

CORRESPONDENCE

SOME FURTHER THOUGHTS ON ORIGIN OF LIFE

In his note, "Origin of life From prebiotic chemistry to the first replicating molecule" (Jour Geol Soc India, v 66(5), 2005, pp 649-653) V Sukumaran portrays life as a material phenomenon that can be explained purely in terms of materials or molecules I would like to comment on three of his statements

"Life is a self-sustained chemical system capable of undergoing Darwinian evolution" (attributed to Jerald Joyce)

"All life is an interplay between proteins and nucleic acids (DNA and RNA), the former carry out all cellular functions of life while the latter are the repositories of genetic information"

These narrow definitions may be adequate for the needs of physical sciences But, they are limited in their scope The statement, "capable of undergoing Darwinian evolution" gives the impression that Darwinian evolution is something that transcends life to an extent that life has to conform to it I am an admirer of Darwin as a scientist and a thinker But, I cannot elevate Darwin's contribution to the level implied in Jerald Joyce's supposition There is far more to life than the observable patterns of Darwin's evolution Life is inherently associated with an abstract attribute, variously referred to as "mind" or "instinct" that is capable of "thought" in some form or the other This attribute underlies a unique feature of living things referred to as behaviour, which includes a multitude of manifestations such as judgement, choice, will to survive, adaptation, and, in the case of higher animals, emotions Mind, which is central to what we understand to be life, lies outside the scope of physical sciences, which are devoted to the observable world of matter

Life, as we know it, does not exist without matter or energy Yet, its nature is so radically different from that of any known form of matter or energy Nor do we have any clue about the nature of the connection between matter or energy on the one hand, and life, on the other Despite enormous efforts throughout history, humans have not yet succeeded in comprehending the nature of life well enough to bring it within the scope of their rational pursuit known as science

Modern research extensions of physical sciences into "cognitive" processes show indications of extending the scope of matter-based science into the abstract But, it is not clear whether these efforts are entirely mechanistic in their approach, or whether they are breaking new ground in incorporating the abstract into the scope of physical sciences

"Though it is unlikely that a satisfactory final answer will be forthcoming in the near future the principal chemical pathways that led the emergence of animal matter from inanimate elements are fairly clear, "

What attribute distinguishes inanimate from animal matter? From a purely chemistry point of view, one may find that certain types of complex molecules that constitute the bodies of living organisms might be synthesized from less complex organic chemical compounds that are inanimate But current knowledge of these connections and pathways does not address the question of how a group of molecules can at one instant constitute life in the sense of possessing a mind or instinct, but be devoid of the same mind or instinct at the next moment when it is dead It is true that brain-scans routinely show electrical activity of specific areas of the brain associated with specific life activities such as vision, speech, or even emotions However, we do not have any understanding of the connections between these energy manifestations and mind These electrical activities may suddenly disappear at death, when life ceases to "be"

The intrigue of life extends beyond individual organisms to communities of organisms and species, exhibiting collective will to sustain, adapt and survive James Lovelock, a chemist, takes the notion of collective life to its logical limit by speculating in his Gaia hypothesis that the Earth itself is a giant organism that has influenced and altered the planet's geological evolution to suit its own survival

In its totality, human knowledge includes science as a subset Arts, culture, philosophy, and other abstract forms of knowledge concern themselves with thoughts that lie outside the scope of physical sciences Historically, physical scientists and philosophers, including Newton, were cognizant of the bounds of their science They restricted themselves to the specific issue of how Nature functions, in

so far as it can be viewed as some sort of a machine. They devoted attention to understand the immutable laws or principles according to which the machine functions now, and has functioned for billions of years in the past. Many of these scientists were religious in their personal lives. In balancing their religion with science, they deliberately avoided the question of why these laws exist, or who made them so. These questions have traditionally been part of metaphysics, philosophy, culture, and religion.

Darwin's contribution was extraordinary in that it took science from its comfortable position of studying inanimate objects subject to immutable laws of nature, and placed it in the difficult position of studying living things. Darwin introduced concepts such as "selection", "survival", and "adaptation" that go beyond inanimate objects into the abstract realm of mind and instinct. In doing so, he ventured into unexplored territory, pushing the limits of the physical sciences. The daunting question about life's origin on the Earth, of which Darwin's evolution is a part, motivates us to reach out to other branches of human knowledge.

The nature of life and its role in the scheme of the world around us have been addressed with remarkable sophistication throughout human history. Specifically, should one believe in evolution or should one believe in a Creator? In a comparative study of religions, Max Müller (Müller, F. M., *Natural Religion*, The Gifford Lectures of the University of Glasgow, Longmans, Green and Co., London, 1889., pp. 244-247) examines the Hindu perception of creation from the Rig-Veda, in which two ideas of an uncreated and self-developing world, and of a creator or maker run side by side. The world is spoken of as having

been originally water without light (*salilam apraketam*; Rig-veda, X.129.3). The water contained an egg from which everything else sprang forth (Rig-veda, X.82.5). The poet says that no one knows whence this creation sprang. Even the gods came after it. He who is called the seer in high heavens, he may know, or even he may not. This speculation of ancient Hindus is surprisingly compatible with our current understanding of origin of life on the Earth. Based on fossil evidence from Western Australia, eastern South Africa, and elsewhere, current belief is that single-celled bacteria and stromatolite colonies flourished in primitive oceans some 3.5 billion years ago. Just as the ancients, modern science has not quite figured out how first cell from which everything else sprang came to possess that abstract attribute known as "mind" which appeared when the egg was alive at one instant, and disappeared at the next instant when it died.

It seems to me that in order to bring life fully into its fold, science has to bring the abstract attributes of life within the scope of observation, measurement, quantification, and testability. Or, science has to redefine its own scope by going beyond its currently held notions of observation, measurement, and testability.

Materials Science and Engineering T.N. NARASIMHAN
Environmental Science, Policy and
Management
 322, Hearst Memorial Mining Building
 Univ. of California at Berkeley,
 Berkeley, CA – 94720-1760
 Email: tnnarasimhan@lbl.gov

Announcement

3rd INTERNATIONAL CONFERENCE AND EXHIBITION – ASSOCIATION OF PETROLEUM GEOLOGISTS

This conference is scheduled to be held at Goa during 22-24 September, 2006. For further information, please contact: Convenor, Association of Petroleum Geologists, 3rd Floor, Geology Division, KDMIPE, ONGC, 9, Kaulagarh Road, Dehra Dun - 248 195. **Phone:** 0135-2795187, 2795567; 022-24045330, 09869222409; **Email:** apg_india@rediffmail.com; **Website:** www.apgindia.org