Prof. John Barnabas (1929–1994): An obituary

Prof. John Barnabas was born on October 12, 1929, in Mangalore. After his schooling in Mangalore, he got his bachelor's degree from the University of Madras. He studied for his master's degree at the University of Bombay and later got his Ph D from the University of Poona.

In 1954, he began his career in a small town college, the Ahmednagar College, which had been started by his family in 1947 for making higher education available to the young people from interior Maharashtra. He was a very successful teacher and taught in Ahmednagar College for 29 years as a lecturer to undergraduate students and later in the capacity of the Head of the Department to postgraduate students. He was a postdoctoral fellow at Yale University, USA (1958–1959), and at the University of Groningen, Netherlands (1960–1961). His postdoctoral work on fusion haemoglobin, the 'Haemoglobin-lepore Hollandia', greatly stimulated his interest in the haemoglobin molecule.

In 1963, he started the biochemistry department at Ahmednagar College which grew under his leadership to develop into the Post Graduate School for Biological Studies, which trained students for M Sc and Ph D degrees in biochemistry and organic chemistry and has been an interdisciplinary centre for research in life sciences. Barnabas supervised 15 students for their Ph D degree in biochemistry in the area of molecular evolution. During his tenure as a college teacher, he had received many honours, including the S. S. Bhatnagar Award (1974), Fellow of the Indian Academy of Sciences (1976), Fellow of the Indian National Science Academy (1979) and the Jawaharlal Nehru Fellowship (1983–1985). He was also a member of the Science Advisory Committee to the Cabinet during 1983–1985.

Barnabas entered the field of biochemical evolution when it was in its infancy in the early sixties. He used the haemoglobin molecule for probing biochemical evolution. Through a study of 53 animal species, including mammals, birds, reptiles, amphibians and teleost fishes, he established that multiple haemoglobins occurred widely in vertebrates. Through fingerprint maps of a number of haemoglobins at the subunit level in the mammalian families Bovidae and Muridae, he and his group demonstrated the presence of many electrophoretically silent haemoglobins as well as a common polypeptide chain among within-species haemoglobins. Significantly, the invariant two-α-chain profile in haemoglobins was first observed by them in water buffalo and was shown to be a product of duplicated genes, through a wider species coverage as well as by their expression in the foetal haemoglobins.

He realized that in order to discern the evolutionary relationships between within-species haemoglobins, the sequences of the component polypeptide chains as well as appropriate approaches for constructing phylogenetic trees based on this sequence data were needed. Though in the 1960s, he and his group made a painstaking attempt to determine manually the amino acid composition of an easily crystallizable protein, β-lactoglobulin of bovids, it was difficult to carry out systematic sequence studies at Ahmednagar College due to lack of facilities. However, in collaboration with Prof. Genji Matsuda of Nagasaki University, Japan, they contributed to the determination of the sequence of α and β globins of langur, *Presbytes entellus*.

During his visit to Prof. Morris Goodman's laboratory at the Wayne State University, USA, in 1969, they constructed phylogenetic trees of globin sequences which established that haemoglobin–myoglobin gene duplication probably took place after the divergence of lampreys, the α–β gene duplication in the primitive fishes and the β–γ duplication in the higher primate line. The collaboration also resulted in the development of mathematically proven methods for the construction of phylogenetic trees based on the maximum parsimony approach as well as on the 'additive hypothesis' approach. Based on these and other approaches, they discerned the evolution and descent of globin genes from their metazoan ancestor in the descent of man.

On his return to Ahmednagar College in 1972, for lack of adequate computer facilities, he developed a simple parsimony method, called the zip method, for the construction of ancestral sequences for a set of macromolecular sequences by hand search operations. Using this method, he deduced the evolutionary genetics of mammalian globins as well as basic patterns of mammalian evolution during Cenozoic history and the functional innovations in haemoglobin molecule as it evolved from a monomer having high oxygen affinity and low co-operativity to a tetramer having low oxygen affinity and high co-operativity.

During a conference organized by Barnabas at the Green Hill Campus in Mahabaleshwar, a discussion with Prof. Obaid Siddiqui gave birth to the idea of 'Mahabaleshwar Seminars on Modern Biology'. These seminars covered the frontier areas of modern biology and were held at Mahabaleshwar annually since 1975, being sponsored by Ahmednagar College, Tata Institute of Fundamental Research and Indian Institute of Science. The objective was to stimulate in the participants an interest in the frontier areas of modern biology and bring them in close contact with people working in these areas. After Barnabas moved to Pune, these seminars are being held in other places.

Having been convinced by molecular

genealogical studies on haemoglobin that biochemical systematics can be used to deduce phylogeny of living organisms, Barnabas decided to spend a sabbatical year during 1979–1980 at Georgetown University, USA, where he collaborated with Prof. Margaret Dayhoff. They studied the major metabolic innovations in the Precambrian using information from phylogenetic scheme based on the sequences of bacterial ferredoxins, 2Fe–2S ferredoxins, 5S ribosomal RNA and c-type cytochromes.

Barnabas was a Jawaharlal Nehru Fellow at the National Chemical Laboratory, Pune, from 1983 to 1985. During this time, he reviewed the available information, including his own, on evolutionary molecular biology and traced the outlines of evolution of three kingdoms of living organisms, namely, monerans, protists and animals. He also examined the evolution of the chemistry of iso-prenoids along with the diversity spectrum of carotenoids in plastids in relation to both algal phylogeny and endosymbiotic origins of plastids.

Barnabas took up the position of the Head of the Division of Biochemical Sciences at National Chemical Laboratory, Pune, in mid 1985. In this capacity, he reorganized the research activities of the division to focus on four major areas: plant molecular biology and genetic engineering; structural and evolutionary biology; microbial technology and plant tissue culture technology. His research activities at NCL focused mainly on the evolutionary relationships of early eukaryotic lineages and major groups of land plants as well as the establishment of genetic relatedness of closely related mammalian species based on mitochondrial DNA analysis. He believed that by reconstructing evolutionary trees based on sequence data of relevant proteins and nucleic acids using parsimony and bootstrap approaches, the history of living organisms from Archean to the Present could be retrieved. Further, by combining the information from these and other phylogenetic scheme with that from the traditional approach, which with its emphasis on fossil record gave the time dimension, one could discern the pattern of morphological change to obtain an overview of the evolution of prokaryotic and eukaryotic lineages.

PRABHAKAR RANJEKAR
SHAMA BARNABAS

Biochemical Sciences Division
National Chemical Laboratory
Pune 411 008, India

Sir John Maddox

Current Science congratulates John Maddox, the editor of *Nature* who has been knighted in the New Year's Honours List. It is obviously a reward for his remarkable publishing record. It is said that Britain's share in the world of science has declined. But *Nature* remains preeminent as the world's most important single science journal. John Maddox trained as chemist, became a theoretical physicist before he turned to science journalism in 1955. He has kept *Nature* in front, ahead of all other science journals by publishing exciting results quickly and by making it truly international.

S. Ramaseshan (*Editor*)

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