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Title:

(De-) Idealization as an Epistemic Strategy in Experimental Practices.

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Abstract:

In this paper, I aim to explain and evaluate idealization and de-idealization as an epistemic strategy in the context of a more general issue, namely, how scientists produce knowledge that is manageable and adequate for *scientific modeling* of concrete target systems such as the properties or the dynamical behavior of technological devices. The epistemic purpose of these scientific models is to enable relevant and reliable reasoning about them (e.g., towards creating a desired property, or designing, improving, optimizing or controlling a process).

Nancy Cartwright has been enormously influential in making philosophers aware of the limitations of scientific knowledge, especially when it comes to applying it to real systems. In laboratories, we develop reproducibly functioning experimental set-ups in such a way that stable, repeatable patterns of data are produced, from which we infer to *laws of nature*. Cartwright (1983, 1999) calls these law-producing experimental set-ups *nomological machines*. She rightly argues that laws of nature, and scientific models derived from them, are only true at those *idealized conditions* and usually do not present us with true descriptions of real systems.

Nevertheless, (de-)idealization is an important *epistemic strategy* in the production of scientific knowledge about concrete target systems. De-idealization is closely related to some other epistemic strategies such as: *conceptualization* (which is the strategy to introduce conceptions of *phenomena*, for instance, specific physical properties, by means of operational definitions in terms of paradigmatic experimental set-ups; see Feest 2010, Boon 2012); *abstraction* (which is the strategy to produce representations that abstract from some of the concrete content); *mathematization* (which is the strategy to subsume measured data-sets under mathematical formula); and *simplification* (which is the strategy of neglecting in our description aspects that supposedly have a negligible contribution).

In order to explain and evaluate (de-)idealization, I will address the following questions: (I) What is idealization and how does it work in the production of scientific knowledge? (II) How does application of 'idealized knowledge' in the modeling of concrete target systems go about? (III) Why is idealization productive as an epistemic strategy?

(ad. I) I will propose that (de-)idealization concerns the way in which scientific practices develop *experimental set-ups* for 'discovering' natural regularities. This strategy involves technologically *isolating* a part of the world such that it exhibits reproducible behavior (i.e., *phenomena*) that can be studied at varying but controlled and measurable conditions.

(ad. II) Subsequently, conceptual and mathematical descriptions of 'isolated' phenomena, in concord with knowledge of the paradigmatic experimental set-ups at which they have been produced, enable us to identify the occurrence of such phenomena in a concrete target systems under study, and build our knowledge of this phenomenon in the model of the target system. Furthermore, the paradigmatic experimental set-up plays a key-role in investigating the phenomenon at 'non-ideal', 'non-isolated' conditions of the target system.

(ad. III) Examples from chemical engineering, biotechnology and material sciences will be presented such to illustrate this view.

References

Boon, M. (2012). "Scientific concepts in the engineering sciences: Epistemic Tools for Creating and Intervening with Phenomena." In: *Scientific Concepts and Investigative Practice* U. Feest and F. Steinle (eds.). Berlin, New York: Walter De Gruyter GMBH & CO. KG, Series: Berlin Studies in Knowledge Research.

Boon, M. (forthcoming). "Contingency and Inevitability in Science – Instruments, Interfaces and the Independent World." In: *Contingency – Science as it could have been*. L. Soler *et.al.* (eds.)

Cartwright, N. (1983). *How the Laws of Physics Lie*. Oxford, Clarendon Press, Oxford University Press.

Cartwright N. (1999). *The dappled world. A study of the boundaries of science*, Cambridge University Press.

Feest U. (2010). "Concepts as Tools in the Experimental Generation of Knowledge in Cognitive Neuropsychology." *Spontaneous Generations: A Journal for the History and Philosophy of Science*, Vol. 4 (1): 173-190.