SCIENCE NEWS

EVOLUTION IN ASTRONOMY AND BIOLOGY

(Summary of an Academy lecture delivered on February 23rd 1987 by Prof. Fred Hoyle, Retired Professor of Astronomy, University of Cambridge, UK)

Prof. Fred Hoyle is well known for his fundamental contribution to astrophysics and cosmology and for his brilliant and thought-provoking writings. Most recently, he has proposed a new picture of the origin and development of life which challenges long held beliefs in biology and astronomy. These new views formed the subject of his Academy lecture.

The textbook picture has an evolutionary tree rooted in a single origin of life on earth, branching out by random mutations and natural selection to its present diversity and complexity. Prof. Hoyle started by pointing out that the evidence for this tree from the fossil record is extremely weak, especially at the vital branching points. The broad chemical similarities of different life forms should rather be regarded as evidence of a common pool of components. For example, architectural forms show similarities arising from common materials rather than a single origin.

Even within the conventional view of evolution, the need for swift changes rather than slow drift is increasingly being recognized. On the new view, this can be compared to the incorporation of new subroutines into an existing computer program which can produce dramatic changes. The components are to be identified with the sea of viruses which surround and invade all other forms of life. Modern genetic engineering is in fact based on the possibilities of incorporating new genetic material into old to an extent which could not have been foreseen a generation ago. While most of the changes produced in this way could have negative effects, the few successes would pass into evolutionary history as new forms. This scenario squarely confronts the incredible complexity of the present day life which Prof. Hoyle suggested is a major difficulty with the conventional mutation/selection thesis.

A remarkable aspect of virus infections such as influenza has been noted in some studies in the medical literature. The probability of a person catching the infection is not significantly increased by another case in the same house or by living in the more crowded environment of a city rather than the country. Direct spread from person to person cannot explain these facts, and would further imply an extreme, 'all or nothing' infection rate in environments such as boarding schools and this is contrary to fact. The large scale mingling of people from remote corners of the globe in airliners would again lead to a disastrous spreading if the mechanism were contact. Prof. Hoyle strongly advocated the alternative view that the viruses rain down from the upper atmosphere. This could explain the well known cyclic annual variation of the infection rate with a peak in winter in both hemispheres. Separate studies suggest that this is not a temperature effect and could therefore be directly correlated with atmospheric mixing. It is at this point that astronomy comes in. The earth sweeps up a thousand tons per year of interplanetary materials and a significant fraction could be of biological origin. Studies of interstellar and interplanetary matter rest heavily on the characteristics of the radiation which it absorbs and emits, at infrared wavelengths. Recent observations include matter ejected from the nucleus of Comet Halley and that surrounding the so called Trapezium Star cluster in Orion. In both cases, Prof. Hoyle felt that the organic material proposed by himself and Wickramasinghe gave a significantly better account of the observations than alternatives such as silicates. A related and much older problem is the wavelength dependence of the extinction of starlight by interstellar dust. Prof. Hoyle recounted how the main stumbling block had been the need for a low average refractive index and the crucial step was the realization that dried out bacteria have just this property. The final picture which emerges is an interstellar medium with significant quantities of material which is biological in origin. The formation of stars is accompanied by clouds of comets which provide a possible environment for amplification of this material with the kind of efficiency that only biological processes can have. Much of this is recycled back into interstellar space by radiation pressure as the comets disrupt while a small fraction finds a home in places like the earth.

Ending on an even more speculative note, Prof. Hoyle stated that in his view, postulating separate

origins for biological material even in different galaxies was unnatural. It must ultimately have a common cosmic origin whose elucidation will prove to be one of the main tasks, if not the cornerstone, of any future cosmology.

The lecture was followed by a lively discussion including topics such as the Viking experiment on Mars and the evidence from protein sequenes for evolution. What this summary cannot fully convey is the unique nature of the scientific enterprise which Prof. Hoyle described in which the stakes are nothing less than the entire universe.

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ANNOUNCEMENT

IX INTERNATIONAL SYMPOSIUM ON TROPICAL ECOLOGY

Exploitation of natural resources, and human impact on regenerative and productive potential of ecosystems have been specially exacerbated in the tropical regions by population explosion and the need for speedy economic development. The resultant problems of land degradation, environmental pollution and growing susceptibility of natural ecosystems to man-induced disruptive forces, call for formulation and implementation of strategies for sustainable development and harmonization of society–environment relations. Thus, the International Society for Tropical Ecology is organizing the IX Symposium with its focal theme on *Ecological Management of Tropical Ecosystems*.

The symposium will include a number of conferences and sessions of invited lectures, contributed papers and posters covering a wide variety of subjects of global importance such as land degradation and restoration, pollution, human ecology, plant geography and man's impact on forest, savanna, aquatic and agricultural ecosystems, environmental management etc.

A major post-symposium tour to the Nilgiri biosphere reserve and Silent Valley covering a wide range of ecosystems from dry to wet tropics is being planned.

The symposium will include a special conference on 'Restoration of degraded ecosystems: A global issue'.

The following conferences will be held during the symposium. Names of organisers are given in parenthesis.

Restoration of degraded ecosystems (Prof. M. K. Wali); Human ecology (Prof. Madhav Gadgil); Mangrove ecosystem (Dr A. G. Untawale); Tropical oceans (Dr A. H. Parulekar); Plant geography (Dr V. M. Meher-Homji); Tropical agro-ecosystem (Prof. P. S. Ramakrishnan); Tropical freshwater resource (Dr B. Gopal); Wildlife conservation (Dr H. S. Panwar); Dynamics and regulation of plant population (Prof. R. S. Tripathi); Air quality and plants (Prof. C. K. Varshney).

The abstracts should be submitted by 1 September 1987. Correspondence and enquiries may be addressed to Professors R. S. Ambasht/J. S. Singh/ K. P. Singh, Department of Botany, Banaras Hindu University, Varanasi 221 005.

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