Chapter 15
Computing, Philosophy and Reality:
A Novel Logical Approach

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ABSTRACT

The conjunction of the disciplines of computing and philosophy implies that discussion of computational models and approaches should include explicit statements of their underlying worldview, given the fact that reality includes both computational and non-computational domains. As outlined at ECAP08, both domains of reality can be characterized by the different logics applicable to them. A new "Logic in Reality" (LIR) was proposed as best describing the dynamics of real, non-computable processes. The LIR process view of the real macroscopic world is compared here with recent computational and information-theoretic models. Proposals that the universe can be described as a mathematical structure equivalent to a computer or by simple cellular automata are deflated. A new interpretation of quantum superposition as supporting a concept of paraconsistent parallelism in quantum computing and an appropriate ontological commitment for computational modeling are discussed.

INTRODUCTION: PHILOSOPHY OF SCIENCE

This Chapter is the outcome of my collaboration and joint presentation at ECAP09 with Michael Nicolaidis, in which I contrasted his computational model of the universe and view of quantum superposition with a number of other current models based on the logical approach I call "Logic in Reality" (LIR). I also made a critique of his positions on some issues in quantum physics. This is repeated here and the interested reader can compare it with his statement on the relation of his theory to LIR in his Chapter. It was and is our feeling that the "strongest possible theory of reality" (the working title of our contribution) is one which would incorporate both computational and non-computational perspectives.

DOI: 10.4018/978-1-61692-014-2.ch015

In my view, an adequate philosophy of science should include, as a minimum, the following:

- A view of reality, that is, the ontology of the physical universe, independently of whether and how it can be effectively or adequately modeled;
- A view of models of the physical universe, that is, whether it can be modeled independently of what it is or may be in itself.

The situation regarding computer science is particularly interesting, since many recent conceptions of both reality and models of reality are computational. The juxtaposition of the terms computing and philosophy in this venue thus strongly implies that computational models and approaches should include explicit statements of the worldview underlying them, given the fact that reality has both computational and non-computational aspects. The primary objective of this Chapter is to address the first of above points, although implications for the second will also emerge.

I begin in Section 2 by outlining several current cosmological theories of various types. Section 3 revisits the issue of computability and non-computability. Section 4 summarizes the key concepts of Logic in Reality (LIR) and its implications for outstanding issues in philosophy and science. Section 5 discusses each of the cosmological theories and their corresponding ontological commitments from the perspective of LIR, and Section 6 makes some brief comments on models.

CURRENT THEORIES OF THE UNIVERSE

Since the advent of quantum mechanics and the computer, the classical dichotomy between a universe based on energy or position, deterministic or indeterministic, continuous or discontinuous, has been recast into three or four major kinds of theories, with widely varying degrees of ontological commitment, as shown in the following Table. Many of these issues are also surfacing in another form, namely in connection with natural computation or computing, in which an understanding of their ontology can be critical to the use of natural phenomena as components of a computing process.

The first three types of theories have one thing in common – they fail to take into account or acknowledge that there might be something fundamentally true about the opposing theory, and, even if this is recognized, have no mechanism to handle the relationship. In addition, the motivation of many of these theories is to "deliver" the epistemic agent, that is, *also* to provide a basis for qualia, intentionality and free will. In my view, however, no ontological commitment is made that enables this. The generally low level of ontological commitment in the first three types, for various reasons, including the belief that one cannot know at least some of the attributes of reality, creates more problems than it solves for a scientific realist.

Table 1.

Theories of Reality
Model Exponents Ontological Commitment
Mathematical/Digital
Tegmark Platonic
Zuse ditto
Wheeler "It from Bit"
Wolfram Agnostic (Cellular Automata)
Nicolaidis Agnostic (Meta-objects)
Mathematical/Analogue
Longo Continuum Hypothesis
Thom/Petitot Continuity
Epistemological/Informational
Floridi Agnostic (ISR)
Ladyman*et al.* Informational Patterns
Logical-Dynamic
Brenner New Energy Ontology