

# Understanding defective theories: A structuralist approach to scientific understanding

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## Abstract

Here I aim at providing responses to two questions from the epistemology of science, namely: *can scientists achieve legitimate understanding of defective theories?* and if so, *how is this possible?* On the one hand, understanding has been traditionally considered to “consist of knowledge about relations of dependence. When one understands something, one can make all kinds of correct inferences about it” ([8]: 100). In addition, understanding is often regarded as factive, this is, the content of understanding can only include true propositions that are known to be so. This considered, it is impossible to understand a knowingly defective (conflicting, inconsistent, false and even impossible) set of information. On the other hand, much scientific practice makes use of defective theories ([1], [6]), and, despite the fact that some of these theories are knowingly defective, scientists have found different ways of scrutinizing and working with them to the point that they report having ‘understood’ both the theories as well as the phenomena that they describe. Regarding this issue, it is important to notice that the mechanisms that these scientists use to, allegedly, gain such an understanding, are such that by going against some of the basic principles of classical logic, allow scientists to identify relevant segments of the structure of the defective theory ([7], [6]). The combination of these facts poses the following dilemma: either understanding defective theories is possible or scientists that report having understood any defective theory are mistaken. Hence the importance of addressing both issues together.

Here I aim at explaining under which circumstances when scientists report having understood a defective theory, their claim might be legitimate. In particular, I argue that scientists understand a defective theory if they can recognize the theory’s underlying inference pattern(s) and if they can reconstruct and explain what is going on in specific cases of defective theories as well as consider what the theory would do if not-defective –even before finding ways of fixing it.

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In order to do so, I proceed in three steps. First, I characterize very broadly scientific understanding and its incompatibility with defective information. Second, I characterize defective theories and I explain in which way they are distinct from felicitous falsehoods ([2], [4]). Third, I present a (non-classical) structuralist approach to understanding ([3], [5], [6]) and explain the way in which understanding of defective theories is not only possible but has been constantly achieved in science –and in philosophy.

## References

- [1] Bueno, O. (2006): “Why Inconsistency Is Not Hell: Making Room for Inconsistency in Science”, in *Knowledge and Inquiry: Essays on the Pragmatism of Isaac Levi*, Cambridge Studies in Probability, Induction and Decision Theory, Cambridge University Press: 70–86.
- [2] Elgin, C. (2007): “Understanding and the facts”, *Philosophical Studies*, 132(1): 33–42.
- [3] Hazlett, A. (2017): “Understanding and Structure” in S. Grimm (ed.), *Making Sense of the World: New Essays on the Philosophy of Understanding*. Oxford University Press:135-159.
- [4] Lawler, I. (2019): “Scientific understanding and felicitous legitimate falsehoods”, *Synthese*. 10.1007/s11229-019-02495-0.
- [5] Le Bihan, S. (2017): “Enlightening Falsehoods: A Modal View of Scientific Understanding” in *Explaining Understanding: New Perspectives from Epistemology and Philosophy of Science*, Routledge: 111-136.
- [6] Martínez-Ordaz, M. del R. (2020): ”The ignorance behind inconsistency toleration”, T.C. *Knowing the Unknown: Philosophical Perspectives on Ignorance*, *Synthese*.
- [7] Reck, E. H., and Price, M. P. (2000): “Structures and structuralism in contemporary philosophy of mathematics”, *Synthese*, 125(3): 341–383.
- [8] Ylikoski, P. (2013): “The Illusion of Depth of Understanding in Science”, in H. De Regt, S. Leonelli & K. Eigner (eds.) *Scientific Understanding: Philosophical Perspectives*, Pittsburgh University Press: 100-119.