



Science and Scientist

Bhaktivedanta Institute Newsletter

Science/Spirituality Quotes:

- "You pass from matter to life because your intelligence of today ... cannot conceive things otherwise. How do you know that in ten thousand years one will not consider it more likely that matter has emerged from life?"



- Louis Pasteur

- "There are two kinds of reality or existence; the existence of my consciousness and the reality or existence of everything else."



- Eugene Wigner

- "Just as heat and smoke are symptoms of fire, so consciousness is the symptom of the soul."

- A. C.
Bhaktivedanta
Swami
Prabhupada



- "Scientific and religious paths are like two streams of the creative human mind. ... The scientific path tries to explain the nature of reality within rationality, whereas the religious or spiritual path does so within and beyond rationality."



- T. D. Singh

The Scientific Revolution in Evolution

Staff – *Science and Scientist*

Suzan Mazur, journalist for *Scoop, Independent News*, recently reported that what is planned for this July (2008) "promises to be more transforming for the world than Woodstock." [1] Challenging the central doctrine of Evolution - Natural selection - is the controversial topic that scientists will discuss at the Konrad Lorenz Institute in Altenberg, Austria. This meeting of 16 renowned biologists and philosophers could transform the whole concept of Darwinian evolution and with it the entire way that scientists and the rest of us view the world.

The theory of evolution that is accepted by most biologists and is taught in our schools is proving to be inadequate for explaining the world as we know it today because of its pre-DNA roots, its inability to explain body forms, and its antiquated formulation that renders it irrelevant to other new discoveries in modern biology. The 150 year old theory of Charles Darwin was last upgraded 70 years ago in the form of neo-Darwinian

evolution. All accounts indicate that a major shift is about to occur again, away from the population genetic-centered conception that has been currently adopted.

The role that natural selection plays in evolution in filtering out those characteristics that are unfavorable for survival is mistakenly assumed by many to be the central mechanism for evolution. But the process that creates a particular organism to be selected is not a product of natural selection. In fact, the actual mechanism for producing one species from another presently is not known.

Richard Lewontin, Harvard evolutionary geneticist, thinks that the idea of natural selection came from the free market capitalism that Darwin was caught up in. He commented, "That's where Darwin got the idea from, that's for sure...He read the stock market every day...How do you think he made a living?." [1]

Stanley Salthe [2], a philosopher at Binghamton

University, NY, agrees with Lewontin. He is also a strong critic of the theory of natural selection,



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— Richard Lewontin, Ph.D., Alexander Agassiz Research Professor, Harvard

which he thinks may be a real phenomenon, but claims that it has never been demonstrated to affect long term changes in populations.

Both Lewontin and philosopher Massimo Pigliucci are critical of those who do not know enough about the intricacies of biology to raise

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Modern science has generally been directed toward investigating the material world, excluding consideration of the conscious scientist who is essential to the whole process, since, of course, the nature of the scientific endeavor itself depends upon consciousness. Bhaktivedanta Institute was founded to encourage the study and exploration of the means and methods for developing a more complete science of reality based on the knowledge of matter and spirit.

The key participants of this conference are listed from top, left to right:

John Beatty, University of British Columbia
Sergey Gavrilets, University of Tennessee
David Sloan Wilson, Binghamton University
Greg Wray, Duke University

Michael Purugganan, New York University
Eva Jablonka, Tel-Aviv University
John Odling-Smee, Oxford University
David Jablonski, University of Chicago

Massimo Pigliucci, SUNY Stony Brook
Stuart Newman, New York Medical College
Gerd Muller, University of Vienna
Gunter Wagner, Yale University

Marc Kirschner, Harvard University
Werner Callebaut, Hasselt University
Eors Szathmary, Collegium Budapest
Alan Love, University of Minnesota



issues regarding the irrelevance of natural selection. As a philosopher, Pigliucci does ask the hard questions: "Is the paradigm you're working with, in fact, working? Is it useful? Could it be better?"

For instance, epigenetic inheritance is a mechanism that Darwin did not even know existed. Experimental evidence implies that there may be a whole chemical layer that exists on top of the genes that is inheritable but is not DNA. Neo-Darwinism attempts to incorporate mutations at the DNA level, but it does not take this extra layer of inheritable material into account.

Spontaneously organized material systems, like snowflakes, hurricanes, etc. - formed by a process called self-organization - grow in complexity from processes involving simple forces of attraction and repulsion. The production of biological forms is much more complex and, of course, remains one of the essential processes for which evolutionary biologists are yet to provide any sound explanation.

Stuart Kauffman, developmental biologist and head of the Biocomplexity and Informatics Institute at the University of Calgary in Canada, has done most of his research on the study of self-organization. Informatics is the combined study of information theory and thermodynamics. While snowflakes can form without needing natural selection to do so, the competition for resources that confront living organisms is where natural selection becomes a factor. At the same time, Darwin's theory begins with life, so it does not apply to, what to speak of explain, how life itself began.

Genes are molecules, which are "utterly dead," Kauffman explains. There are approximately 25,000 genes, which each

have two states – on or off. That amounts to about 10 to the 7000th permutations. Considering that there are only 10 to the 80th particles in the universe, the probabilities involved in forming these molecules is staggering. Yet cells and organisms also involve a very complex set of processes that activate or inhibit one another, so that much more than genes are involved. Kauffman's view can best be represented in the new book he has published entitled "Reinventing the Sacred." [3]

He believes that self-organization has to be added to the Darwinian formulation, and that the relation of self-organization to selection is "barely understood." On the other hand, Stuart Pivar, with the background of both a chemist and engineer, thinks natural selection is irrelevant to self-organization. He believes that body forms derive from a basic egg-cell membrane structure called the multi-torus. The identification of the dynamic torus of the sea urchin embryo, which looks like an elongated smoke ring, gives some empirical credence to his theory.

Lewontin thinks that the structure of the cell membrane may certainly have some influence on the future development of the body, and that it is not dependent purely upon the genes and



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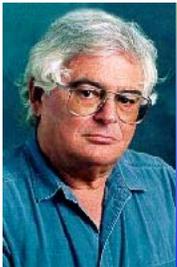
— Stuart Kauffman, Ph.D.

Developmental biologist and head of the Biocomplexity and Informatics Institute at the University of Calgary in Canada

nucleus of the cell. However, he doesn't think it can be the sole explanation of the body forms. Pivar, on the other hand, believes it is the only determining factor.

Michael Lynch, author of "The Origins of Genome Architecture," doesn't believe that a new extended evolutionary synthesis that incorporates complexity, body formation, etc. is needed. He considers that the challenge is to connect genomic level evolution with cell development and the encompassing phenotypic system.

Jerry Fodor, a philosopher at Rutgers University, wrote a scathing critique of natural selection in the *London Review of Books* called "Why Pigs Don't Have Wings." [4] In his article he explains that biologists now think that the concept of natural selection has outlived its usefulness and that it cannot survive the modern demands of biology. He believes that a new theory has to be developed that will not include the natural selection



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and something more complicated than mere biomolecular considerations of living organisms is required. So far, such a theory has not been developed.

Fodor continues,

"In fact, an appreciable number of perfectly reasonable biologists are coming to think that the theory of natural selection can no longer be taken for granted. This is, so far, mostly straws in the wind; but it's not out of the question that a scientific revolution – no less than a major revision of evolutionary theory – is in the offing. Unlike the story about our minds being anachronistic adaptations, this new twist doesn't seem to have been widely noticed outside professional circles. The ironic upshot is that at a time when the theory of natural selection has become an article of pop culture, it is faced with what may be the most serious challenge it has had so far. Darwinists have been known to say that adaptationism is the best idea that anybody has ever had. It would be a good joke if the best idea that anybody has ever had turned out not to be true. A lot of the history of science consists of the world playing that sort of joke on our most cherished theories."

To suggest that it is premature to try to synthesize a new theory of evolution at the present time, is only to admit that eventually the task will have to be taken up in the future. This only brings up the question, why would we want to postpone such an effort?

story. He also admitted it is very difficult to get this kind of attack on natural selection in print without risking severe counter attack.

Fodor writes,

"... Darwin's theory of evolution has two parts. One is its familiar historical account of our phylogeny; the other is the theory of natural selection, which purports to characterise the mechanism not just of the formation of species, but of all evolutionary changes in the innate properties of organisms. According to selection theory, a creature's 'phenotype' – the inventory of its heritable traits, including, notably, its heritable mental traits – is an adaptation to the demands of its ecological situation. Adaptation is a name for the process by which environmental variables select among the creatures in a population the ones whose heritable properties are most fit for survival and reproduction. So environmental selection for fitness is (perhaps plus or minus a bit) the process par excellence that prunes the evolutionary tree."

In other words, if it is the type of the environment (ecotype) that selects a particular phenotype according to its survivability in that particular environment, then the mechanism of adaptation is primarily exogenous to the phenotype. On the other hand it is generally assumed that variations in the endogenous traits of the phenotype are the main factors responsible for adaptation to the environment. If both are at work, then exogenous ecotypic factors are responsible for endogenous phenotypic development,



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— Jerry Fodor

The scientists at Bhaktivedanta Institute understand that a completely non-evolutionary ontology of life has to be developed. Thus any attempt at explaining the variety of species will be problematic until the irreducibility of life as a distinct and fundamental feature of Nature is recognized. This means that life is neither a product of matter, nor is it the result of any material process, pattern or design. According to this conception of life, the gradual erosion of the Darwinian theory of evolution or any other extensions thereof must be expected in the scientific pursuit of knowledge.

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VEDANTA AND SCIENCE

T. D. Singh, Ph.D.



Introduction

"The most beautiful and deepest experience a man can have is the sense of the mysterious. It is the underlying principle of religion as well as all serious endeavor in art and science." – Albert Einstein

The essence of all Vedic teaching is contained in the Vedanta, the scientific and theological doctrine of Vedic science, and in the timeless wisdom of the Vedas. Its scientific and intellectual contents have attracted the attention of some of the world's finest scientific and philosophical minds, such as Erwin Schrödinger, Robert Oppenheimer, Albert Einstein, and Aldous Huxley. It speaks of billions of years of history, creation of the universe, medicinal science, metallurgy, space travel, embryology, art, music, etc. It is no exaggeration to say that there is almost no branch of knowledge that is left untouched in the Vedas.

There are five core features in Vedic teachings: (1) God – *Isvara*, (2) Soul – *Jiva*, (3) Time – *Kala*, (4) Matter – *Prakriti*, and (5) Action – *Karma*. Of these the first four principles are eternal whereas the last feature is temporary. Based on these principles, Vedic science provides a deep knowledge and understanding of life and the universe. In its pure form, Vedic science is also known as *Sanatana Dharma* or the eternal function of the living entity. One of the unique features of Vedic science is that it provides a very vivid and broad description of God and His energies. This paper outlines the Vedantic worldview in reference to many of modern science's perspectives including the subjects of mind, consciousness and embryology.

According to Vedanta, there is another reality in nature different from matter. It is the fundamental spiritual particle (called *atman* in Vedantic terminology), which the author has coined as "spiriton." It is a transcendental particle and is ontologically different from matter. It has a conscious property and has free

will contrary to material particles like electrons. It is only by the presence of the spiriton that matter appears animated. In Vedanta this seemingly animated matter is referred to as embodied life.

"... all knowledge relates to the spirit, or more properly, exists in it, and that is the sole reason for our interest in any field of knowledge whatsoever." – Erwin Schrödinger [1]

According to Vedanta, every life form has *atma* or spiriton, within it. In other words not only do human beings possess a spiriton, but so do all microorganisms, insects, aquatics, plants, reptiles, birds, and so on. In this regard, Vedanta is unique and different from the scientific and theological views of many other world traditions. The *Bhagavadgita* (verse 15.7), states: *mamaivamsa jivaloke jivabhutah sanatanah*, which means that all spiritons are



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eternal conscious particles of the Supreme Lord. The fundamental qualities of the spiritual particle, or spiriton are of the same nature as the Supreme Lord's and are as follows: *sat* (eternal existence), *cit* (full cognition), *ananda* (blissfulness), *sveccha* (free will) and *cetana* (consciousness). Vedanta explains that matter, however complex, will never generate life or its inherent symptom, consciousness. There are two categories of consciousness: God's consciousness is universal (all pervasive) whereas the spiriton's consciousness is localized and always remains so but both are ontologically non physical in nature.

The Law of Karma, Free Will and The Three Modes of Material Nature

Vedanta states that the material nature is broadly divided into three modes (*gunas*)— *sattva* (goodness), *rajas* (passion) and *tamas* (ignorance). In order to accommodate the different desires

of the living entities (spiritons), the material nature, by the will of the Lord, manifests a variety of forms through the mixing of the three modes of nature. All embodied spiritons—human beings, animals, birds, plants, etc., are influenced to different degrees by the three modes of material nature. [2] Any activity that the spiriton performs under the influence of the three modes of material nature, either psychologically or physically is known in Sanskrit as *karma* - action. In the Vedantic tradition there is the concept of a natural 'Law of *Karma*.'

The law of *karma* is similar to the rules of action and reaction in Newton's Law. All spiritons are engaged in different activities within this cosmic manifestation. From time immemorial the spiritons are enjoying or suffering the fruits of their activities according to the law of *karma*. The results of the law of *karma* are singular and pointed and there cannot be any error in them. The answer to the question, 'why bad things happen to good people?' is '*karma*'. The law of *karma* remains although an individual may not remember the action that has caused the current reaction. The wheels of *karma* are driven by the free will and desire of the embodied spiritons. It is difficult to deny that we all have free will although it cannot be detected in a laboratory.

Professor Charles Townes, Nobel Laureate in Physics says, "Many scientists will say, 'I can't believe in religion.' On the other hand, if you ask them, do you think you have some free will, almost every scientist instinctively thinks so. He has free will. He



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In regards to modern science's inability to explain free will which Vedanta describes as a fundamental quality of the individual spiriton or life, Roger Penrose, the world renowned mathematician from Oxford University, has expressed, "The issue of 'responsibility' raises deep philosophical questions concerning the ultimate causes of our behavior. ... Is the matter of 'responsibility' merely one of the convenience of terminology, or is there actually something else – a 'self' lying beyond all such

influences – which exerts a control over our actions? The legal issue of 'responsibility' seems to imply that there is, indeed, within each of us, some kind of an independent 'self' with its own responsibilities – and, by implications, rights – whose actions are not attributable to inheritance, environment, or chance. If it is other than a mere convenience of language that we speak as though there were such an independent 'self', then there must be an ingredient missing from our present-day physical understandings. The discovery of such an ingredient would surely profoundly alter our scientific outlook. ... it will tell us to broaden our view as to the very nature of what a 'cause' might be. A 'cause' could be something that cannot be computed in practice or in principle. ... when a 'cause' is the effect of our conscious actions, then it must be something very subtle, certainly beyond computation, beyond chaos, and also beyond any purely random influences. Whether such a concept of 'cause' could lead us any closer to an understanding of the profound issue of our free wills is a matter for the future." [4]

Free will is a quality of the life particle or spiriton and by exercising free will an individual performs actions and is implicated in various reactions according to the law of *karma*. The use of free will either appropriately or inappropriately will decide the course of life's journey. Vedanta describes that all other forms of life below the level of human consciousness cannot escape the chain of *karma* under normal circumstances. Therefore, Vedanta emphasizes that the human race has an

obligation to protect and guide not only mankind but also all lower forms of life.

Biodiversity and Evolution of Consciousness

According to modern biology, biodiversity is due to a genetic variation caused by the process of occasional chance mutation. However, according to Vedanta, the law of *karma* and the three modes of material nature — *sattva*, *rajas* and *tamas* — are responsible for biodiversity as well as for diversity in terms of levels of intelligence, degree of development of mind and consciousness of the embodied being within the same species. Furthermore, the Vedas state that biodiversity is a process to accommodate the various states of consciousness in different life forms. There is a gradual evolution of consciousness through various species of life according to the subtle laws of *karma*. These life forms are said to number 8.4×10^6 and include – microorganisms, insects, plants, aquatics, birds, reptiles, animals, humanoids and human beings. [5] According to the conscious evolutionary cosmic time scale, one gets the human form of life after passing through millions of varieties of life forms.

Vedanta further explains that many life forms manifest simultaneously. In other words, genetic variation is already within a cosmic plan. Nobel Laureate Werner Arber's observation that genetic mutation is not due to error or mistake is in line with the Vedantic conception. He says, "Evolution does not occur on the basis of errors, accidents or the action of selfish genetic

elements. Rather, the evolution genes must have been finetuned for their functions to provide and to replenish a wide diversity of life forms. [6] Both of these viewpoints support that biological forms are already within the cosmic plan. This is just the opposite of Darwin's concept of biological evolution. Stephen Jay Gould, a prominent evolutionist from Harvard University writes, "The extreme rarity of transitional forms in the fossil record persists as the trade secret of paleontology . . . In any local area, a species does not arise gradually by the steady transformation of its ancestors, it appears all at once and fully formed." [7] According to Vedanta, natural selection and random mutation are not the causes of biodiversity - the spiriton continually transmigrates from one life form to the next until it reaches the human form where consciousness is fully developed and has a chance to reestablish its pure spiritual existence. Thus, in the Vedantic tradition it is the consciousness that evolves, not the bodies.

Darwin's mistake was that he could not conceive of an eternal existence of consciousness. Under normal circumstances, the consciousness of the spiriton evolves linearly as well as stepwise. As previously referenced, the *Brahma Vaivarta Purana* affirms, that one gets the human form of life after having changed 8.4×10^6 other forms of life. The *Padma Purana* gives a detailed statement regarding the different forms of life as follows: "There are 8,400,000 forms of life. There are 900,000 forms of life in the water, and 2,000,000 forms of trees and other plants. Then, there are 1,100,000 species of small living beings, insects

human beings have the innate ability to develop their consciousness to an almost unlimited extent, up to the point of knowing the Absolute Truth - God. Other species do not have this special ability. That is why Vedanta emphasizes that *brahma jignasa*, inquiry into the *Brahman*, God, is specifically meant for the human form of life. When one begins to sincerely inquire about *Brahman*, one's bud-like spiritual consciousness begins to bloom and as a result of this blossoming of consciousness one practices regulated spiritual discipline and evolves further and further. Finally, one attains complete transcendental realization, God consciousness - *saccidananda* - the 'fully bloomed' state of consciousness.

A Glimpse of Embryology

It is interesting to note that there is a significant description about the science of embryology in Vedantic literatures. *Srimad Bhagavatam*, Third Canto gives a brief description of human embryology. *Garbhopanishad*, one of the ancient Upanishads, also serves as a brief treatise on embryology. According to Vedanta life manifests from the moment of conception. Life first enters the semen of the male and is injected into a womb of a woman. [10] Dr Jerome Lejeune, [11] known as "The Father of Modern Genetics," also said, "Life is present from the moment of conception" before the Louisiana Legislature's House Committee on the Administration of Criminal Justice on June 7, 1990. He explained that within three to seven days after fertilization we can



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— T. D. Singh, Ph.D.

and reptiles, and 1,000,000 species of birds. Finally, there are 3,000,000 varieties of beasts and 400,000 human species."

Biological forms impose a limitation on the development of consciousness, therefore, different degrees of consciousness are expressed through different bodies. Vedanta divides the degrees of consciousness into five broad categories: *acchadita* (covered), *sankucita* (shrunken), *mukulita* (budding), *vikasita* (blooming) and *Purnavikasita* [8] (fully bloomed). Trees and plants, for example, are almost inert. They fall into the category of 'covered consciousness.' When we observe them carefully, we see that they have a limited or covered consciousness. The famous scientist Jagadish Chandra Bose reported that plants do have consciousness. [9] Other living entities, such as worms, insects, and other animals are in 'shrunken consciousness.' They are not as covered as plants, but their consciousness is not fully developed either. Human beings have 'budding consciousness.'

A bud appears shrunken, but it has the potential to bloom into a flower. Human consciousness has a similar potential. Thus,

determine if the new human being is a boy or a girl. "At no time," Dr. Lejeune said, "is the human being a blob of protoplasm. As far as your nature is concerned, I see no difference between the early person that you were at conception and the late person which you are now. You were, and are, a human being." He pointed out that each human being is unique - different from the mother - from the moment of conception [12].

A man's semen contains millions of cells called sperm cells (about 107 /ml). Each sperm cell is an actively motile, free-swimming and elongated cell from 60-75 μ in length. F.M. Burnet remarked, "It is an intimidating thought that there is more information on organic chemical synthesis packed into the head of a spermatozoon than in all the 200 volumes of the Journal of Biochemical Chemistry." [13]



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— Jerome Lejeune, The Father of Modern Genetics

According to vedic literatures, a spiritual particle, spiriton (soul) enters this sperm cell which then fertilizes the ovum, the female gamete, to form a single cell called zygote. The various stages of development of embryo in the womb of the mother are described in *Srimad Bhagavatam* 3.31.2-4, 10, 22-23: "On the first night, the sperm and ovum mix (to form zygote), and on the fifth night the mixture ferments into a bubble (blastocyst). On the tenth night it develops into a form like a plum, and after that, it gradually turns into a lump of flesh." "In the course of a month, a head is formed, and at the end of two months the hands, feet and other limbs take shape. By the end of three months, the nails, fingers, toes, body hair, bones and skin appear, as do the organ of generation and the other apertures in the eyes, nostrils, ears, mouth and anus. Within four months from the date of conception, the seven essential ingredients of the body, namely chyle, blood, flesh, fat, bone, marrow and semen, come into existence. At the end of five months, hunger and thirst make themselves felt, and at the end of six months, the fetus, enclosed by the amnion, begins to move on the right side of the abdomen.

Deriving its nutrition from the food and drink taken by the mother, the fetus grows and remains in that abominable residence of stools and urine, which is the breeding place of all kinds of worms. Placed within the amnion and covered outside by the intestines, the child remains lying on one side of the abdomen, his head turned towards his belly and his back and neck arched like a bow. Thus endowed with the development of

bodily needs. They inquire, 'where is water?', 'where is food?', 'where is shelter?' and so on. However, they do not have the capacity to inquire about the deeper purpose and meaning of life. But in the human form of life, one is endowed with the unique ability to inquire beyond these bodily needs. This is the special and unique qualification of the human form of life. *Srimad Bhagavatam* (1.2.10) states: "Life's desires should never be directed toward sense gratification. One should desire only a healthy life, or self-preservation, since a human being is meant for inquiry about the Absolute Truth. Nothing else should be the goal for one's works."

Presently, scientific inquiry without spiritual knowledge is one-sided. All forms of human inquiry should be utilized in search for Absolute Truth. A physicist should inquire: what is the real source of the laws of nature? A chemist can inquire: who is the Supreme Chemist behind all the wonderful molecules, DNA, chlorophyll, proteins, etc.? Vedanta explains that if we do research far enough, we will find that the ultimate source is God. Thus, *Vedanta* advises that scientific knowledge should not try to remove God from everything. When one realizes the Absolute Truth through such an inquiry, he will understand the actual basis of reality. And then, his duty is to glorify the Supreme Lord through the scientific understanding. This is the secret and the real platform of happiness. This is what is instructed in the *Bhagavata Purana*, the natural commentary on the *Vedantasutra*. [16]

consciousness from the seventh month after his conception, the child is tossed downward by the airs that press the embryo during the weeks preceding delivery. Like the worms born of the same filthy abdominal cavity, he cannot remain in one place." [14] It is indeed, worth wondering that a scripture written more than 5 thousand years ago contains such a vivid description of formation of a baby in the mother's womb, that even the most advanced modern scientific instruments cannot reveal to us.

Inquiry and Uniqueness of Human Life

The unexamined life is not worth living. – Socrates [15]

In Vedanta, inquiry, *jijnasa*, is the fundamental duty of human life. Everyone inquires about something or the other. In the course of life, one experiences different phases like old age, disease and many kinds of sufferings. Therefore, we want to find out the solution to these problems. Every research work is a kind of inquiry. Humanity begins when this sort of inquiry is awakened in one's mind. Therefore, inquiry forms the most important process of acquiring knowledge. We want to know about things that are beyond what we can see conventionally. We invent electron microscope, telescope, etc., to satisfy our curiosity. But this is not enough. Our senses and extended senses are still very limited.

Can a bird inquire about the meaning of its existence? Innocent and ordinary living beings like birds and animals inquire only of



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Albert Einstein once remarked, "The important thing is not to stop questioning. Curiosity has its own reason for existing. One cannot help but in awe when he contemplates the mysteries of eternity, of life, of the marvelous structure of reality. It is enough if one tries merely to comprehend a little of this mystery everyday." [17]

In the human form of life, the consciousness (*cetana*), intelligence (*buddhi*), mind (*manas*), senses (*indriyas*) are fully developed. Thus, human being is totally equipped to make the deepest *jijnasa* (inquiry), the spiritual inquiry. A similar message echoes in the statement of Albert Einstein who states that knowing the mind (plan) of God is most important and the rest are details. [18] By this inquiry, *sambandha*, the relationship between the individual self and God will be established and the pure spiritual knowledge of the self will be understood. *Isa Upanisad* further declares, *isavasyamidam sarvam*, everything

belongs to the Supreme Lord. Therefore, everything should be used, including the works of the scientists and all the leaders of the world in the service of the Supreme Lord. In a nutshell, this is the view of Vedanta regarding the prime duty of humanity.

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9. "... In many other ways we are able to find that the plant has a heart that beats continuously as long as life remains." [Cf. Dibakarsen and Ajoy Kumar Chakraborty, *J. C. Bose Speaks*,

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10. *Aiteraya Upanisad* 2.1.1, *Aitareya Brahmana* 2.5.1 and *Srimad Bhagavatam* 3.31.1
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SCIENCE AND SPIRITUALITY IN THE NEW MILLENIUM

Jagdish N. Srivastava, Ph.D., CNS Research Professor, Colorado State University

[From *Thoughts on Synthesis of Science and Religion*]*



Introduction

The surging worldwide interest in the synthesis of Science and Religion is not surprising. Science has made immense strides and has been impacting all sectors of human life by improving man's living conditions. However, it has also given to man the means for total self-annihilation. There are ecological side effects, and many are scared of the genetic Genie that might be coming soon upon us. There is more wealth in the world, but the overall misery remains the same in terms of social and economic tensions. Man has not matched the progress in science with ethical progress needed for life in the emerging global village. A revolution in values is needed.

Traditionally, Religion has provided some of this. But, taken too narrowly, this also increases misunderstanding, and promotes

conflict. Moreover, there has been a tilt toward material values as opposed to ethical, because of Science providing man with an abundance of goods. Today due to busy schedules, man is finding less time for contemplating the finer needs of life. Indeed, considering the increase in violence among children, and many other similar social indicators, there seems to be an erosion of values. However, to most people, both Science and Religion have a large number of attractive features. The rational methods of Science are attractive, and many would like to combine them with ethical and other spiritual values that Religion offers.

Science

Science is a study of the universe around us, as it appears to us through our senses, or the extension of the senses in the form of

measuring instruments. It also deals with the making of machines which can help us in what we wish to do, by helping us to do it, do it faster, do it at a larger or smaller level, or at a level requiring a larger or smaller precision, etc. Often, Science deals with the prediction of natural processes of interest to us, or the taming of (or dominating) nature for our convenience. A good scientific researcher is wedded to the truth behind his subject matter. If he finds from his work that the truth contradicts previous opinions held by his peers, elders, or teacher(s), he still proclaims his results and argues in their favor. Indeed, otherwise, Science cannot proceed further. Science is, often, 'utilitarian' in its efforts. Pursuit of science, in most sectors, requires varying amounts of funds. Thus that which is considered to offer more material reward in the short or long run, is favored. Science, thus, becomes \$cience ('dollarcience'). Thereby in many schools of science, pursuit of 'scientific truth for its own sake' has become a matter of the past, and they are now more or less 'school of \$cience'.

Besides the above, Science is also accused of becoming 'suiscience' (suicide science) in view of giving to man the nuclear and biological holocaust products for mass destruction, even though the decisions for the same are largely outside the realm of Science. On the other hand, there have always been fairly large number of scientists, whose attitude towards life and the world is quite spiritual. Many of them are quite selfless workers, whose mind lives in the pursuit of scientific truths. Driven by

played an enormously significant and beneficial role in the history of man. To varying degrees, they have taught ethical and moral values, without which society could not survive. This, in turn, is because they usually embrace various forms of spirituality.

Spirituality

Spirituality is concerned with the eternal nature of the Self, the inherent Reality (at the deepest levels) of all entities. The 'Self' is beyond concepts. It is not a subsidiary concept of any other concept, including the concept of existence. The Self is also called 'The Whole'. In other words, it is above duality, or the conflict of the pair of opposites. It must be added that this lack of duality does not mean that you necessarily dissolve your individuality. You only need to relinquish your false ego. In particular, in order to live in the state of eternal devotional service to the Divine, you may need to have the duality in which you have a separate identity. Indeed, the spiritual world is a whole



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— Jagdish N. Srivastava, Ph.D.

conscience or intellectual interest, many prefer the life of plain living and high thinking. A lack of worldly interest among many great scientists is not uncommon. It is said that Einstein (when he first came to USA from Germany and joined Princeton), on being asked how much he wished to be paid, mentioned a ridiculously low salary. Similarly, Gödel did not want to attend a conference in his own honor. The mathematician Paul Erdos, was almost a sage, having few worldly possessions.

Religion

It has been said that all people have a religion, it being the mode by which they actually live. The atheist has the religion of believing in 'no-God' (even though he cannot prove his position to be correct). Indeed, in most cases, a religion is a belief-system, considered by its adherents to be divinely inspired. A religion may have a rather rigid notion of 'God'. Sometimes even though God is considered all powerful in almost all religions, some do not allow God's nature to be personal. Others consider God unable to be in an icon. In some circles, one may have a God who is considered omniscient and merciful, and yet who knowingly creates souls who do mischief in the world and are thus permanently sent to hell by Him. But, such a God would have a tyrannical sport, contradicting the fact of His being merciful. In other circles, one may have gods and goddesses who often seem to have (the limitation of having) desires and aversions like we mortals do. In spite of the above, religions have

world in which different entities find a place according to their own mental makeup. As your mental contact with sense-objects diminishes, you experience the profound joy of the inner self. As a whole, it is subject to no axiom, and obeys no logic. However, it has sub-universes, each with its own axioms and its own logic. Each of this has its own place, its own importance, in the Whole. But, the Whole is not a sum of its parts.

Note that in order to ask a question, or to have an argument, you need to be in some well-defined sub-universe endowed with an axiom system and a logic. Then, you can try to conduct your query and reach an answer. But, this answer may not be valid, and the question itself may not even be meaningful in a different sub-universe. Thus, the questioning approach has serious limitations. From the above, it is also clear that any fixed and limited belief-system is to be discouraged, if the quest of the Self is to be continued, for any such system must correspond to a particular sub-universe, to the exclusion of the others. Spirituality is also concerned with the manifestations of this nature or reality. It deals with the study of this reality at all levels, and with any and all practices that help in such study. It is, thus, also the set of all experiences connected with such study and practice. Any life style that is conducive to such study, practice, and experience is termed 'spiritual'.

The spiritual journey is the journey towards the realization of the Self, the ultimate reality. You listen to the Self, who directs you

when you surrender and wish to be directed. You are content with wherever the Self takes you. You only keep doing selflessly your duties towards your attainment of the Self. Shaking off the worldly fever, not entertaining hopes for success, leaving behind the sense of mine-ness, get involved in the battle for life. By so doing, you may later be surprised to find that even at the worldly level you are quite successful. The validity of this statement is not hard to see. By adopting the above stance, you gain in two major ways. Since you are working selflessly, being oriented to the Divine, you keep pressing hard instead of 'resting a little bit'. Also, if you meet failure, you do not lose heart because of lack of personal attachment. You persevere.

The second reason is more subtle. The spiritual activities tend to increase the intuitive abilities of the practitioner. This gives him a great advantage in day to day life, since he has a better grasp of the situations around him. It is really true that even in this world, it is generally easier to succeed following the straight path rather than the crooked one. Spirituality teaches you to look at the positive side of whatever circumstances you are in. He knows that although the negative events were beyond his control, his own response to the total situation is surely within his control. Looking at the positive side, he discovers new doors that get opened, doors that often lead to opportunities which could not have been easily envisioned before.

There are three philosophies, 'utilitarianism', 'pragmatism', and

experimentation. In positivist language, Einstein is saying that metaphysics precedes scientific lab work. Another point is that all of, or even the greater part of knowledge that comes from Science, comes by intuition or direct perception of the nature of truth. Thus, the positivist is looking at things upside down. The process is entirely spiritual in nature. The positivist is wrong in assuming that knowledge comes to us only through our five senses and the extension of these by machines.

As the author has argued elsewhere, there is the Law of Intrinsic Confounding in Experimentation, which basically says that all experimentation has an inherently subjective character. This is so because the methods involved in the experiment, and the 'site' of the experiment are partly forced upon us, and partly chosen by us using 'theoretical' judgment, which again amounts to using 'metaphysics'. 'Repeatable experiments' are a part of statistical philosophy, which is at much shallower levels. The Higher Truths related to the Self do not come that way. It requires faith and receptivity. This is reflected in the following statement of the great spiritual leader B. Siddhanta: "Partial gnostic attempts of empiricists would never permit them to come in touch with the Absolute, unless they have got a submissive mood, a conciliatory habit, of audiencing the transcendental sounds invoked to their ears" (see, [1].) This statement is supported by the author's scientific work (see, [2]) on the Nature of Reality (see [3] and [4]), which maintains that our universe has the form of a logic-tree. The role of faith and receptivity become

'logical positivism', which have been in vogue during the last century, each of which purport to deny spirituality itself. However, although these theories relate to matters too small relative to the questions being discussed here, they do have a local importance. Utility is based on the economic concept of material value of some activity. But, for the spiritualist, the criteria of interest are many and of varied kinds, and the context is far larger. For such a situation, a rational generalization of the utility principle would lead to what the spiritualist is supposed to do.

Pragmatism is sterile, and is a life wasted. Under positivism, no 'metaphysical' statement can be meaningful and 'spirituality' should be discarded. Positivism says that true knowledge can be obtained from science only, and that a scientific statement must be logical and must be verifiable by repeatable experiments. This attitude is inherently accepted as true, and teachers all over the world have imparted that to the students, causing a growth of rampant materialism and shallow thinking. As a young man, even Einstein was impressed by it. But later, he made his famous remark that positivism was essentially 'nonsense'. On the surface, the main thesis of the positivist appears to be fine and innocuous. Yes, of course, we do not want to be illogical, and we should want to be able to verify scientific assertions. There seems to be nothing wrong in this. But the trouble lurking in it is seen at much deeper levels.

Einstein said to Heisenberg that theory precedes

clear by the logic-tree paradigm. According to Gödel's theorem, irrespective of how much Science develops, there will always be unanswered questions left. The scientific method is not capable of fathoming Reality at a non-negligible level. *At higher levels, Reality is seen by direct perception alone.*

Spirituality: In Science, and in Religion

Briefly put, Spirituality is the larger Self of Science, of which the latter is generally unaware and sometimes shyly regards as fantasy. Both Science and Spirituality are dedicated to truth. But, Science is more mundane. Progress made by different workers is combinable. Spirituality is concerned with the Whole, the total Reality. Both use intuition quite a lot, but in Spirituality, it is at every step. Spiritual progress by different seekers can be 'combined' to a slight extent, since they can give each other fellowship and compare notes. You can learn and gain energy from your spiritual guide. Science aims at the control and domination of Nature. But this aim of science would change and



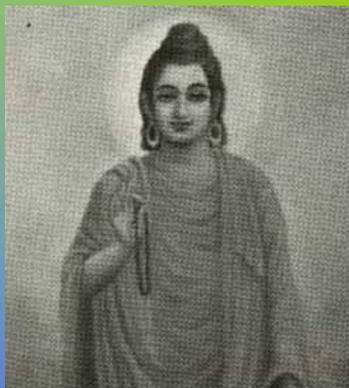
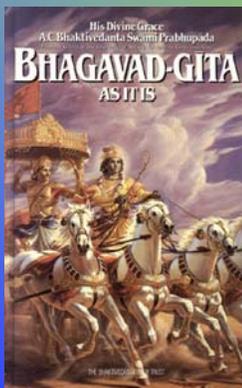
According to Gödel's theorem, irrespective of how much Science develops, there will always be unanswered questions left.

Spirituality would eventually take over if society is able to make scientific progress without ethically degenerating and becoming self-destructive.

What about Religion? It is the organism in which Spirituality usually takes birth. Yet, what form the organism will take as it grows is very variable. Often Spirituality is hardly visible in the grown up form. In a few cases, the opposite occurs, and it shines through every cell. Religion is usually a limited definition of 'God'. The highest Spirituality is limitless. Religion pursues certain needs that are to be fulfilled. Spirituality rises above 'needs' to the state of needlessness. Religion is often a prescription for good times here and particularly in the next world. Spirituality is above the concept of good and bad time, and sees God in everything and everything inside God. Spirituality is when you see the source behind the contradictions, leading to a unified vision. Spirituality is the experience of the Infinite. Its joy is indescribable. It is the exploration of the Inner Space. Even the least spiritual experience is a great experience. You may find it in the hush of the wilderness, in the calm of the ocean on a moonlit night, in the rhythm of the restless waves, in the fragrance of the freshly bloomed flower. Spirituality is when Silence begins to talk to you, when you transcend language, when knowledge comes to you through your innocence. It occurs when you know that God is a greater well-wisher and caretaker of yours than you yourself are or could ever be, when you know that any moment of your life not spent in the service of God is a wasted moment.

Being all-encompassing, spirituality helps you at the physical and worldly level as well. That happens because of your faith in, and your act of surrender to, the Divine. What we call Nature is, indeed, the nature of the Divine. The faith and the surrender open up the avenues in Nature through which the Divine can help you. This fact has always been well known to spiritualists. However, now, it is also finding support in the author's mathematical work in this field. Spirituality is not just a bunch of emotions and fantasy. It is the Reality of our existence. Physics lives inside it only. The proof of the pudding is in the eating. It has to respond. Indeed, it will respond with a mathematical precision.

Spirituality is sufficient unto itself. It is the force of growth inside the seed. The 'sermon on the mount', for example, would live forever with or without a St. Paul. Religion is only a vehicle, Spirituality the driving force. Religion is both horizontal and vertical. Only its vertical part is made of Spirituality. The horizontal part comes from personal and traditional choices, and worldly urges and associated struggles. The ascent to the Divine is vertical only. A religious man, devoid of spirituality, may consider members of his flock to be committing 'adultery' if they hobnob with people of a 'different' religious flock Spirituality does not admit of such 'differences'; it is beyond them. The messages in spiritual books, such as the *Bhagavad-gita* for example, are for all mankind, and for all times. They are in 'the nature of things'. That is why the Buddha became the '*Tathagata*' (one who is in



Lord Buddha

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Conclusion

As a result of worldly urges, and devoid of spirituality, science and religion may join together in one group and may fight with science and religion allied together in another group. We see that

all the time. What we need is the realization of spirituality in both. As the discussion in this article shows, spirituality is the prime factor behind each one of them. It is the true, the only, link between the two. In the interests of our continued existence, the strengthening of this link is of prime concern to all.

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THE LOGIC OF LIFE

B. M. Puri Swami, Ph.D.



Modern science generally assumes that the same laws of logic apply to mechanical, chemical and biological entities alike because they are all ultimately material objects. This may seem to be so obvious that there would be no need to validate it -- experimentally or logically.

In this article we would like to critically examine this assumption and show that from an experiential/observational level, as well as from a rational/logical level, it is not valid. This becomes apparent, for instance, when we consider the simple observation in which we distinguish animate from inanimate objects: those objects that seem to spontaneously move themselves and those that move only when impelled by some applied force outside or beyond the object. This distinction may be valid at the macroscopic level more than at the level of theoretical atomic particles. Thus the detailed nature of spontaneous movement must also be understood.

We consider animate objects to be living, and the inanimate ones dead. Yet we consider both as being material objects since they

metabolism, etc. The point is that animate and inanimate objects, even at the simple level of observation do exhibit important differences. Objects that participate in chemical reactions are different from objects that do not react with each other. And animate objects or organisms behave in manners that chemical objects do not exhibit.

Over two millennia ago, Aristotle made an attempt to explain by philosophical analysis the peculiar nature of living organisms. He considered dead matter to be what he called *dunamis* or potentiality, and matter in action *energia* or actuality. The word "actuality" implies "act." And the Greek word *energia* means "energy." According to scientists, the concept energy means "the ability to do work." A certain amount of energy can do a certain amount of work. This is how energy is determined and measured.

Yet what is it that moves dead matter (*dunamis* or potentiality) into action (*energia*, act-uality). Aristotle called that actualizing force *entelechia* or entelechy. This peculiar word comes from *teleos* or teleology, and specifically it refers to inner (*en*) teleology. It means purpose or end in the sense of aim.

We may at first think of teleology as external purpose, as is the case when a carpenter builds a chair from wood. The wood is the original matter, and the chair is the end product - the idea of the chair in the carpenter's mind is actualized in the form of the wood as a chair. Any artifact can be viewed from this perspective of

are both composed of atoms and molecules. Even if the composition may be a little different for the two, still the living objects can die and thus become the same as the dead objects. Thus the difference does not seem to be specifiable within the material aspect of the object.

This means we are left with the question: what automates the animate living objects that does not seem to be present in the dead ones. At first we may try to answer this question by claiming that it is the chemical reactions going on in the animate object that are causing it to move. After all, chemical reactions can occur on their own in any laboratory by a process as simple as mixing two reactive chemicals together.

Of course there is a serious problem with that explanation. Chemical reactions generally produce a stable product - just like acid and alkali when added together produce a salt. The reaction seems to occur spontaneously, but it does not go on and on for many years. It does not sustain itself. In the living object or living organism there occurs sustainable chemical activity of a special type called biological activity. That activity can become very complex, even defying all explanation at a simple chemical level because of the intricacy involved.

But living organisms exhibit further peculiar traits that we call behavioral symptoms that are not found in inanimate objects. That is, organisms exhibit growth, irritability, reproduction,

external teleology.

But inner teleology is quite different. According to Aristotle there are many types or kinds of being or matter. For instance, the being of an animal is different from the being of a bird or of a man. Thus the *dunamis* or potentiality has different potencies depending on the kind or species of creature that it is. For example, the seed of an oak tree, or the egg of a chicken have certain potencies within them characterizing the type of matter they are. When their potency is awakened their entelechy will drive them to actualize as a tree or chick.

If we consider Aristotle's ideas from the modern viewpoint, we find a similar concept is utilized in biology. The specific genetic and phylogenetic material of each type of organism is unique due to the different arrangements of the amino acids in the DNA code and other specific proteins, enzymes, mitochondria, etc. that are part of the makeup of the various kinds or species of life. The specific type of matter will therefore determine what kind of creature will develop from it. So it is a tribute to the brilliant intelligence of Aristotle that his conceptions, in its general principle, is still quite valid even today.

Of course, modern science has not found out 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



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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]

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 latter 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 the same themes in his philosophical analysis of the scientific understanding of organisms. [4]

I think it will be very useful to look at the way Hegel organized the various types of objects that we observe in Nature, viz. the mechanical, chemical and biological, according to what he called the Concept (*Begriff*). The Concept, for Hegel, is basically a dynamic or organic unity of the different moments or parts that make up the Concept and its content. We will start with his application of this idea to the mechanical object.

Mechanical Objects

Mechanical objects do not have an internal relationship of parts. Thus you can divide a rock and it becomes two rocks, but the basic nature of the rock does not change. What lacks internal relation like this, is said to have merely an external relation to what is other than itself. Thus rocks are related to other rocks by the external force of gravity, or other causal factors. Objects that lack internal relatedness 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 into the solar system.

In mechanistic objects, the unifying Concept (in this case, gravitational force) exists only implicitly, and therefore only explicitly or externally to the object. Mechanics views a system as having separable, independent parts that are fully understandable outside their connection within the system of which they are parts. When the parts of a system retain the same identity when isolated from the system as when connected within it, it is called a mechanical system. This is the particular logical

character or nature that is implied when we refer to a system as being mechanical.

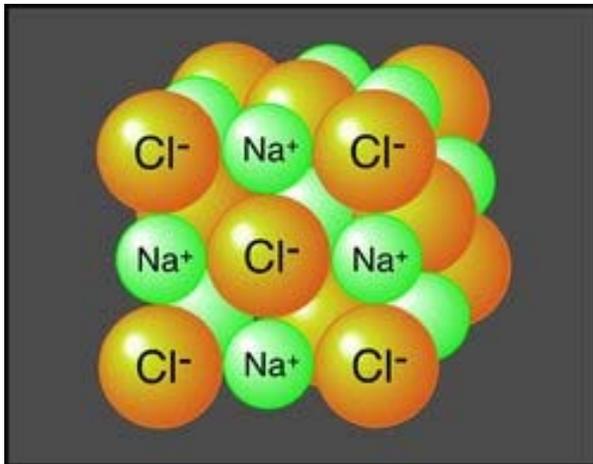
Chemical Objects

Now, those entities that show an intrinsic affinity toward other entities leads to the next type of object - the chemical object.

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. Thus, for example, a salt crystal cannot maintain its identity when divided at its most fundamental molecular level since sodium and chloride atoms when divided would form two distinct substances - sodium and chlorine. External relations are formed due to the intrinsic properties of the individual parts of a chemical reaction. Thus an acid is intrinsically related to an alkali, which combine to form a neutral salt. Their unity, the neutral salt, is a completely different substance compared to the distinct parts in their isolation.

Furthermore, to speak of nascent acid would be a misnomer. A substance is acidic only in relation to alkaline substances. Its identity or definition as an isolated entity is incomplete and can only be understood in its relation with another object. On the other hand, mechanical objects possess an individuality that is complete in itself without reference to another object.

The unity of a mechanical system, like the solar system, made



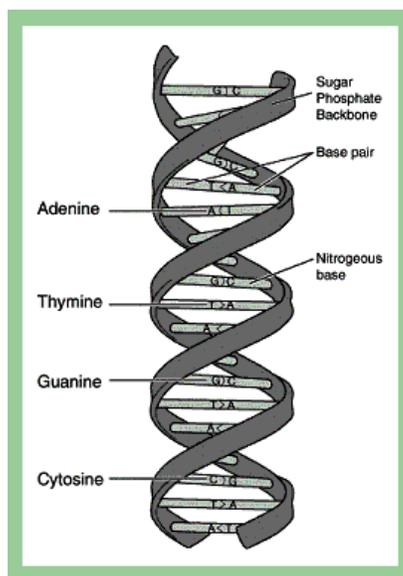
up of mechanical objects, is established externally in the form of a law, which reigns outside of and over the parts and by which the parts of the system are regulated. On the other hand, the unity of the chemical system is intrinsic to the parts, arising from their intrinsic natures. The ordered structure of a crystal is based on the nature of the constituent parts of a chemical system. Still, the parts of a chemical system retain their identity even apart from the interactive system, so that their initial and final states can be differentiated. In this sense the parts are both independent as well as dependent. For example, an acid and alkali can be isolated in different bottles and then added together

to form a third substance - a neutral salt.

Biological Systems

Those parts that can not 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 of 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 cause and effect of every 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.

Life is a unity in multiplicity. It is a process as a united flow, but it consists of many instantaneous moments - like the frames of a movie. The tendency of abstract understanding is to either think of 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 and means to one another.

The living organism internally assimilates itself and produces itself. This self-consumption and self-production is its metabolism, by which it anabolizes and catabolizes, creates and destroys its own cellular substructure in order to maintain its own

superstructural integrity. Likewise, the superstructural system assimilates the outer environment of which it is an integral participant. It both consumes and produces the environment in which it lives, but on a localized scale, unlike the totality of its destructive and constructive activity that occurs within itself. Reproduction is a production of itself as a totality but in a localized portion of the environment. It is a process of preservation of the species.

Its inner metabolic process is the preservation of its particularity. Its assimilation and defense against the environment is the preservation of its individuality. And the reproduction of itself as a species is the preservation of its universality. The particular, individual and universal aspects of the living process are characteristic of what is called a Concept. A Concept has three aspects: universal, particular and individual. For example, in biology we speak of genus, species and specimen. Mammal is a genus (general or universal), whereas tiger is a particular species or kind of mammal, and the individual tiger that we meet in the jungle is a specimen. All three of these aspects are required in order to completely specify the individual identity of whatever is experienced.

The living organism, therefore, ultimately has the Concept as its substance when it is comprehended completely. Thus, the categories of understanding that seek to fix identities in their identity (e.g. A=A, B=B, etc.) cease to be applicable to the living

organism whose participants do not possess isolated identities but are identified only in their mutual relations. Unlike chemical objects, the participants of a biological system are produced by as well as productive of the other participants.

The proper understanding of inner teleology requires that we grasp that there is not one thing being driven by another outside of it or beyond it, but a single nature actualizing itself, sustaining its own reality. Teleology is in the organism in the same way that reason is in the thing studied. The self-differentiating unity of organic teleology is not observationally but conceptually grasped. In other words, in the same way that gravity can not be directly observed but is deduced from the behavior of bodies, we cannot observe teleology but it must be logically concluded because the behavior of the participants cannot be explained by either mechanical or chemical principles. As previously explained, that which is logically concluded involves thought, and thought when developed in form is called a Concept.

The objectivity of the organism

Hegel briefly summarizes what has been explained above in his *Science of Logic*: [3]

In the first stage of comprehending the objectivity of the organism, when the Concept is not explicitly known, and is thus only implicit or potential for knowledge as inner unity, we determine only the purely external relationship of parts known as

superficial.”

Immanuel Kant, like Aristotle before him and Hegel after him, understood that an organism had to be distinct from both mechanical and chemical systems, and could only be understood within a teleological framework. For Kant, teleology exists when two criteria are met:



It is a little difficult to understand why the machine concept of organism could have had such long lasting popularity. After all, no machine has ever built itself, replicated itself, programmed itself, or been able to procure its own energy. The similarity between an organism and a machine is exceedingly superficial.

— Ernst Mayr, 20th century's leading evolutionary biologists

mechanism. Here the totality of the determinations of the Concept appear merely as the external immediacy of its self-subsistent, independent parts, in other words, as an ordered aggregate.

In the second stage of comprehending the organism as an object the immanent law of the parts is established so that particular relationships between the parts is revealed. This is chemism.

In the third stage, the essential unity of the object is comprehended as distinct from the self-dependence of the parts, and posited as a subjective end which is opposed to the objectivity that it utilizes as means to fulfill its purpose. This is teleology or the biological object.

This end or purpose is actually the Concept which is related to objectivity for the purpose of removing its defect as being merely subjective. As actualized end it is the return of the Concept to itself from its externally posited being and in this internal unity with itself is called the Idea.

Conclusion

In his book "This is Biology," [5] leading biologist Ernst Mayr wrote, "It is a little difficult to understand why the machine concept of organism could have had such long lasting popularity. After all, no machine has ever built itself, replicated itself, programmed itself, or been able to procure its own energy. The similarity between an organism and a machine is exceedingly

1. The parts of a whole are possible only through their relation to the whole.

and

2. The parts are combined into a whole by being reciprocally the cause and effect of their form.

He therefore proclaimed that "There will never be a Newton of a blade of grass." [4] This is because there is no regulative law that can be formulated for a teleological system. As previously explained, law applies only externally to mechanical systems, whereas teleology is an effect that is internal to the unity of the system.

What Hegel called the Concept, Aristotle called the soul. This additional element is needed to describe the living organism, and it cannot be completely explained without it. This is the conclusion of some of the greatest philosophers of Western culture. And it has its counterpart in Eastern philosophy as well. In fact, it is the teaching of all the great religions of the world.

Only modern science has insisted on trying to explain life on a purely mechanical-chemical level, and has failed repeatedly to even come up with a definition of life on that basis, as it must since life and matter are inherently understood as being distinct principles. Reason is one, thus modern science, as the honest study of reality, must eventually concur with the same truths that human reason has established in our philosophical and spiritual

traditions. It is due to the progress of science that we are led to acknowledge the limits of science and the importance of recognizing life as a distinct principle beyond the mere material or naturalistic conception of Nature. The whole concept of Nature, itself, cannot be encompassed simply in terms of atoms, molecules and their physical and chemical reactions. A deeper truth has to be sought in the corresponding reality of thought and spirit. It is hoped that this brief introduction to the logic of life will inspire further study into this deeper reality.

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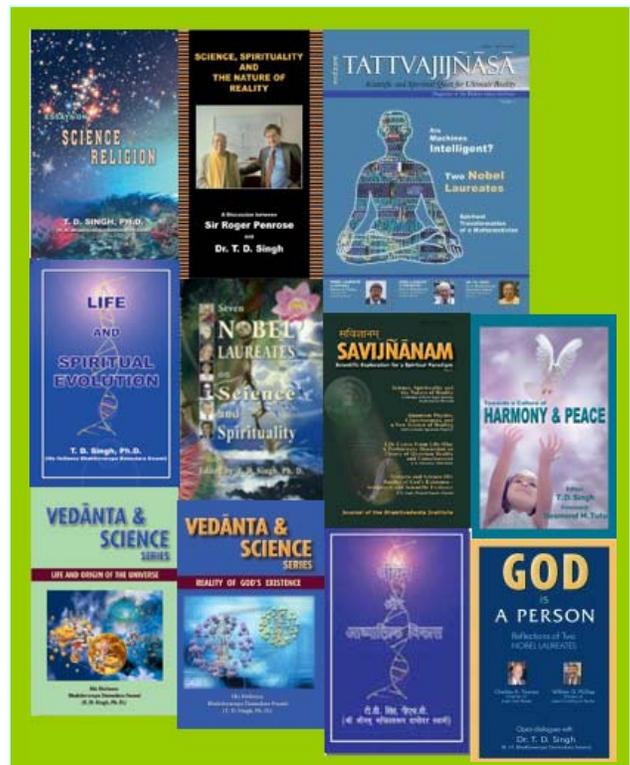
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