirical adequacy, which prevent us from evaluating which of them would be true, or even if any of them would be true; (2) the problem of "loss of reality": a scientific theory is a theoretical model expressed by an abstract mathematical system, and, thereby, could not be considered a legitimate representation of reality; and (3) the problem of "unobservables": many theoretical models postulate the existence of entities that are not empirically perceivable (such as "molecules", "electrons", "viruses" etc.) and, however, there must be a good reason to believe this entities should be regarded as existing. Any realist who intend to defend its position needs to offer an account of these problems and this is exactly what Ghins tries to do.

Three pillars support the arguments used by Ghins to defend his realist theses and to provide an answer to the problems listed above. The first pillar is a particular conception of scientific theories, which links the so-called "syntactic" and "semantic" conception of theories. We can understand the *syntactic* or *logician* conception of scientific theories as a system of propositions axiomatically organized. On the other hand, we can understand the *semantic* conception as a set of *models* of phenomena. The Belgium philosopher, in turn, develops the "synthetic" conception, which interpret the scientific theories as a set of models *and* propositions satisfied (i.e., made true) by these models. It may be considered that the benefit of this synthetic conception is the contribution in solving the problem of *underdetermination*, since the acceptance of a theory is no longer an exclusive matter of "empirical adequacy", incorporating an additional criterion of "explanatory power", which is provided by causal explanation models – a legacy of the semantic tradition. The adoption of this semantic element in his own conception, however, forces Ghins to deal with two problems underlying that theory conception: the problem of "loss of reality" and the problem of "unobservables", both mentioned earlier. Comes into play here, the second pillar supporting the Ghins's theses: the admission of a particular conception of truth as correspondence between language and the world.

Ghins argues that it is possible to accept a conception of truth as correspondence without committing with any theory of correspondence, in which the exact nature of correspondence would be explicit (as Wittgenstein tried to do in the *Tractatus*). The acceptance of this conception of truth, in association with his synthetic conception of scientific theories, allows him to give an answer to the problem of "loss of reality". The contact point between reality and scientific theories is not held by abstract mathematical models (which cannot be representations of phenomena), but through propositions of language. That is why Ghins needs also the legacy of *syntactic* model: if scientific theories are, likewise, a set of propositions, these very propositions guarantee the contact between the theories and the world. "The reality is found again," says the philosopher, "for the simple reason that it had never been lost" (p.39).

The third pillar of support for Ghins's theses is also the most original argument of this work, according to the philosopher. This argument defends the truth (at least approximately) of scientific theories

from an analogy, or a parallel with the ordinary experience. This argument will be call here "argument of converging results" (which must not be confounded with "convergent realism"). In this argument, Ghins holds that we can believe in the reality of unobservable entities postulated by theories, as well in the approximate truth of the theories themselves, for similar reasons by which we believe in the existence of the observable objects. We use many independent resources to defend our belief in the existence of sense entities: not only observation and its reiteration, but also intersensoriality and intersubjectivity. This is the case, for example, when we see the presence of a bee in a room both by sight and hearing, and by reiterated testimony of others. The variety of these independent resources and the convergence of their results do not guarantee the absolute certainty of conclusions, but greatly increase our belief in the reality of these entities. Similarly, scientific research frequently does not have only one method for measuring a property such as mass or charge of a particle, but several. These methods, supported by various theories, stemming often from distinct fields, can provide results that converges to the same conclusion. This is observed, Ghins advocates, with entities we call "molecules", "electrons" and "virus", among others. According to the philosopher, the merit of this argument is it does not rely on the well known and much criticized "miracle argument" to defend scientific realism, and it provides adequate basis for the defence of truth of scientific theories.

From these three pillars of support, Ghins offers his conception of scientific laws. First, he shows that the conceptions of scientific laws that he called "regularist view" (Lewis) and "necessitary view" (Armstrong) fail to provide an appropriate criterion of identification of laws. Then, he defends a conception of scientific laws in which they would be universal propositions satisfied (made true) by regularities in nature and being part of explanatory and successful scientific theories. Although it doesn't seem very clear in the book, one can assume, however, that these scientific laws are considered true by being part of a scientific theory whose truth can be judged (by the method of "converging results", which was presented above). Thus, it becomes feasible to maintain scientific laws can be identified, since they would be true universal propositions embedded in explanatory scientific theories that are also true (or at least approximately true).

The Belgian philosopher could be satisfied at this point. He already offered an answer to the main problems of realism and grounded the thesis of the truth of scientific theories and identification of scientific laws. However, it is not the case. His conception of laws does not deal with one of the central problems in the analysis of scientific practice. The problem of "counterfactuals" in science. All metals expand when they are heated. If there is no expansion, then the metal was not heated. The problem with this kind of logical inference, largely used in scientific practice, is that it cannot be justified unless you could defend the "necessity" of scientific laws. However, the first of Ghins's thesis (the truth of scientific theories) is not able to guarantee this necessity. When we admit that scientific laws can be true propositions, the true here is only in the descriptive level and not at the modal one. That is to say, there is no guarantee that observed regularities *in* nature, on which nomological propositions are based, are really regularities *of* nature. There is no guarantee that nature is, in fact, regular. In other words, there is no guarantee that may actually exist "laws of nature", whereby the counterfactual inferences could be justified. Thus, it is here that Michel Ghins introduces his second thesis (scientific laws can be regarded as laws of nature), making use of a metaphysical argument: there is "dispositional properties" or "causal powers" in nature. In the last section of the book he argues that, although we have no definitive empirical evidence, we have "good reasons" (actually four reasons) to believe in the existence of "causal powers" in nature (p.86-90). But the reader must evaluate this reasons for himself in the book. In this review, it is only convenient to said that if scientific laws can be identified and considered true, and, if there are indeed laws of nature, it follows that "the scientific laws [of our best theories] deserves fully be called 'laws of nature'" (p.90).

Like every bold proposal, the book presents some gaps and questionable points, but also many merits. One of them, for example, is the author's persistent assumption of faithfulness to scientific practice. Most of the ideas proposed by Ghins, besides contribute for resolution of various problems, are consistent with effective scientific practice. The philosopher does not ignore what scientists actually do when he makes his analysis of the scientific enterprise. Another issue worth mentioning is the original argument about the truth of scientific theories, which undoubtedly will join the other realist arguments already known. An interesting aspect for future research is to investigate the soundness of this argument here called Ghins's "argument of converging results".

Regarding possible gaps and questions in the work, we cannot fail to notice, though superficially, at least two points. The first is the ambiguous idea of "approximate truth", which rarely gets a better delineation from moderate realists, and Ghins is not an exception to the rule. Clearly, the realist thesis of the professor depends on this idea, and the absence of a more precise clarification makes unlikely to draw a distinction between the fine line that supposedly separates an "approximate truth" from a "falsity".

The second point, however, seems to us more intriguing. Even though Ghins has already defended this neoaristotelic metaphysics of nature in other works, it persists a certain strangeness by a somewhat paradoxical combination of a metaphysic proposal of nature coined to respond problems mostly raised by empiricist philosophers. In fact, the existence of regularities of nature is a problem for an empiricist, not for a metaphysician. Several philosophers and scientists of modern age, for example, never had a great trouble believing in the existence of necessities in nature, since they had their own metaphysics to support it. Only with the emergence of a more strictly empiricist philosophy, the justification for this belief has become problematic. Therefore, the question is: what value has Ghins metaphysical answer to the problem of truth-makers of the counterfactuals, since this problem arises especially among the more radical empiricist philosophers who reject these metaphysical explanations? On the other hand, what value has Ghins's proposal for metaphysicians, since numerous other metaphysical conceptions could likewise offer an answer to the problem? The main question would not be, thus, if we are facing a "good or bad metaphysics", as Ghins inquired in the last section of his book. It's seems that the main question would be if "it is admissible or not a metaphysics" in search of an answer to the problem of counterfactuals and regularities of nature.

Acknowledgements and final considerations

After completing this review Professor Michel Ghins clarified, in personal correspondence to Ricardo Santos, that a metaphysics is good when we have "reasons derived from experience to believe in it". It is in this sense – it is possible to realize now – that he tries to respond problems that arise especially for empiricist philosophers. Not because he believes that all legitimate cognitive content should come from experience, as the most radical empiricists believe, but because he seeks to formulate a metaphysics that does not ignore empirical evidence, that is, which is as close as possible to the empirical evidence available to us. Furthermore, it is important to thank professors Eduardo Barra and Michel Ghins by revisions and contributions to this review.