



Introduction: Norms, Naturalism, and Scientific Understanding

Jan Faye¹ · Henk W. de Regt² 

Published online: 20 September 2019
© The Author(s) 2019

1 Introduction: Norms, Naturalism and Scientific Understanding

Among philosophers working on scientific explanation, there seems to be a growing consensus that explanation is somehow connected to some form of understanding. This stands in sharp contrast to Hempel's view, according to which understanding is a psychological notion with no constructive bearings on an acceptable notion of scientific explanation. It is well known that Hempel argued that the aim of explanation was not to gain understanding but to deduce what was to be explained from a set of premises containing at least one law statement. In his view, the kind of understanding we experience in connection with explanation refers to a psychological state we are brought into whenever we realize that the occurrence of the explained phenomenon is to be expected on the basis of our knowledge of the laws in question and the particular circumstances.

According to Hempel the expectation itself, although being a psychological state, should be considered to be a completely rational state of mind as it is grounded in the knowledge of the logic of deduction and the concomitant understanding is caused by a successful deduction. Others, like Michael Friedman, have suggested that it is not expectation but unification which gives us understanding, i.e. the insight that a high-level law unites different low-level laws formerly considered mutually independent. In general, philosophers have associated explanatory understanding with different psychological features such as confidence, expectation, feeling of certainty, or intellectual satisfaction.

Thus, the picture that emerges from the literature of the old days is that explanatory understanding is a concomitant phenomenon, a purely psychological feeling that was caused by mental operations like successful deduction, unification, fitting the explanation-seeking phenomenon into a general world-picture, or getting to know the inner mechanism of things in the world. And this is a consequence of the fact that the epistemic aim of explanation is something different from understanding.

✉ Henk W. de Regt
Henk.deRegt@ru.nl

Jan Faye
faye@hum.ku.dk

¹ Department of Media, Cognition and Communication, University of Copenhagen, Copenhagen, Denmark

² Institute for Science in Society, Radboud University, Nijmegen, The Netherlands

In recent years new proposals for understanding ‘understanding’ and its relation to explanation have appeared; see for instance De Regt et al. (2009), De Regt (2017) and Faye (2014). To begin with, most of today’s theories of explanation consider understanding to be the aim of explanation, as it is argued that the aim of explanation should contain a response to the question why we seek explanation in the first place. The answer seems to be that we need explanations for cognitive or epistemological reasons because they provide us with understanding. Hence, understanding is no longer regarded as merely a psychological by-product of explanation but has become an important element of epistemology and cognitive science. The result of this development seems to be a reversal of roles, whereby what was previously regarded as the aim of explanation is now considered to be subordinate to the kind of understanding one strives for.

Note that by placing understanding in the front of the explanatory enterprise, the pragmatic aspects of explanation also move to the foreground. For both the purpose of the explanation and the context in which the explanation takes place play an important role in such accounts of explanation. A significant number of philosophers have already acknowledged that we cannot get on with scientific explanation unless we incorporate these pragmatic features of explanation into the notion of explanation itself. In spite of all their differences we find such an attitude in Charles S. Peirce, John Dewey, Michael Scriven, Sylvain Bromberger, Nicolas Rescher, Bas van Fraassen, Peter Achinstein, and many more.

However, even though ‘understanding’ has moved to the forefront of the debate, it is not at all clear how this concept should be spelled out in detail. The extant literature covers different approaches: some with a naturalistic flavour, others with a much more normative quality. On the one hand, naturalistically oriented approaches may, for instance, hold that understanding in science is not merely connected to explanation. They may point to other forms of understanding embedded in the experimental practice and to the kind of understanding that follows from interpretation of data or classification of new phenomena. Accordingly, the manifestations of understanding in science may appear in many forms: scientists express understanding while they are theorizing and modelling, while they do experiments, while they perform interpretation and explanation, or while they evaluate the validity of data or scientific hypotheses. On the other hand, more normative approaches may focus on the standards for having scientific understanding in contrast to everyday understanding, both in general and in relation to a particular scientific practice. The general standards could be coherence, consistency, deductivity, efficiency, relevance, soundness, truth, and unification, supplemented with particular scientific theories.

If understanding in science should not again degenerate into a purely psychological notion, it seems to be a requirement of any account of understanding that the epistemic state in which one is placed by a cognitive act of understanding must conform to certain standards. Both the naturalist and the normativist would probably agree that any understanding based on deliberation requires certain normative commitments. But the naturalist would emphasize that it is the empirical study of scientific practice by, say, cognitive science that discloses the standards of understanding that scientists are committed to. These empirically discovered standards may very well vary from one science to another and from science to everyday life. In contrast, the normativist may argue that the standards of understanding are closely connected to some a priori claims about epistemic commitments with respect to justification, personal responsibility, and adequate evidence. For example, a normative theory might tell us that a person understands in an epistemically responsible way, if and only if he or she feels obliged to uphold or reject an explanation based on certain criteria of good science. Therefore, the normativist would be sceptical about empirical studies, arguing that they can’t possibly address

the normative goal of scientific understanding. Because, according to the normativist, the norms of intelligibility scientists actually follow are not necessarily those they ought to follow. It is not every alleged kind of understanding we may encounter in science that can reasonably count as a form of scientific understanding. A scientist must be ready to show that she is entitled to attribute to herself or others scientific understanding because her explanation or interpretation meets some well-established norms of scientific intelligibility. However, the naturalist would be much more tempted to argue that the criteria of intelligibility whereby scientists *do* arrive at their understanding are *the same as* the criteria by which scientists *ought* to arrive at their understanding.

This special issue of JGPS attempts to cast some light on the compatibility of, and tensions between, these two lines of thinking, including questions like: What is the epistemic difference between explanation and understanding? Can understanding and intelligibility be separated, and if they are regarded as distinct, how should they then be defined? Are there other forms of understanding in science than explanatory and interpretive understanding? Is it possible, for instance, to be a naturalist about the standards of intelligibility without committing oneself to the naturalistic fallacy? Answers to some of these questions are not only important for theories concerning scientific explanation but have a significant impact on how to conduct philosophy of science. The contribution by *Henk de Regt* begins with a review of how philosophy of science has witnessed a shift in focus from explanation to understanding, which also seemed to involve a change from normative ideals to accurate descriptions of scientific practice, and to naturalistic approaches. Next, De Regt examines how Jan Faye's pragmatic-rhetorical theory and his own contextual theory of scientific understanding deal with issues of normativity, and illustrates the normative implications of the contextual theory with a case study of the chemical revolution.

Nowadays, more and more philosophers of science who work on understanding are open to the suggestion that we can have understanding without truth. While such a non-factivist view may appear plausible from a naturalistic perspective, it might seem to deprive understanding of an important normative criterion. *Yannick Doyle, Spencer Egan, Noah Graham, and Kareem Khalifa* zoom in on this aspect of the debate between those who hold that understanding always involves truth and those who reject this view. The use of idealization in deriving the ideal gas law has often been at the center of this debate. Doyle, Egan, Graham and Khalifa discuss the principle behind the derivation and reach the conclusion that non-factivism provides us with a better interpretation of this case than factivism. This does not jeopardize normativity, however: they argue that naturalism can also give a fair account of the norms and values associated with rationality and scientific understanding.

Important normative issues regarding understanding concern the value of understanding and the possibility of degrees of understanding. *Christoph Baumberger* addresses the latter question through an analysis of objectual understanding, offering an explication of it that has both a descriptive and a normative dimension. In his analysis of the normative dimension he develops criteria for the evaluation of degrees of understanding. Baumberger compares his explication with a case from scientific practice, namely how climate change is understood by means of climate modelling, arguing that the suggested concept of objectual understanding makes sense of this important cognitive achievement of climate science.

Finally, *Daniel Wilkenfeld and Christa Johnson* discuss the question of the value of understanding. They argue that one should expect understanding to have value accessible to those other than the understander. Notions of understanding that fare well in this respect have value "for-hire", in that understanding is valuable to others than the understander. A review of existing accounts of understanding leads them to conclude that

“forward-looking” accounts, i.e. accounts that identify understanding largely with what one can do with it, typically fare better than “backward-looking” accounts, which characterize understanding in terms of its structure or etiology. Explanation-based accounts of understanding belong to the latter category, and have more difficulty with accommodating the “for-hire” value of understanding.

Open Access This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made.

References

- De Regt, H. W. (2017). *Understanding scientific understanding*. New York: Oxford University Press.
- De Regt, H. W., Leonelli, S., & Eigner, K. (Eds.). (2009). *Scientific understanding: Philosophical perspectives*. Pittsburgh, PA: University of Pittsburgh Press.
- Faye, J. (2014). *The nature of scientific thinking. On interpretation, explanation and understanding*. London: Palgrave Macmillan.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.