

was instead covered by fine dust. The most important of all of his theories, to date, is his theory of Deep Hot Biosphere.

The book is indeed well laid-out. It starts with the discovery, in 1977, of presence of exotic submarine life at ocean vents. Shortly thereafter, followed the discovery of new species of bacteria which were only found near ocean vents and in isolated hot springs. Most notable amongst these were the hyperthermophilic microbes, which are known to grow best at 80°C or higher and survive on account of their waxy cell membranes. In the late 1990s occurred the most remarkable discovery of the presence of an entire anaerobic biosphere, at depths of several kilometers, that was isolated from and independent of surface ecology. The finding of previously unknown strains of bacteria and microbial fossils, embedded deep within basement granite, has led to the realization that an entirely new biosphere has been discovered. Thomas Gold has boldly set forth the hypothesis that this deep biosphere is the source of surface life, and that a similar deep biosphere perhaps exists inside other planets as well.

The book then goes on to lay the foundations of this new theory, namely the Deep-Earth Gas Hypothesis. This equally controversial model posits a non-organic theory for the origin of petroleum; and is well-summarized. In Chapter 5, Gold then unifies the deep-hot biosphere model with the non-organic theory of the genesis of petroleum, providing a logically consistent super-model that has far-reaching implications for Geology, Biology, and Physics. According to this enlarged theory, primordial hydrocarbons are welling upwards from the mantle, filling intermediate subterranean reservoirs on the way upwards. It is in these subterranean reservoirs that life first evolved, spreading thence onto the surface. The non-organic theory of the origin of petroleum is then extended to the formation of petroleum, thereby explaining the close correlation observed between oil and coal deposits. Gold then, convincingly, illustrates how upwelling methane can considerably enhance existing peat deposits; although peat is likely to represent preponderantly organic material.

The Siljan Ring Project, undertaken by Thomas Gold in collaboration with the Swedish Government, is also dealt with

in ample detail. Although no commercially utilizable form of petroleum deposit was found, deep-earth petroleum was found, providing strong support for the non-organic theory. The occurrence of petroleum at 6 km depth inside granite bedrock virtually rules out the possibility of an organic origin for this petroleum. The additional discovery of microbes and microbially produced magnetite at this depth confirmed that a deep biosphere in fact exists, and provided another valuable by-product of the project.

In Chapter 7, Gold makes a bold extension of the enlarged deep-biosphere-deep-petroleum theory to provide a new model for the origin of metal deposits. The drawbacks of the conventional hydrothermal theory include the insolubility of metals and their compounds in even highly salty brines, the likely deficiency of naturally available pumping power, and the unrealistic quantities of water required for the creation of commercially viable metal deposits. As an alternative, Gold sets forth the Hydrocarbon Carrier Theory for the formation of metal deposits, in which organometallic compounds in hydrocarbons play the major role in the deposition of metals. In this scenario, anaerobic microbes built up the metal deposits by oxidising the hydrocarbons and reducing the metal oxides in a manner similarly adopted by the deep magnetite-producing microbes which were discovered deep in the Siljan Ring. The vast implications of Gold's Deep Hot Biosphere cover the field of diamond formation as well. The fact that diamond-bearing kimberlite represents powerful explosions of deep magma, the occurrence of gas-filled inclusions and the finding of graphite in the shape of diamonds, supports the concept of diamond origin from hydrocarbons. The middle section of the book is thus an excellent summary of the Deep-Earth Gas Theory.

The last section of the book is devoted to the impact of the Deep Hot Biosphere Theory on the origin of life. The probability of life evolving deep inside the earth, with its greater volume of available pore spaces and abundant supplies of upwelling hydrocarbons, is higher for the deep biosphere than the surface biosphere. The fact that the microbes discovered deep inside the earth are more primitive than those found on the surface, and that they are dependent on a simpler form of non-photosynthetic chemistry,

leads Gold to propose that life first originated inside the Earth. From here, it migrated, along with upwelling hydrocarbons, to the surface. Gold then suggests that the search for extraterrestrial life, which has failed to uncover any form of surface life in the Solar System, should instead switch to the interiors of the planet, where he predicts for the existence of life.

This book is evidently one of the most controversial of all books published in recent history. It is bound to cause much debate, and, if found to be correct, is likely to revolutionize the face of science. Although his ideas have not particularly caught on in the West, this should not prevent Indian scientists from pursuing Gold's Theories and taking a lead in this direction. Furthermore, since his work covers several diverse fields of science, pursual of his theories is therefore likely to impact these various fields; but, in particular areas in biology, geology and astrophysics. For this reason alone the work under consideration deserves careful scrutiny by scientists.

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**Deccan Volcanic Province, West Volume.** K. V. Subbarao (ed.). Mem. Geological Society of India. 1999. v. 43(1). Price, Rs 750. 547 pp.

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Deccan volcanism is a significant event in Indian geological history, and it has drawn much attention from geoscientists world over. International seminars on Deccan Volcanism have been organized in India during recent years. Since classical and seminal contributions on various aspects of Deccan Volcanism, by many stalwarts on Indian Geology, are not readily available, attempts have been made in recent years to reproduce excerpts from their pioneering works. During March 1996, at Nagpur a seminar was organized jointly by Geological Survey of India and Gondwana Geological Society. On that