

# Explanations in Logic

Francesca Poggiolesi<sup>1</sup>

*IHPST, UMR 8590  
Université Paris 1 Panthéon-Sorbonne*

---

## Abstract

To explain phenomena in the world, to answer the question “why” rather than the question “what”, is one of the central human activities and one of the main goals of rational inquiry. Causal explanations have been dominant in this field, occupying interest and attention at least from 1940’s (see e.g. see [1], [7]). However, in the last decade philosophers have become receptive to another type of explanation, called *non-causal* or *conceptual explanations* (e.g. see [2], [3]). Conceptual explanations do not derive their explanatory power from a network of causal relations, but rather from a network of conceptual relations. Mathematical explanations – that is, mathematical proofs that explain the theorem they prove – are an emblematic example of conceptual explanations. Whilst many have argued that logic has little to contribute to the study of causal explanation (e.g. see [6]), conceptual explanations are *prime facie* a natural object for logical analysis. The main aim of the talk is to propose an account of the logical structure of conceptual explanations. We will do so by using the resources of proof theory and by introducing the novel notion of *formal explanation* (e.g. see [4], [5]). The results we provide not only shed light on conceptual explanations themselves, but also on the role that logic and logical tools might play in the burgeoning field of inquiry concerning explanation.

*Keywords:* Complexity, derivations, explanations, proofs.

---

## References

- [1] Hempel, C., “Aspects of Scientific Explanation and Other Essays in the Philosophy of Science,” Free Press, New York, 1965.
- [2] Lange, M., “Because Without Cause: Non-causal Explanations in Science and Mathematics,” Oxford University Press, Oxford, 2017.
- [3] Mancosu, P., *Mathematical explanation: Problems and prospects*, *Topoi* **20** (2001), pp. 97–117.
- [4] Poggiolesi, F., *On defining the notion of complete and immediate formal grounding*, *Synthese* **193** (2016), pp. 3147–3167.
- [5] Poggiolesi, F., *On constructing a logic for the notion of complete and immediate formal grounding*, *Synthese* **195** (2018), pp. 1231–1254.
- [6] Scriven, M., *The logic of cause*, *Theory and Decision* **2** (1971), pp. 49–66.

---

<sup>1</sup> This work has been developed in the framework of the project IBS (ANR-18-CE27-0012-01), poggiolesi@gmail.com.

- [7] Woodward, J., "Making Things Happen: A Theory of Causal Explanation," Oxford University Press, Oxford, 2004.