

The Logic of Life



Ch. 1: The Logic of Life

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Idols of
the Mind

vs.

True Reality

Bhakti Madhava Puri, Ph.D.



Ch. 1: The Logic of Life



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Animate & Inanimate Objects

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Reductionist science, which overemphasizes the importance of microscopic phenomena, does not give proper attention to the integral difference between life and matter, which is directly observed macroscopically.

Not giving proper attention to the difference between life and matter leads to problems with discerning the integral difference between living and mechanical systems.

This leads to issues with honestly assessing the capacity of Artificial Intelligence, among other problems.



Clownfish

Animate & Inanimate Objects

1. What animates living objects/entities? Is it chemical reactions?

Chemical reactions generally produce a stable product, such as an acid and alkali producing neutral salt. However these chemical reactions are not self-perpetuating over the course of many years.

Within living entities (biological systems), there exist special kinds of chemical reactions that are sustained for great lengths of time. This is known as biological activity, which can become very intricate and thus defy explanation at merely a chemical level.

Actuality & Potentiality

Aristotle called inanimate matter *dunamis* (Greek), meaning potentiality, and referred to actuality as *energia*.

Energia, or energy, is defined by scientists as "the ability to do work" (Britannica). But what impetus compels the inanimate to animate, the potential to actualize? What allows a living entity to behave so differently from inert matter or a machine?

Aristotle called this *entelechy* from *teleos*, meaning end, purpose, or goal - also referred to as teleology.

Specifically, this is internal teleology (as opposed to external teleology) which means intrinsic or natural purpose, what Immanuel Kant called *Naturezweck*



Internal Teleology

The inherent unity of reality, the Organic Whole, is manifest within the parts/participants of reality as their purpose or final end. The purpose which they serve within the Organic Whole is the reason for their existence. Genuine fulfillment of the participant is only experienced when the potential of this purposeful relationship is realized and then actually pursued.



External Teleology

When a carpenter decides to build a chair out of wood, the external purpose or teleology of the wood becomes the chair.

The inert material of dead wood has the potential to become a chair. This potential is actualized through the cognition and labor of the carpenter.

Any artifact (an object made by a person) can be viewed from the perspective of external / outer teleology.

- Material cause** → wood
- Efficient cause** → carpenter
- Formal cause** → concept of chair
- Final cause** → utility of chair (outer teleology)



Dunamis, Energia, & Entelechy

“There is a science which studies Being qua Being, and the properties inherent in it in virtue of its own nature. This science is not the same as any of the so-called particular sciences, for none of the others contemplates Being generally qua Being; they divide off some portion of it and study the attribute of this portion, as do for example the mathematical sciences. But since it is for the first principles and the most ultimate causes that we are searching, clearly they must belong to something in virtue of its own nature. [...] The term ‘being’ is used in various senses, but with reference to one central idea and one definite characteristic, and not as merely a common epithet. Thus as the term ‘healthy’ always relates to health (either as preserving it or as producing it or as indicating it or as receptive of it), and as ‘medical’ relates to the art of medicine (either as possessing it or as naturally adapted for it or as being a function of medicine) - and we shall find other terms used similarly to these - so ‘being’ is used in various senses, but always with reference to one principle. For some things are said to ‘be’ because they are substances; others because they are modifications of substance; others because they are a process towards substance, or destructions or privations or qualities of substance, or productive or generative of substance or of terms relating to substance, or negations of certain of these terms or of substance.”

:: Aristotle, *Metaphysics* 4.1003a-b

Dunamis, Energia, & Entelechy

According to Aristotle, there are many different (although not necessarily equivalent) kinds of being or matter. The *dunamis* or potentiality exhibits various potencies depending on the inner nature of that which it is the potential of. For example, the seed of a tree and the egg of a chicken actualize as different organisms based upon the inherent nature of the particular kind of living entity.

Within modern science, the study of Genetics validates the brilliance of Aristotle, who lived from 384 to 322 B.C., and this particular line of thought.



Dunamis, Energia, & Entelechy

"Genes are units of hereditary information, and they carry instructions for building proteins. The genes that are encoded within these proteins are what enable cells to function. Most organisms that reproduce sexually have two copies of each gene, because each parent cell or organism donates a single copy of its genes to its offspring. Additionally, genes can exist in slightly different forms, called alleles, which further adds to genetic variation.

The combination of alleles of a gene that an individual receives from both parents determines what biologists call the genotype for a particular trait, such as hair texture. The genotype that an individual possesses for a trait, in turn, determines the phenotype - the observable characteristics - such as whether that individual actually ends up with straight, wavy, or curly hair."

www.nationalgeographic.org/encyclopedia/genetic-variation/

"species, in biology, classification comprising related organisms that share common characteristics and are capable of interbreeding. [...] the genetic species concept, which considers all organisms capable of inheriting traits from one another within a common gene pool and the amount of genetic difference between populations of that species."

www.britannica.com/science/species-taxon

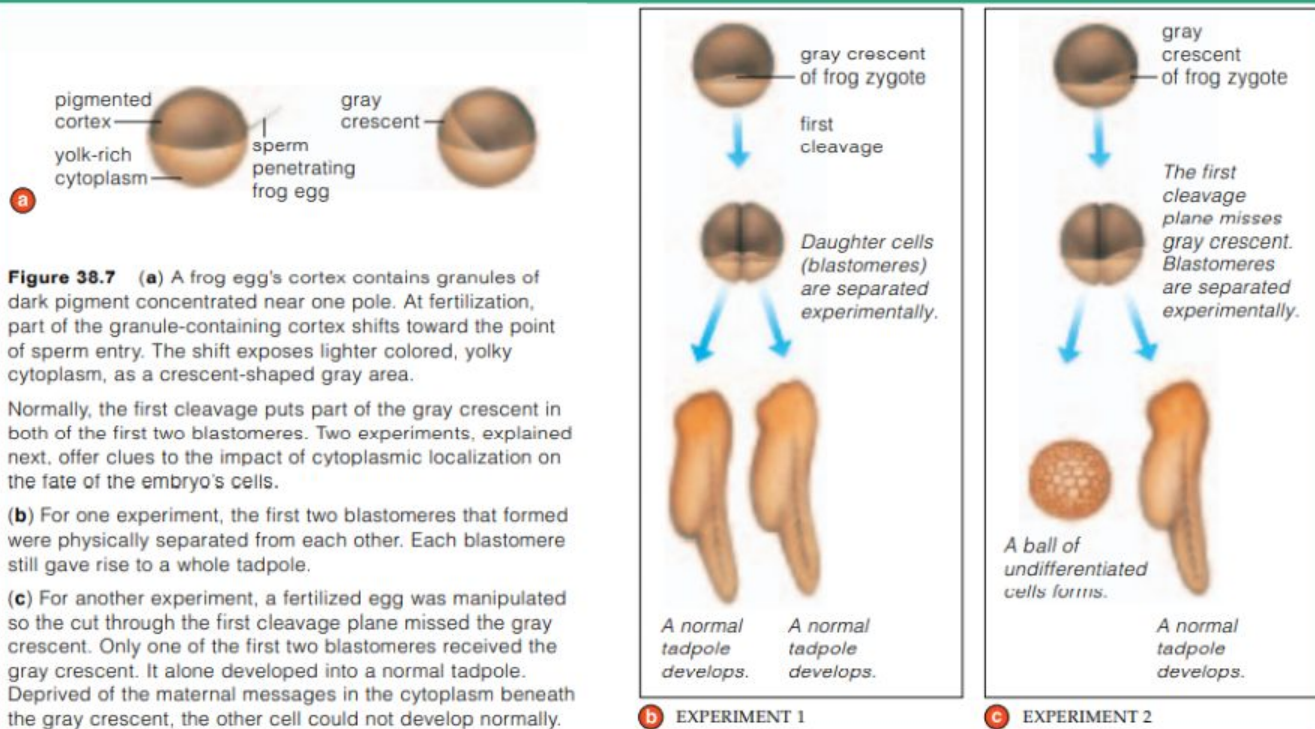
Dunamis, Energia, & Entelechy

"Of course, modern science has not discovered what corresponds to the entelechy, the mysterious force that causes a particular glob of protoplasm to differentiate and almost magically develop into whatever life form it eventually becomes. It is much too complex and specific to be understood as the result of a series of standard chemical reactions. Various experiments have been done on the zygote (fertilized egg) to show that there is a definite directive process involved that continues despite severe modification of the basic structure at an early stage of development. [1]

:: Bhakti Madhava Puri, Ph. D., *Idols of the Mind vs. True Reality*, pg 14



Dunamis, Energia, & Entelechy



[1] Starr, C. (2005). *Biology: Concepts and Applications* (p. 650). Thomson Brooks/Cole.

Dunamis, Energia, & Entelechy

"Embryonic development has been traditionally seen as an inductive process directed by exogenous maternal inputs and extra-embryonic signals. Increasing evidence, however, is showing that, in addition to exogenous signals, the development of the embryo involves endogenous self-organization. Recently, this self-organizing potential has been highlighted by a number of stem cell models known as embryoids that can recapitulate different aspects of embryogenesis in vitro. Here, we review the self-organizing behaviors observed in different embryoid models and seek to reconcile this new evidence with classical knowledge of developmental biology. This analysis leads to reexamine embryonic development as a guided self-organizing process, where patterning and morphogenesis are controlled by a combination of exogenous signals and endogenous self-organization. Finally, we discuss the multidisciplinary approach required to investigate the genetic and cellular basis of self-organization."

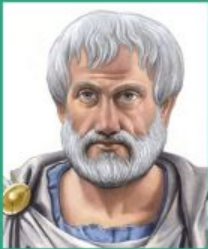
J. Serrano Morales, Jelena Raspopovic, Luciano Marcon,

From embryos to embryoids: How external signals and self-organization drive embryonic development, *Stem Cell Reports*, Volume 16, Issue 5, 2021, Pages 1039-1050, ISSN 2213-6711, <https://doi.org/10.1016/j.stemcr.2021.03.026>.

Dunamis, Energia, & Entelechy

"It is almost as if there were an invisible pattern, concept, or idea that was imprinted in the specific type of matter that directed it toward development into the specific creature that it becomes. Aristotle considered the situation from this point of view and concluded that there is a soul that was responsible for this. [2] A couple of thousand years later, G.W.F. Hegel also demonstrated in his *Science of Logic* [3] that there is a Concept involved in the determination of its corresponding content. In between these two towering figures of philosophy, Immanuel Kant also developed a similar theme (he called *Naturzweck*) in his philosophical analysis of the scientific understanding of organisms. [4]"

:: Bhakti Madhava Puri, Ph. D., *Idols of the Mind vs. True Reality*, pg 15



Mechanical Objects / Systems





Mechanical Objects / Systems

"Objects that lack internal relatedness may possess merely external relatedness. Planets relate to each other externally, as in the solar system, explicable by the laws of gravity and motion. Newtonian gravity depends upon mass, but the internal composition of that mass does not play any role in determining their attraction to other planets. Thus gravity acts in a purely external way to unite the planets as a solar system moving around the Sun. [...] Mechanics views a system as having separable independent parts that possess a fixed identity outside their connection within the system of which they are parts. If the isolated parts of a system retain the same identity as when connected within it, it is called a mechanical system."

:: Bhakti Madhava Puri, Ph. D.
Idols of the Mind vs. True Reality, pg 16-17

Chemical Objects / Systems

NaCl

A glass salt shaker is tipped over on a dark wooden surface, spilling a large amount of white, granular salt. The chemical formula NaCl is written in the powder in a cursive, hand-drawn style. The shaker is partially filled with salt and has a perforated metal cap.

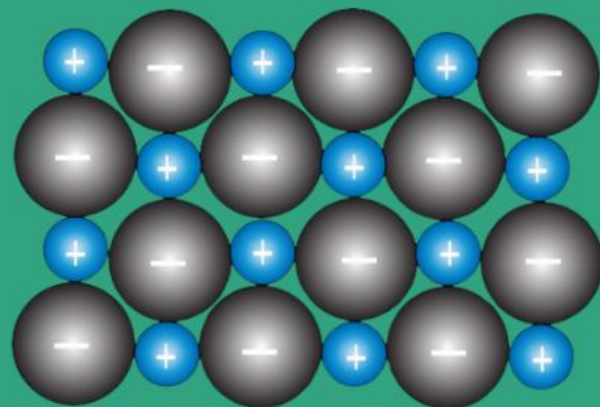
Chemical Objects / Systems

"Chemical objects have parts that are internally related. They are not the same when isolated from each other as when they are connected or united with each other."

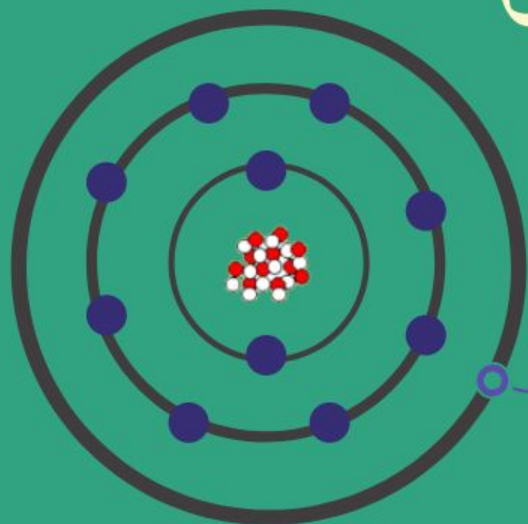
Chlorine ion (Cl^-)



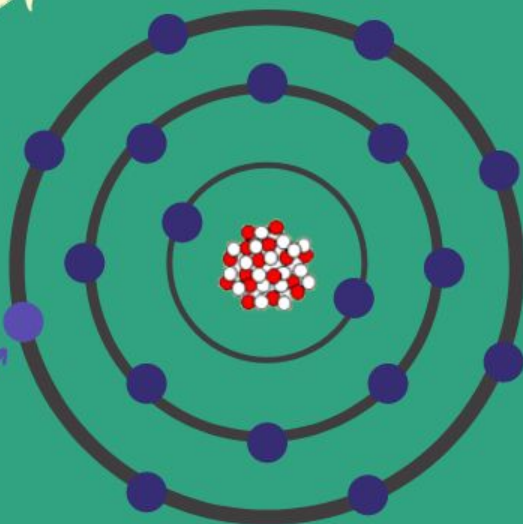
Sodium ion (Na^+)



Sodium Chloride (NaCl)
Table Salt



Sodium



Chlorine

"[...] External relations are formed due to the intrinsic properties of the individual parts of a chemical reaction."

:: Bhakti Madhava Puri, Ph. D.
Idols of the Mind vs. True Reality, pg 17

Chemical Objects / Systems

The individual characteristic of a chemical object, such as being basic or acidic, is relative to the characteristic of what it is being compared to.

The individual characteristic of a mechanical object is generally not relative to external things.



Chemical Objects / Systems

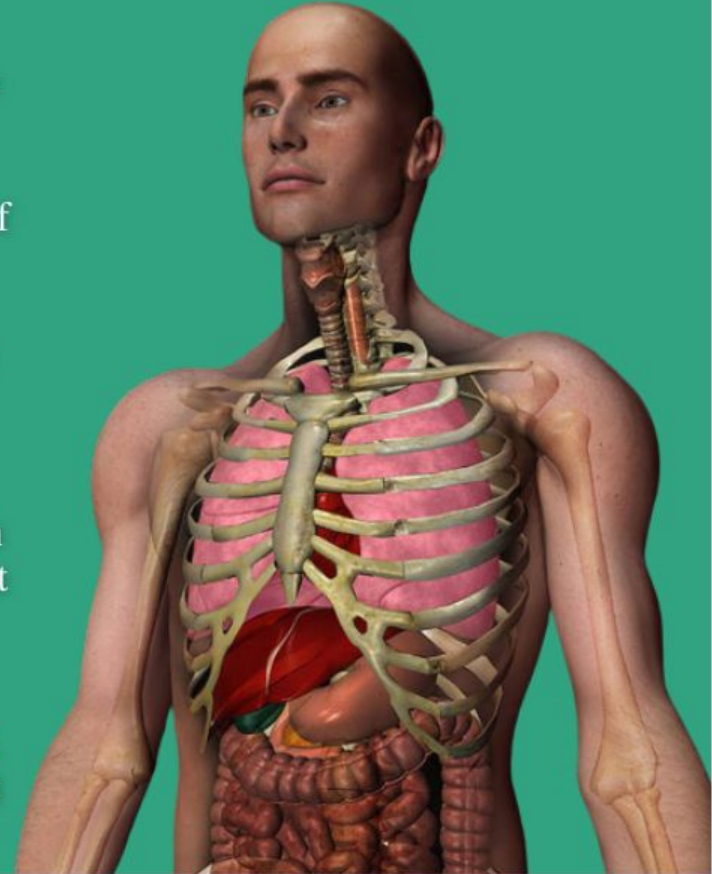
The relationship of mechanical objects to other objects within a mechanical system is created by external law, whereas the relationship of chemical objects to other objects within a chemical system is due to the inherent nature of each individual chemical object and the natural interaction of such objects based on these properties.

The parts of a clock retain the same identity whether or not they are united as a clock. The parts of a chemical system have a distinctive and separate identity when they are isolated from each other, such as individual Sodium and Chlorine ions, while also forming a new distinctive identity as salt when they are united. Salt, Sodium, and Chlorine all have unique identities. They each may exist independently in an isolated state, while also existing dependently as elemental constituents of a final chemical compound.

Biological Systems

"Those parts that cannot be separated from a system without destroying it as a working system can no longer be called parts but are participants or members of a dynamic whole. The participants are as essential to the whole as the whole is to the participants this is the biological system or organism. Here we are removed from the stasis of fixed objects and are in the milieu a pure dynamical activity. Participants cannot be isolated from the whole in which they are participants and remain what they are. A DNA molecule can no more be what it is as a producer of protein molecules than the protein molecules can be what they are as produced from the action of DNA and producing the DNA. Each participant is the cause and effect of each other participant, as Kant defined organism. Therefore nothing in an organism is without purpose nor is the organism as a whole without purpose in the environment thus everything in the organism is both purpose (end) and means."

:: Bhakti Madhava Puri, Ph. D.
Idols of the Mind vs. True Reality, pg 18



Biological Systems

"In the first step, the information in DNA is transferred to a messenger RNA (mRNA) molecule by way of a process called transcription. During transcription, the DNA of a gene serves as a template for complementary base-pairing, and an enzyme called RNA polymerase II catalyzes the formation of a pre-mRNA molecule, which is then processed to form mature mRNA (Figure 1). The resulting mRNA is a single-stranded copy of the gene, which next must be translated into a protein molecule."

[www.nature.com/scitable/topicpage/
translation-dna-to-mrna-to-protein-393/](http://www.nature.com/scitable/topicpage/translation-dna-to-mrna-to-protein-393/)

LINEAR CAUSALITY

Cause

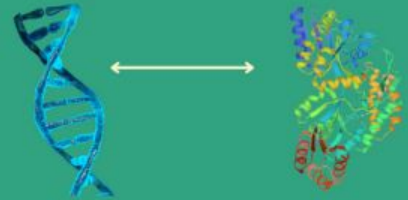
Effect



DIALECTIC CAUSALITY

DNA

Protein

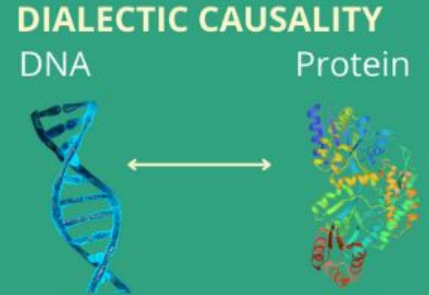
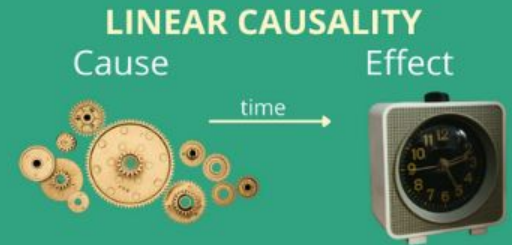


Biological Systems

"DNA replication involves an incredibly sophisticated, highly coordinated series of molecular events. These events are divided into four major stages: initiation, unwinding, primer synthesis, and elongation. [...] During initiation, so-called initiator proteins bind to the replication origin, a base-pair sequence of nucleotides known as oriC. This binding triggers events that unwind the DNA double helix into two single-stranded DNA molecules. Several groups of proteins are involved in this unwinding.

[...] Primer synthesis marks the beginning of the actual synthesis of the new DNA molecule. Primers are short stretches of nucleotides (about 10 to 12 bases in length) synthesized by an RNA polymerase enzyme called primase. Primers are required because DNA polymerases, the enzymes responsible for the actual addition of nucleotides to the new DNA strand, can only add deoxyribonucleotides to the 3'-OH group of an existing chain and cannot begin synthesis de novo. Primase, on the other hand, can add ribonucleotides de novo. Later, after elongation is complete, the primer is removed and replaced with DNA nucleotides."

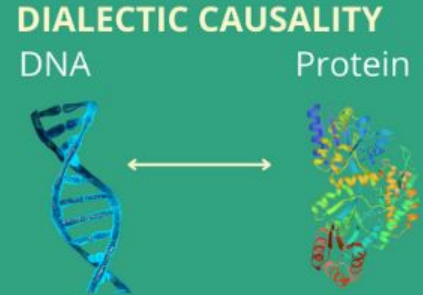
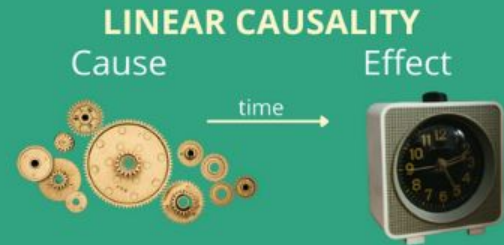
www.nature.com/scitable/topicpage/major-molecular-events-of-dna-replication-413/



Teleological Connection between Part & Whole

"Abstract understanding tends to think of either a unity or a multiplicity. Pure multiplicity is indicative of the atomic thinking of material reductionism. Pure unity is the indeterminateness of abstract monism. Unity in multiplicity is the comprehensive thinking of dialectical reason. Life has to be comprehended as a process in which its participants are simultaneously both ends (products) and means (production) to one another."

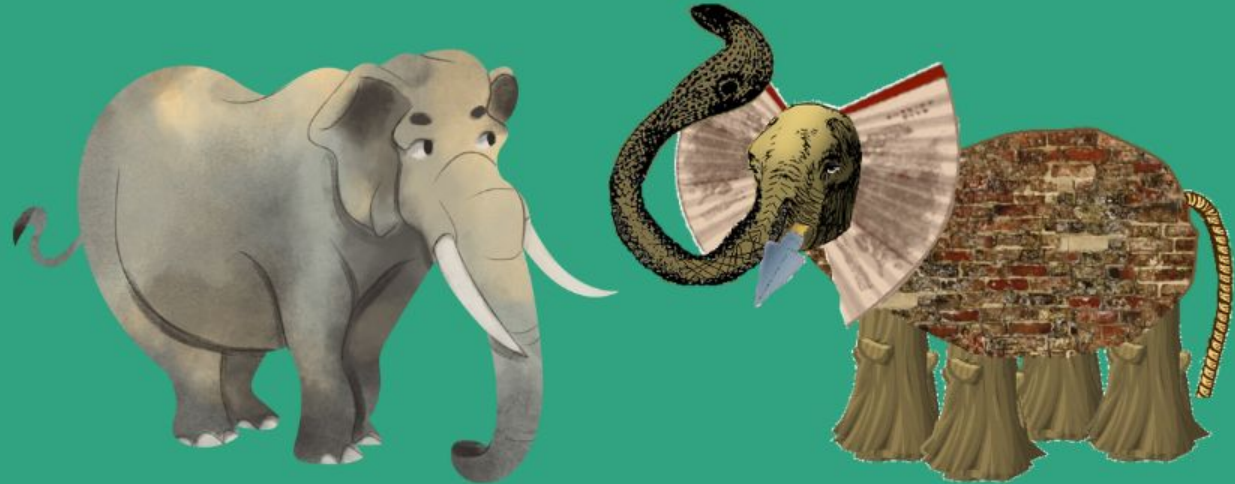
:: Bhakti Madhava Puri, Ph. D.
Idols of the Mind vs. True Reality, pg 19



Teleological Connection between Part & Whole

Text without context is pretext
Blind men and elephant

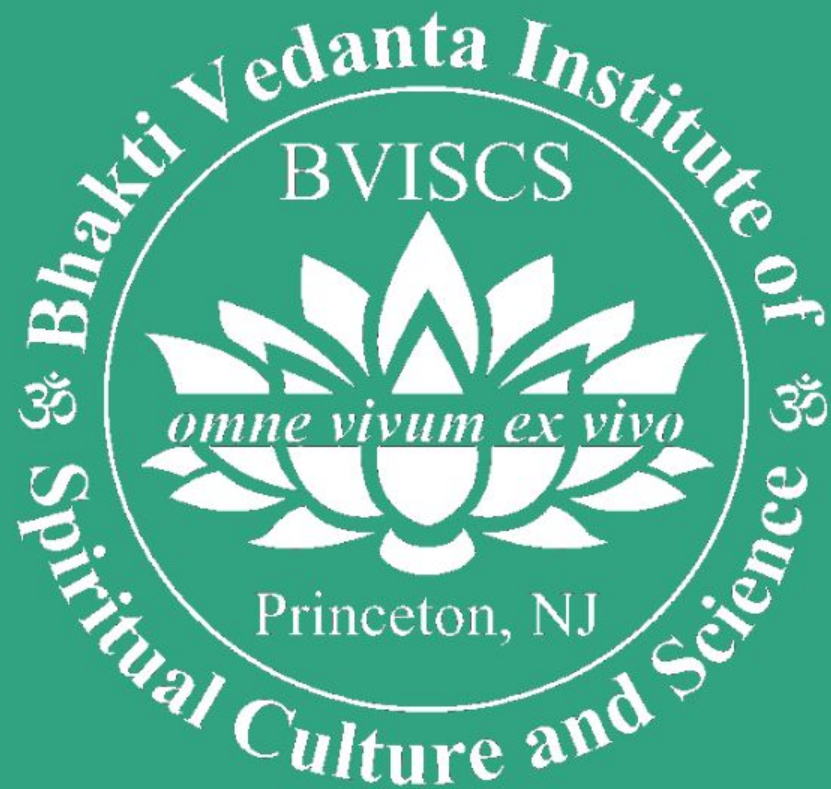
The parts are sublated in the whole. There is unity and difference. The seed is implicit in the tree. The seed produces and is produced from the tree. This is self-determination.



Teleological Connection between Part & Whole

Mechanical metaphors and reductionist approaches miss or neglect the living dynamic unity of reality. The unity is evident within the part as its purpose, its final end (teleology). The part is integrated with the whole through its teleological relationship to the whole. Without acknowledging this teleological relation to the whole, the part cannot be properly conceived. Thus the emphasis of modernity is on the finite individual's purposes and needs instead of the infinite whole of which the individual is an organic part.

Mechanistic and chemical perspectives are true in a limited sense but are incomplete as such (chemical explanation leaves gene editing and proof reading in cell as mysterious). This does not explain the complete truth. Teleology provides more complete understanding, everything is driven by purpose, fully realized as *Krishnera nitya das* in Vedic wisdom.



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