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## The Dappled World Perspective Refined

The concept that I would term the *Dappled World Perspective* was first proposed by Nancy Cartwright (1999: *The Dappled World: A Study of the Boundaries of Science*, Cambridge University Press):

“... we live in a world rich in different things, with different natures, behaving in different ways. The laws that describe this world are a patchwork, not a pyramid.” (p. 1)

I will propose a new argument in favour of the Dappled World Perspective, and will show how this Perspective can be refined in the *model-based model of cognition* (MBMC), which I am trying to promote since my article (2009: *Towards a Model-Based Model of Cognition*. [The Reasoner 3\(6\)](#), pp. 5–6).

The first thesis of MBMC: Let us try out an unusual, extremely broad, and seemingly oversimplified definition of modeling: *a model is anything that is (or could be) used, for some purpose, in place of something else*. In this definition, models are meant to be concrete systems that serve as replacements of concrete target systems (for some concrete purposes).

In this compact form, the definition was proposed by Jeff Rothenberg (1989: [The Nature of Modeling](#). In: *Artificial Intelligence, Simulation, and Modeling*, Wiley & Sons, pp. 75–92):

“Modeling in its broadest sense is the cost-effective use of something in place of something else for some purpose.”

Similar definitions (with an emphasis on *replacing* and *purpose*) were proposed in the 1960s by Leo Apostel, Marvin Minsky, and Herbert Stachowiak. However, the very idea of “replacing” (*Ersatz*) appears already in Einstein’s address (1918: *Motive des Forschens. Zu Max Plancks 60 Geburtstag: Ansprachen in der Deutschen Physikalischen*

*Gesellschaft*, Müller Verlag, Karlsruhe, pp. 29–32).

The second thesis of MBMC: *Models are the ultimate results of cognition*, and the ultimate goal of it. Humans and robots need models (in the above sense) to manage what is happening in the world around them. This greatly simplifies the picture of cognition: *ultimately, we need models, hence, the rest of cognition should be regarded and assessed, first, as a means of model-building*. Means of model-building can be further subdivided into theories, research programs, doctrines, paradigms, ontologies, logics, languages, etc. Most of these knowledge constructs serve as *meta-means* – mainly, as a means of building theories.

The second thesis represents a radically simplified version of the line of thought that resulted in the “models as mediators” concept, proposed by Margaret Morrison and Mary S. Morgan (1999: *Models as Mediating Instruments*. In: *Models as mediators: Perspectives on natural and social science*, Cambridge University Press, pp. 10–37).

In MBMC, the Dappled World Perspective (“patchwork of laws describing the world”) is refined by considering it separately at the level of models and at the level of theories and other means of model-building.

At the level of models, the Dappled World Perspective can be *derived* from the above definition of modeling by the following *Detailization Argument*:

Let us set a very detailed prediction as our purpose. How detailed could a Big Bang simulation model be made for replacing the entire history of the Universe? An obvious fact: a tiny fragment of the Universe cannot replace the entire Universe in full detail. Or, imagine a target system consisting of more than  $10^{23}$  components (the number of molecules in a liter of gas). How detailed could a model be made for replacing such a system? Since no two identical liters of gas exist in the Universe, no model will be able to

predict the coordinates and velocities of individual molecules at every moment of time. These limitations are not caused by limitations of human cognition, but are limitations built into the very structure of the Universe! Hence, a very plausible *metaphysical hypothesis*: if the target system consists of more than  $10^{23}$  components, no other system can replace it in full detail.

As we see, the very idea of *modeling as replacing* implies severe limitations, namely, the Dappled World Perspective at the level of models: Neither humans nor robots can hope to create a single detailed model for extensive parts of their environment. *At the level of models, we will always have only a patchwork of models, each very restricted in its application scope.*

It remains to consider the situation at the level of means of model-building. Since a single “Model of Everything” is impossible, in order to manage what is happening in the world, we need to generate a variety of different models. Could this be accomplished by using a single future “Theory of Everything” (or, at least, by means of a *limited* set of theories)? Let us denote this hypothetical limited complete set of theories by ToE.

From the MBMC perspective, the precise meaning of “being a ToE” is defined as follows: ToE (as means of model-building) should allow us, *without any ad hoc assumptions*, to generate all the variety of models we may need. If in trying to build a model we are forced to invent even the smallest *ad hoc* assumption that cannot be derived from the alleged ToE, then the latter fails as a ToE! May we expect *such* a ToE to appear in the future?

If, in order to proceed, we will invest resources only in attempting to build a complete fundamental theory of physics, then no ToE (in the above sense) will ever be obtained – as put by Philip W. Anderson (1972: [More Is Different](#). *Science, New Series*, Vol. 177, No. 4047, pp. 393–396):

“The ability to reduce everything to simple fundamental laws does not imply the ability to start from those laws and reconstruct the universe. ..., at each level of complexity entirely new properties appear, and the understanding of the new behaviors requires research which I think is as fundamental in its nature as any other.”

If the above arguments can be accepted, they simultaneously show that the seemingly oversimplified concept of MBMC leads to significant conclusions.

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