

Research Article

What is the place of naturalistic philosophy in the doing of science? Implications for the teaching of science

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In general, naturalistic philosophy deals with concepts that relate to the world as expressed in natural language, as it has evolved from a finite stock of root words substantially derived (in European languages) from Latin and Greek. In that sense naturalistic philosophy occupies an intermediate position between natural language and the appropriation of that language for uses in science. Our aim is to show that naturalistic philosophy is neither dead, nor is it to be found residing exclusively in a separate discipline named “philosophy of science”. We maintain that although science and naturalistic philosophy have some methodologically distinct aspects, when properly described, science *includes* naturalistic philosophy. Naturalistic philosophy is entailed in activities from conceptualisation and theorisation, to interpretation of the products of science. We provide examples of the process of argumentation said to characterise naturalistic philosophy, as an integral part of the work of eminent scientists. This more complete view of what constitutes the doing of science has implications for the teaching of science, suggesting that at least some emphasis is required on the conjectural and creative aspects of science, as well as the purely methodological.

The following document is part of the introduction to an article that was accepted for publication in *The International Journal of Interdisciplinary Educational Studies* on 1st May 2023.

This selected part of the article addresses some (but by no means all) of the issues that have been raised by Qeios reviewers to an earlier version. Further clarification is made in the version of the article accepted for publication (and “in the Press”).

The specific issues that are addressed below are about (a) the definition of naturalistic philosophy, (b) our perceived neglect of various important figures in the philosophy of science and (c) our selection of

various scientists and philosophers as relevant to the discussion of the place for naturalistic philosophy in the doing of science.

Keywords: Naturalistic philosophy, intelligibility of science, phenomena, complementarity, Bohr-Heisenberg debate, science education.

In the search for a harmonious attitude towards life, it must never be forgotten that we ourselves are both actors and spectators in the drama of existence. (Niels Bohr, 1948, p. 318)

Introduction

Until the 1830s, people like Darwin were known as natural philosophers. A categorical schism had its origin in 1833 with the coining, by William Whewell, of the name “scientist” to describe members of the British Association for the Advancement of Science (Henig, 2001)¹. Thenceforth, the task of scientists changed from the systematic elucidation of an underlying divine plan, to the solving of a secular puzzle (Henig, 2001). The debate surrounding this ostensible schism has persisted, metamorphosed, and reemerged in various guises and contexts since that time.

According to Papineau (2021) the term “naturalism” does not have a precise meaning in contemporary philosophy. Much of its current usage derives from debates in America in the early 20th century. The “naturalists” from that period included Dewey, Nagel, and Hook, who aimed to align philosophy more closely with science. They held that reality is exhausted by nature, containing nothing “supernatural”, and that the scientific method should be used to investigate all areas of reality, including the “human spirit”.

As we use the terms *naturalism* or *naturalistic philosophy*, they should not be mistakenly conflated with attempts to demarcate science from metaphysics, which preoccupied a large number of positivist philosophers of science in the 20th century, including Carnap, Popper, Neurath and Ayer (Critchley, 2001).

We avoid restricting ourselves to very specific definitions of what constitutes naturalism or naturalistic philosophy. In general, as we shall use the term in this article, naturalistic philosophy

deals with concepts that relate to the world as expressed in natural language, as it has evolved (in English and some other European languages) from a stock of root words derived, to a considerable degree, from ancient Latin and Greek. In that sense naturalistic philosophy, broadly conceived, occupies an intermediate position between everyday use of natural language and the appropriation of that language for specific uses in science.

The distinction we draw between naturalistic philosophy and science, however, is not based on a distinction between natural and scientific language. Naturalistic philosophy relies on a specific kind of argumentation that occurs in the form of dialogue concerning the doing of experiments and their results. The specific form of the dialogue relates to the intelligibility of those experiments and results. The standard for intelligibility is that the topic under consideration can be understood from the perspective of a user of natural language. The justification for this standard is that as users of natural language themselves, scientists have no other means by which to understand what they do and to judge its results. This criterion does not disregard that science has recourse to elaborate tools of mathematics. However, even mathematics requires natural language in its ultimate interpretation.

Our approach resists understanding naturalistic philosophy as the formalisation of language in logical analysis (as it was conceived by members of the Vienna Circle) which attempted to turn scientific language into a technical instrument. That approach belongs to a moment in history when philosophy was being reduced, by some, to technical thinking. It was subsequently asserted by Sellars (1997) that Carnap and the Vienna Circle were seduced by 'the myth of the given', by the idea that words and sentences have a direct relation to an immediately available reality (Critchley, 2001 pp. 103-107) This is of relevance to the Bohr-Heisenberg-Einstein dialogue which we will discuss below.

In the present article we show that naturalistic philosophy is, despite politically motivated historical schisms, still very much alive in the doing of science. Our claim is contrary to assertions by Maxwell (2017) that natural philosophy has died and hence needs to be revived, although we do, at least partly, concur with his unifying vision for natural philosophy and science. Our arguments also share a point of agreement, and a point of difference, with Carin Robinson (2018) who argued that science and naturalistic philosophy are methodologically distinct. Robinson's claim is grounded in the view that science is entirely methodologically experimental; it is to do with testing hypotheses, *a posteriori*. Philosophy is methodologically argumentative, testing the validity of arguments, *a priori*. We have no difficulty with this claim given the specific meaning we attribute to the terms *a priori* and *a posteriori* in what follows.

If doing science is only about doing experiments, it seems to follow, quite logically, that there is no place for naturalistic philosophy in doing science. Robinson's article is an attempted refutation of some recent proposals by philosophers (Maddy, 2009; Papineau, 2014), who maintain that naturalistic philosophy is either already like science, or ought to be like science. Our claim, contrary to these writers, is that the experimental method and philosophical argumentation are complementary, mutually dependent aspects in the doing of science.

Our point of difference with Robinson is as follows. Her focus is on philosophers of science. In a review (Turnbull and Barnard, 2022) of Robinson's article, we suggested that scholars should consider the views and the work of *eminent scientists* who we considered could be taken as examples of doing naturalistic philosophy as part of their scientific endeavour. Rather than taking into account the views of professional philosophers, we took the exemplary/case study approach to illustrate our central claim that naturalistic philosophy is integral to the doing of science. The use of examples is more useful for teaching, and is more readily understood than the complex language of professional philosophers.

We selected theoretical physicists Richard Feynman (1963), Werner Heisenberg (1959) and Niels Bohr (1928, 1948) as examples of scientists who have demonstrated distinctive philosophical approaches in the doing, and in the complementary teaching of science. In the present article we include material concerning these scientists that did not appear in our brief review, as well as discussing contributions of philosopher Ludwig Wittgenstein and political theorist Hannah Arendt insofar as their writings are directly relevant to the argument we wish to present.

We explain the selection as follows: Feynman's (1963) philosophical/educational approach makes use of the distinctive Wittgensteinian concept of the picturability of facts. This approach resonates with Bohr's (1928) notion that 'the phenomena' of quantum physics are picturable representations of quantum objects interacting with instruments of measurement. Heisenberg (1959) provides an example of a philosophical/educational approach to the explaining of physics to students and laypeople. Heisenberg's (1959) philosophical/educational approach contains an answer to the question that Arendt (1958) posed concerning the intelligibility of science from a position outside of science that still to this day requires a response from those within it. Arendt posed the problem of to what extent are the "truths"² of science capable of normal expression in speech and thought (Arendt, p.3). Taken together, this clustering of thinkers enables us to address the question of the intelligibility

of science to both students and the interested community (that both funds, and is impacted by, the results of science).

We address this issue through a discussion of the Bohr-Heisenberg debate concerning the meaningfulness of various concepts in science. These concepts include the principle of complementarity, a principle that Bohr proposed as an answer to the problem of intelligibility concerning the wave-particle duality in quantum physics. Bohr later claimed this principle was relevant to sciences other than physics, including psychology, biology, and anthropology. It is this claim by Bohr, as well as his demonstration of a philosophical approach in his proposal of complementarity, and his recognition of the need for ongoing clarification of the concept, that inspired the writing of the current article. The Bohr-Heisenberg debate provides an example of naturalistic philosophy as it has occurred in science in which the problem of intelligibility to which Arendt refers eventually spilled over into the political arena. The importance of this debate to the present day provides a prototypical example of the place for naturalistic philosophy in the doing of science. It also provides an exemplary instance of *the origins of education* in a dialogue between people who are committed to understanding what the other is saying.

The remainder of this article will be available when the full published version is issued

Footnotes

¹ Although this is tangential to the main points of our argument, we suggest that Whewell's distinction between science and naturalistic philosophy was a political manoeuvre in order to claim professional status for a select group of scientists (thereby excluding others) and establishing a disciplinary boundary. This approach to knowledge has affinities with Francis Bacon, who, in the late Elizabethan era, set out to consolidate the study of nature in the precincts of a college setting (like the Inns of Court), in the hands of well-born gentlemen, out of the hands of gardeners, clockmakers, engineers, chemists and women (Harkness, 2007, p. 214).

² Arendt's use of shudder quotes indicates she means these are so-called truths.

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