The Necessity of Conceptual Skill Enhancement to Address Philosophical Challenges of New Science: Background and Implications

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Sensory extension and increasingly powerful computation underpinning emerging new science provides us with daunting conceptual challenges. It is here argued that because they are primarily philosophical in nature, high-level conceptual challenges are unique and different from those that help us refine outputs and achievements based on solving our technical and political problems. This paper explores the practical implications of such unique conceptual challenges and discusses the need for enhancement of conceptual skills. Such conceptual enhancement may provide us with a good opportunity to best respond to and benefit from these challenges.

1 Introduction

The use of information to achieve knowledge, derived from data originating with many sources, is essential to successful enterprise in any human effort. Indeed, we note that the derivation and use of knowledge is key to human advance in any field. This appears to be obvious, but the central argument provided in this paper is that the obviousness of this phenomenon that leads us through our processes of scientific discovery and advance may mask the emergence of unique conceptual challenges to our conceptual skill capacity defined by their philosophical nature, where such challenges are not at all obvious.
2 Background

To accomplish the derivation of scientific knowledge, we engage in two essential activities of science: [i] we continue to extend our senses to gather increasingly detailed, voluminous and complex data sets having to do with the very large and the very small, and the very complex and the very dynamic; and [ii], we apply many tools of analysis and synthesis to those data, and in the modern era we continue to develop and employ increasingly complex, networked, and very powerful advanced perceptual and computational tools for this purpose, especially those having to do with simulation, to assist us with and help us continue to develop and explore how to enhance theory and knowledge yields from these fundamental tasks. We create, develop, enhance and strengthen our perceptual and computational tools to the extent that, today, we are capable of deriving very useful and sometimes unexpected and exceptionally valuable information about extremely complex systems comprised of vast numbers of interacting components and agents [1]. This is important exploratory work that we could not accomplish, or even dream of accomplishing, only a relatively short time ago [2].

Prior to the advent of the current era where both highly advanced sensing devices coupled with very powerful computational machines continue to be developed, not much could be known about either the working intricacies of high dimensional complex systems, or of the extent and emergent nature of highly complex interactions among large numbers of high dimensional complex system variables and components. This meant that high levels of functional detail about complex systems might have been postulated, or how such systems behave might have been contemplated, but such detail or postulation was either inaccessible or undeveloped – with the exception, perhaps, of those blessed with a capacity for genius who, based on available early evidence, might be able to work out plausible hypotheses and develop new and useful mathematical models more effectively than others [3]; but even geniuses would not have privileged access to tools of extended perception and advanced computational capacities in advance of everyone else. Such characteristics and features of complex systems were hidden behind the limits to human perception, were postulated hypothetically by those who had the capacity to push to the edges of the hypothesis development envelope, and awaited discovery beyond a computational ceiling that could begin to be penetrated only by advanced mathematical modeling of plausible systems – but again, in relative terms, this ceiling was kept low by early generation computational capacities. Knowledge about what actually comprised such complex systems and their environments, as well as their behaviours – or even knowledge [not speculation] that such systems themselves existed – could not be accessed or perhaps not even surmised except in very special circumstances of hypothesis construction, and certainly not beyond rational conceptual limits which would relegate such thinking to the realm of fantasy.