

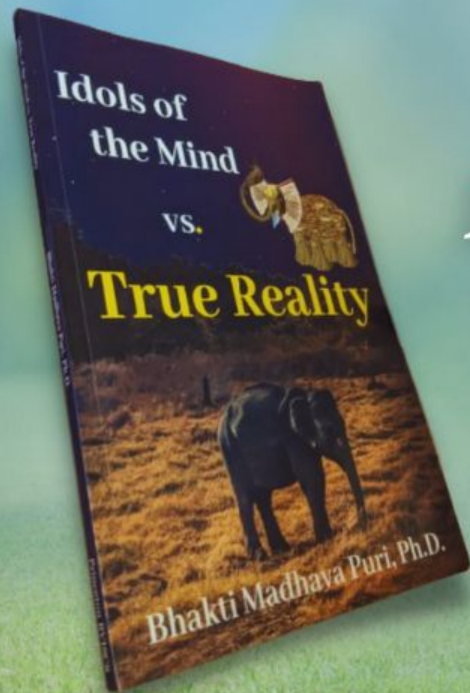


BHAKTI VEDANTA INSTITUTE
of Spiritual Culture and Science

PRINCETON, NEW JERSEY, USA



OSPREYHUB
STOCKTON UNIVERSITY

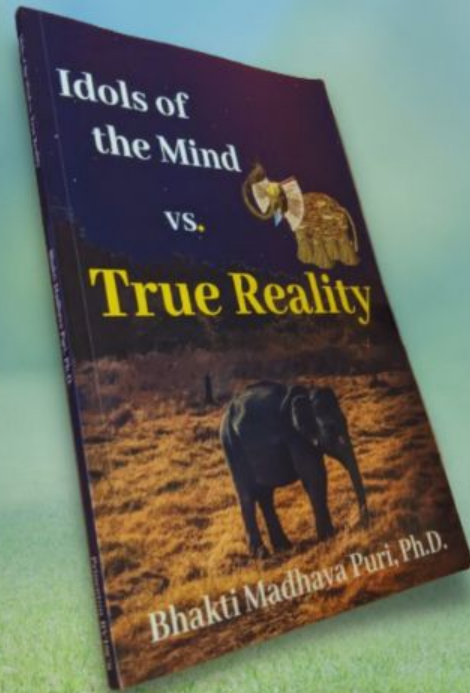


Idols of the Mind vs. True Reality

(by Dr. B Madhava Puri, Princeton Bhakti Vedanta Institute)

**An Introduction to the Complementarity of
Science, Philosophy, & Religion**

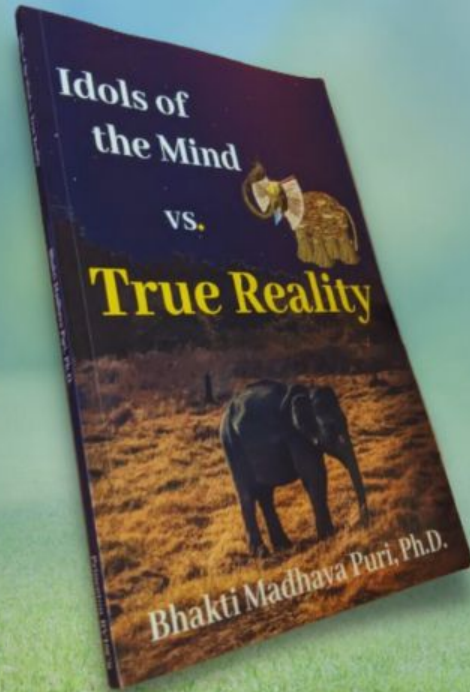
**Chapter 3: The Unreasonable
Effectiveness of Mathematics
in the Natural Sciences**



“The title of this book comes from Sir Francis Bacon (where human concepts are thought to be objectively true) and it synthesises a Vedantic approach with that of Hegel grounded in the primacy of the idea, Spirit and Consciousness. On the basis that there is no equivalence between organisms and machines, the author criticises the attribution of metaphysical qualities to inanimate robots as a serious category error: life and consciousness do not derive ultimately from matter. Interestingly, Nobel laureate and emeritus Honorary Member George Wald was persuaded by this approach on encountering Vedantic philosophy and switched his views accordingly to assert that mind had always been present in evolution. [...] This book makes a sophisticated and significant contribution to an emerging science of consciousness.”

::David Lorimer

Programme Director of the Scientific and Medical Network
(Full book review published in Paradigm Explorer - 137 p 65)



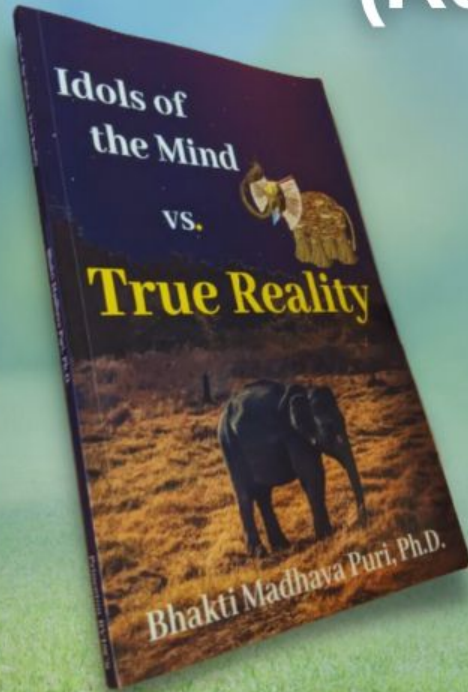
“Readers looking for a bridge between ancient Hindu philosophy and its Western counterpart will appreciate the general nature of this text. [...] This book serves as a useful synopsis of the main arguments for looking beyond materialist science toward a more holistic worldview. Although some readers will find the pace and breadth of Dr. Puri’s arguments disorienting, others will appreciate its comprehensiveness and straightforward presentation. In any case, the message is an important one, as materialist philosophy continues to wreak havoc on social relationships and the environment around the world.”

::Jennifer Lyke, PhD

Professor of Psychology at Stockton University
Science of Life Club Faculty Advisor

(Review) Chapter 1: Logic of Life

Emphasizes the teleological view of nature and life through the philosophies of Aristotle, Immanuel Kant, and G.W.F. Hegel



Aristotle
384–322 BC



Kant
1724–1804

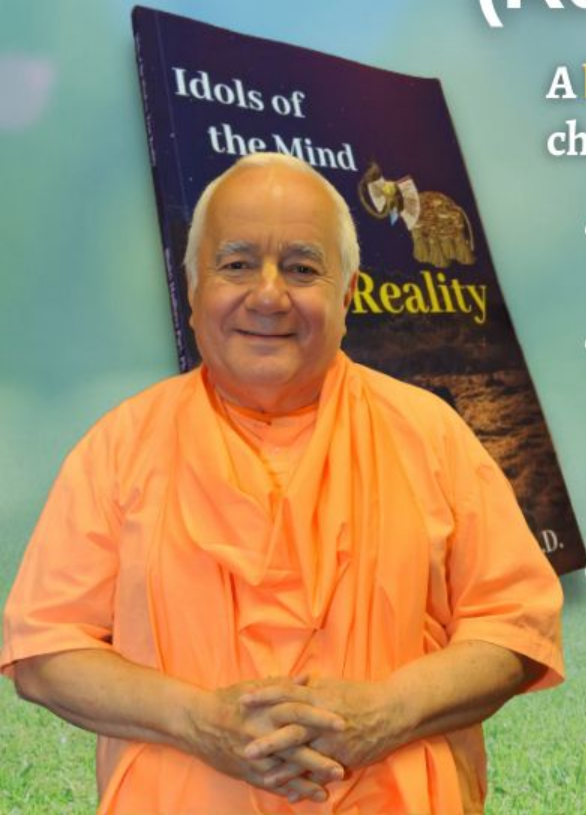


Hegel
1770–1831

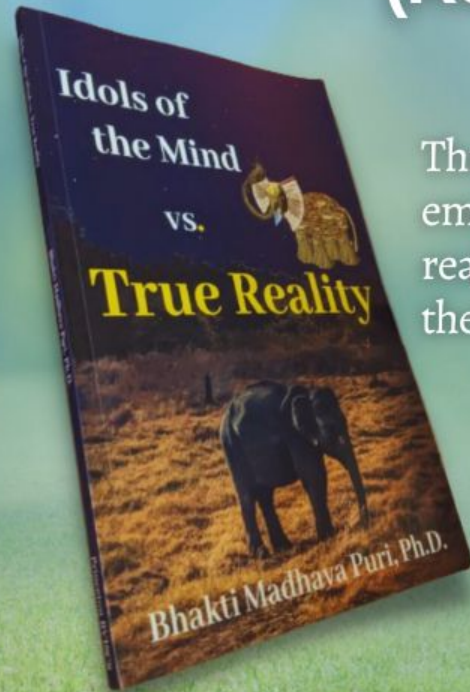
(Review) Chapter 1: Logic of Life

A **book** as a metaphor for the completeness of the mechanical, chemical, and biological aspects of a **living entity**:

- (**Mechanical**) an externally unified aggregate of paper, ink, and glue where there's no inner relation among parts
- (**Chemical**) an aggregate of alphabetical patterns, frequency of combined letters and words where parts have some inner affinity to connect based on sentence structure and the language spoken
- (**Biological**) the intention, purpose, or message of the author that is expressed through the written words on the page
 - only this level is the complete Concept of the book, which includes yet is beyond the lower levels of understanding



(Review) Chapter 2: Idols of the Mind vs. True Reality



Through historical and conceptual perspectives, this chapter emphasizes the significance of not mistaking models of reality for reality itself, the fallacy of isolating a part from its whole, and the theistic development of universal reason as the goal of modern science.



Francis Bacon
1561-1626



René Descartes
1596-1650

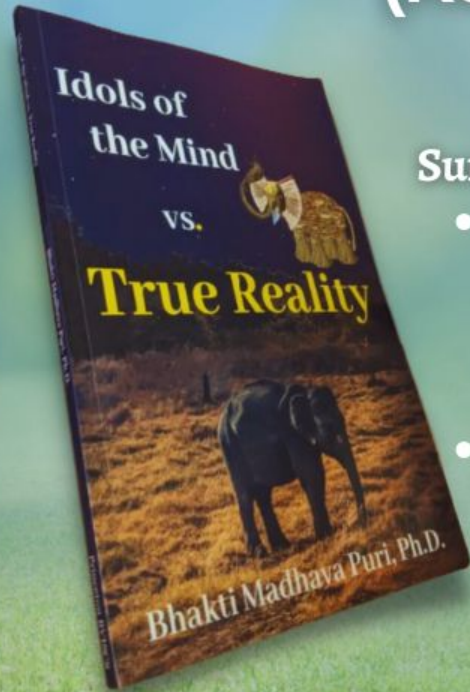


Isaac Newton
1642-1727



G.W.F. Hegel
1770-1831

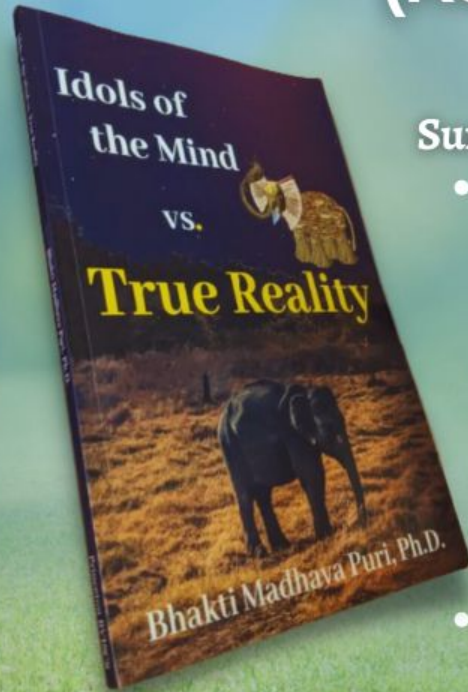
(Review) Chapter 2: Idols of the Mind vs. True Reality, Pt 1



Summary of main topics:

- The theistic inspiration underpinning modern science
 - Newton's "‘Lord God’ [Pantokrator], or ‘Universal Ruler’"
 - Intellectual humility
 - Axioms of modern science — the intelligibility of nature
- Distinguishing between models and truth
 - Heisenberg's discernment that science is an explanation of humanity's experience of nature, not nature in itself
 - Warning against confusing a map (model) for the terrain (truth)

(Review) Chapter 2: Idols of the Mind vs. True Reality, Pt 2



Summary of main topics:

- The theistic development of conceptualizing whole-part relations
 - Descartes' mistake in positing "I think, therefore, I am"
 - The dilemma of self-centered thinking
 - Hegel's idea of the I that is We and We that is I
 - Universal-Particular-Singular conceptual structure and its relation to set theory
 - The I as self-consciousness
 - Theistic conclusion
- Comprehending that the truth is the whole
 - Text without context is a pretext of knowledge
 - "I" is a result, not a starting point

While **Chapter 1** addressed the complementarity of *science and philosophy* and **Chapter 2** established the relevance of *religion* to science and philosophy, **Chapter 3** offers a philosophical reevaluation of the degree to which mathematics truly applies to nature and biology.

CHAPTER 3 : THE UNREASONABLE EFFECTIVENESS OF MATHEMATICS IN THE NATURAL SCIENCES
Reconsidering the mathematization of nature

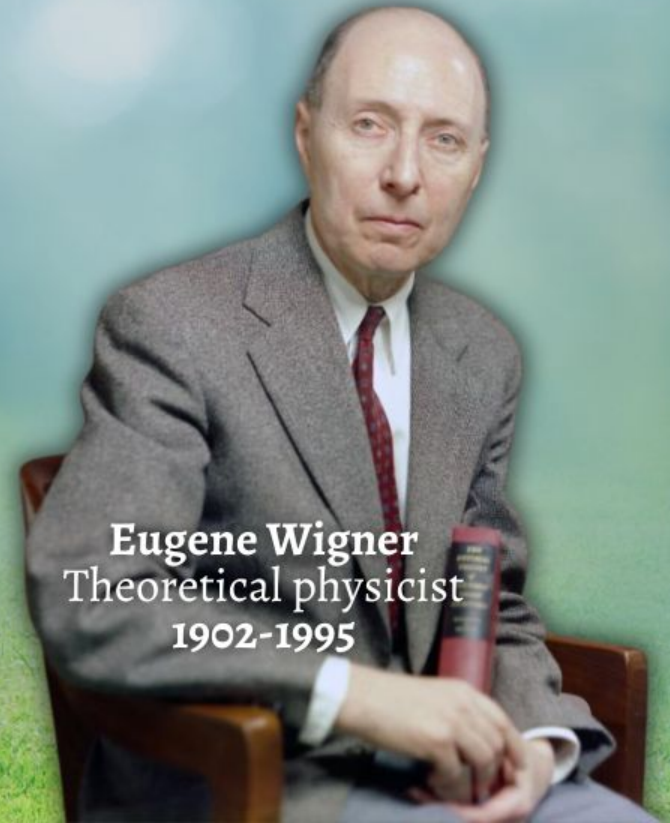
Reconsidering the mathematization of nature

Reprinted from *Communications in Pure and Applied Mathematics*, Vol. 13, No. 1 (February 1960). New York: John Wiley & Sons, Inc. Copyright © 1960 by John Wiley & Sons, Inc.

THE UNREASONABLE EFFECTIVENESS OF MATHEMATICS IN THE NATURAL SCIENCES

Eugene Wigner

- 1963 Nobel laureate in Physics “for his contributions to the theory of the atomic nucleus and the elementary particles”

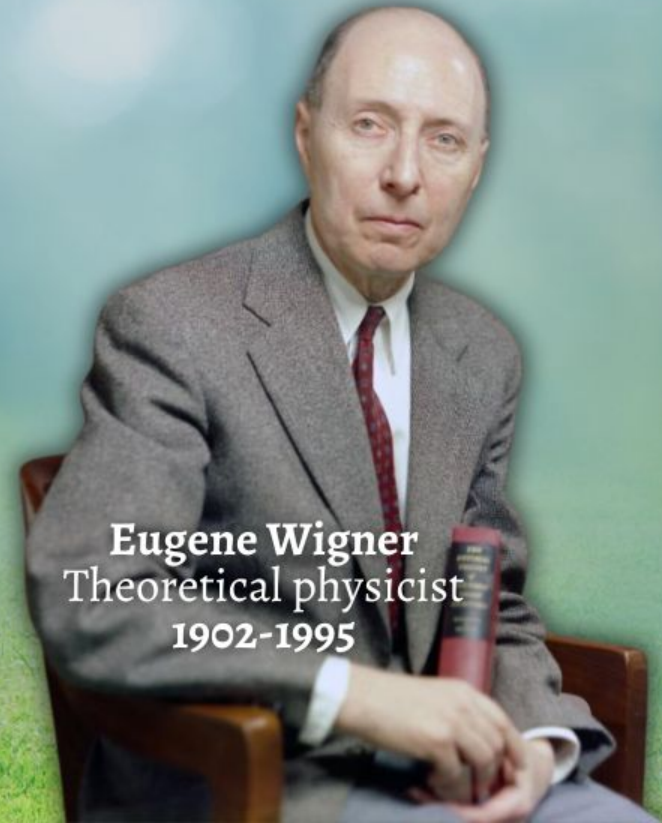


Eugene Wigner
Theoretical physicist
1902-1995

Reconsidering the mathematization of nature

“I would say that mathematics is the science of skillful operations with concepts and rules invented just for this purpose. The principal emphasis is on the invention of concepts. [...] we do not know why our theories work so well. Hence, their accuracy may not prove their truth and consistency.”

- Wigner said that math is a complete system in the mind, independent of observations in nature. It just requires a pencil, paper, and mind to work out. So why should math have any application to nature?



Eugene Wigner
Theoretical physicist
1902-1995

Reconsidering the mathematization of nature



- These “three” apples are not identical to each other
 - Each individual contains unique qualities such as shape, weight, etc
 - Strictly speaking, in terms of addition, 3 indicates three instances of a single identity (3 is quantitative)
 - It’s a description for mental activity that *does not* directly correspond to relationships among the objects

“The point is that counting numbers in mathematics and counting physical objects deal with different entities.”

:: Dr. B Madhava Puri, IMvTR, p 57

Reconsidering the mathematization of nature



- The logical law of identity states that a thing is identical to itself, $A=A$
- The mathematical expression $1+1$ refers to two entities that are not only identical to themselves but also to each other
- Leibniz's (1646-1716) identity of indiscernibles recognized that there are no identical entities in nature

“The point is that counting numbers in mathematics and counting physical objects deal with different entities.”

:: Dr. B Madhava Puri, IMvTR, p 57

Reconsidering the mathematization of nature



- Projecting math onto nature and claiming that $1 \text{ apple} + 1 \text{ apple} = 2 \text{ apples}$ is a vastly different assertion than $1+1=2$
 - The former is a generalized quantitative claim regarding familiar objects that are not identical to each other, since no two apples or any other natural objects are identical to one another
 - The latter is an abstract claim denoting the relationship between two identical entities forming a new identity when added together
 - This is just the start of the stark contrast between the logic of mathematics and nature
 - The law of identity $A=A$ cannot refer to any living entity in nature since bodies undergo constant changes through metabolic processes

Reconsidering the mathematization of nature

Distinguishing between models and truth

“Natural science does not simply describe and explain nature; it is a part of the interplay between nature and ourselves; it describes nature as exposed to our method of questioning.”



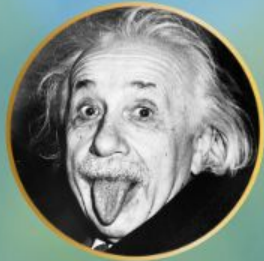
Werner Heisenberg
Theoretical Physicist
1901-1976

Nature as exposed to our method of questioning = a model of nature:

- The Ptolemy's geocentrism and Copernicus' heliocentrism represent **empirical models**
 - an explanation of an observed phenomenon
- Atomic theory and quantum theory are **theoretical models**
 - proposing the existence of something unobserved to explain an observed phenomenon

A model is to truth what a map is to its terrain

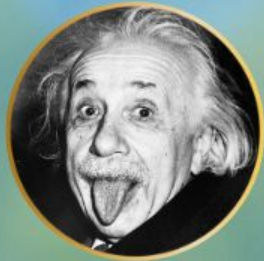
Reconsidering the mathematization of nature



Albert Einstein
Theoretical Physicist
1879-1955

“One reason why mathematics enjoys special esteem, above all other sciences, is that its laws are absolutely certain and indisputable, while those of all other sciences are to some extent debatable and in constant danger of being overthrown by newly discovered facts. [...] it is mathematics which affords the exact natural sciences a certain measure of security, to which without mathematics they could not attain. At this point, an enigma presents itself which in all ages has agitated inquiring minds.

Reconsidering the mathematization of nature



Albert Einstein
Theoretical Physicist
1879-1955

How can it be that mathematics, a product of human thought which is independent of experience, is so admirably appropriate to the objects of reality? Is human reason, then, without experience, merely by taking thought, able to fathom the properties of real things? In my opinion, the answer to this question is, briefly, this: As far as the laws of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality."

Einstein, A. (1921, January 27). Geometry and Experience.

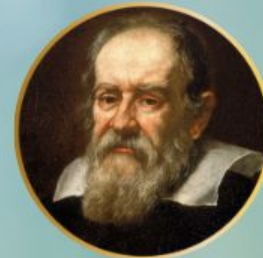
IMvTR, pp 62-63

CHAPTER 3 : THE UNREASONABLE EFFECTIVENESS OF MATHEMATICS IN THE NATURAL SCIENCES

The historical development of the mathematization of nature

The historical development of the mathematization of nature

- Recognizing the historical bias of presuming that “the book of nature is written in the language of mathematics,” which has permeated modern science since at least the time of Galileo (1564-1642)
- Acknowledging that the mechanistic paradigm still dominating modern science is substantiated by the presumption of the mathematization of nature
- Galileo also distinguished between quantitatively measurable “primary qualities” such as length, weight, mass, etc., and “secondary qualities” like color, taste, etc. — what are called “qualia” today
- *The unexplainable existence of qualia (in terms of modern science) seems at the heart of what is popularly called “the hard problem of consciousness.”*



Galileo Galilei
“father of observational astronomy”
1564-1642

The historical development of the mathematization of nature

- Descartes seemed to advocate that mind (*res cogitans*) and matter (extended bodies in space — *res extensa*) were two distinct and separate substances, thus scientists could focus on studying matter without being concerned with the influence of mind
- He also promoted studying space and time within a mathematical framework (the Cartesian plane)



René Descartes
1596-1650

The historical development of the mathematization of nature

“The mathematical bones of Newton’s Principia Mathematica were taken by modern physics and presented as a mechanical model of the universe without the Pantokrator. Of course, Newton, himself, wrote his mathematical section as a whole, surreptitiously including his remarks about the Pantokrator only in an appendix or scholium. However, the fact remains that observations of the solar system’s movements were used to validate both Newton’s and modern non-deistic theories although they referred to very different imagined realities.”



Isaac Newton
“Father of Modern Physics”
1642-1727

The historical development of the mathematization of nature

“Newton had to invoke a Pantokrator to correct for the unavoidable disastrous perturbations that the planets in the solar system would suffer in their journeys.” IMvTR 60

[Reference] Newton, I. (1729). Andrew Motte’s translation of the General Scholium to Isaac Newton’s Principia (1729).



Isaac Newton
“Father of Modern Physics”
1642-1727

The historical development of the mathematization of nature

“The problems created by mathematical mechanistic theories in cosmology have led to a crisis in the deterministic model that has ruled scientific thinking in the modern period. It has given rise to the theory of Chaos that is now the reigning concept of the Universe, which cannot simply be swept under the carpet by those who still support the doctrine of mechanistic science. In a 1986 speech, James Lighthill said:

‘We are all deeply conscious today that the enthusiasm of our forebears for the marvelous achievements of Newtonian mechanics led them to make generalizations in this area of predictability which, indeed, we may have generally tended to believe before 1960, but which we now recognize were false.

We collectively wish to apologize for having misled the general educated public by spreading ideas about the determinism of systems satisfying Newton’s laws of motion that, after 1960, were to be proved incorrect.”



Isaac Newton
“Father of Modern Physics”
1642-1727

The historical development of the mathematization of nature

[Reference] Debnath, L. (2008). Sir James Lighthill and Modern Fluid Mechanics. London: Imperial College Press, pg 31.

Sir James Lighthill (1924-1998) was a British mathematician who was considered one of the greatest mathematicians of the 20th century; his innovative contributions to such fields as applied mathematics, aerodynamics, astrophysics, and fluid mechanics found such applications as the design of the supersonic Concorde jetliner and noise reduction in jet engines.



Isaac Newton
"Father of Modern Physics"
1642-1727

CHAPTER 3 : THE UNREASONABLE EFFECTIVENESS OF MATHEMATICS IN THE NATURAL SCIENCES

The philosophical development of ideas that science ignores

The philosophical development of ideas that science ignores



Galileo Galilei (1564-1642)

- proposed that mathematics was the language of the book of Nature



Rene Descartes (1596–1650)

- forged the idea of the numerical nature of space and time



John Locke (1632-1704)

- argued that extended objects were distinguished from extended space

The philosophical development of ideas that science ignores



George Berkeley (1685-1753)

- explained that primary qualities are determined by experience as much as secondary qualities
- tried to bring the idea of the [objective] world into the subjective mind



Immanuel Kant (1724-1804)

- reinstate the denuded objectivity of things in terms of an abstract thing-in-itself [noumenal] that was unknown and unknowable but logically posited by thought



Friedrich Schelling (1775-1854)

- furthered this historic development in philosophy by offering that the subjective and objective worlds were perspectives that were identical in their difference, thus overcoming the strict divide between them

The philosophical development of ideas that science ignores



“G.W.F. Hegel (1770-1831) brought the whole development to an absolute conclusion by explaining that the idea of the world was not in a particular subjective mind alone, but there is also the idea of the objective world within which the particular observer is included. This leads to the necessity of a comprehensive Absolute Idea that has being-in-and-for-itself, in which both the particular subjective and universal objective perspectives are dynamic participants of a higher unity in difference that preserves yet sublates them in a negative self-conscious individual unity.”

:: Dr. B Madhava Puri, IMvTR p 60

Takeaway

- Let us reconsider the appropriateness of devoting precious financial and mental energy to mathematical models of biological entities and processes, and invest in a more philosophically robust conceptual framework that can account for the dynamic and organic nature of biological and psychological phenomena

Application to Artificial Intelligence

- AI is limited to syntax while natural intelligence encompasses syntax and semantics
 - other distinctions: (1) AI is not a responsible agent (AI-automated vehicles who accidentally kill someone can't be charged with murder) and (2) the vast inefficiency of AI robots regarding energy used to make decisions and materials required to produce them vs NI organisms which are exponentially more efficient in both areas
- Essentially, AI's limitation to syntax is based on its computational/mathematical foundation, where mathematics is fundamentally syntactical and not semantic. [ref] [ref] If AI is meant to somehow surpass that limitation (in AI engineers/scientists' continual effort to mimic and surpass nature) it would require critically re-evaluating the appropriateness of the mathematization of nature, a deep topic which Dr. B Madhava Puri considers quite important