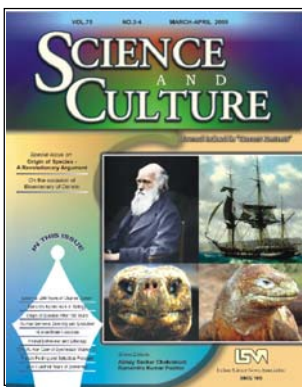


# SCIENCE AND CULTURE

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EDITORIAL

## DARWIN BICENTENARY AND 150TH ANNIVERSARY OF ORIGIN OF SPECIES



This year, 2009 AD, the whole world is celebrating the 200th birth anniversary of Charles Robert Darwin (1809-1882) - by far the most outstanding naturalist of all time - along with the 150th anniversary of publication of his epoch-making book, *The ORIGIN of SPECIES by Means of Natural Selection Or the Preservation of*

*Favoured Races in the Struggle for Life* (1859). The theory of evolution by means of natural selection, as propounded by Darwin in this book ultimately unified the then diverse and fragmentary investigations of living systems, such as taxonomy, morphology or embryology into an integrated science of biology as known today. The intellectual revolution brought forth by this book did not remain confined to the realm of biology only, but impacted on almost every branch of human cognitive endeavor like philosophy, history, economics, sociology, psychology etc and ushered in a paradigm shift in the way we humans look at ourselves as well as our past, present and future in this universe.

The major conclusion that Darwin arrived at in this ca. 550-page book- which he himself characterized as “one long argument”- may be stated thus: New species evolve through splitting or branching from pre-existing ones through the interaction of random hereditary variation and natural selection. Hence all species of present-day plants and animals, including humans are descendants of one Common Ancestor. The last sentence of his book reads as follows:

“There is grandeur in this view of life, with its several powers, having been originally breathed into a few forms or one; and, that whilst this planet has gone cycling on according to the fixed laws of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been and are being evolved.”

The then generally accepted dogma for the past 2000 years, prevalent since the days of Aristotle (384-322 BC) that every species was invariant in time and that humans were God’s special creation completely separate from all other species, was thus overthrown.

The central role of natural selection in evolution was also discovered independently by Darwin’s contemporary, Alfred Russel Wallace (1823-1913), another eminent British naturalist. While Darwin patiently collected for more than 25 years enormous amount of data on the diversity of life, particularly among insects, in the Brazilian rainforests and mammalian fossils in Argentina, Russel mostly devoted his time in collecting butterflies and pondering over their amazing varieties in the distribution of plant and animal lives in South America and later in Malaysia.

The heart of the theory of evolution by means of natural selection may briefly be stated as follows:

- Organisms of all species tend to proliferate in such a manner that the population sizes increase exponentially. However environmental resources being limited, populations are generally observed to remain stable in size, except for seasonal fluctuations. Because of struggle for existence among individuals, only a fraction of the offspring survives each generation.

- Individuals of a population vary in their characteristics so that no two individuals are alike and much of this variation is heritable. Survival in the struggle

for existence is not random, but depends on the hereditary make-up of surviving individuals.

- Individuals with inherited characteristics best fit for their environment are likely to leave more offspring than less-fit individuals. This unequal ability of individuals to survive and reproduce will lead to gradual change in a population with favorable characteristics accumulating over generations (adaptation). Such adaptation may ultimately lead to reproductive isolation from their parent species, giving rise to the origin of a new species.

- The outcome of the natural selection is the adaptation of populations to their environment as a result of interplay between two independent drives viz. randomly inherited variation or “descent with modification” and the necessity for survival and reproductive success in a particular environment. Hence the speciation event is neither teleological i.e. having any predetermined purpose, nor unerringly predictable.

In the *Origin of Species*, Darwin touched upon the problem of human origins in just one sentence. Later on, he extended his argument with regard to human evolution in another important but much more controversial work, *DESCENT OF MAN and Selection in Relation to Sex* (1871). Based on evidence from paleontology and comparative studies of primate morphology (Thomas Huxley) and vertebrate embryology (Ernest Haeckel), as well as his own keen observation that feelings, reasons and, even protomorality in terms of instincts, were all manifest themselves in the chimpanzees, gorillas and orangutans, he finally concluded that Man and extant Great Apes must have evolved from a 'Common Ape-like Ancestor'.

Although Darwin and Wallace share the honor of being independent discoverers of the principle of natural selection, their views regarding the common ancestor and human descent gradually became diametrically opposite. Darwin remained a steadfast materialist. But Wallace drifted towards spiritualism; he contended that natural selection was not sufficient for explanation of evolution of humans endowed with highest cognitive capabilities. He believed that some kind of spiritual force, or “intelligent designer” in current parlance, must have intervened. Science, being based on objective evidence and logic, is no respecter of

subjective belief system of individual scientists, however eminent they may be. Wallace, now an almost forgotten name, is something like a footnote in the history of science.

Darwinian concepts like “natural selection” or “struggle for existence” have very often been misinterpreted and misused with regard to human ethics and morality. These concepts have often been distorted by the racists and colonialists to propound the idea of “survival of the fittest”- a term coined, not by Darwin, but by a contemporary British philosopher, Herbert Spencer (1820-1903) - implying that only strong and aggressive individuals and nations were evolutionarily “fit for survival” and have a “legitimate” right to dominate and oppress weaker and meeker human beings! How wrong they were in invoking Darwin would perhaps be evident from this observation in his *Descent of Man*:

“As man advances in civilization, and small tribes are united into larger communities, the simplest reason would tell each individual that he ought to extend his social instincts and sympathies to all the members of the same nation, though personally unknown to him. This point being once reached, there is only an artificial barrier to prevent his sympathies extending to the men of all nations and races. If, indeed, such men are separated from him by great differences in appearance or habits, experience unfortunately shews us how long it is, before we look at them as our fellow-creatures. Sympathy beyond the confines of man, that is, humanity to the lower animals, seems to be one of the latest moral acquisitions.”

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This special issue of the journal, *Science and Culture*, is our modest tribute to the invaluable intellectual legacy of Darwin in his bicentenary year. Here we present contributions from a number of distinguished scientists on various aspects of Darwinian theory of evolution and its relevance today. Prof. A. K. Chakravarty discusses the social and scientific environment in which Darwin grew up and developed his ideas which ultimately became the “axis” around which modern biology revolves. Prof. V. Nanjundiah presents a non-technical elaboration of the scientific and philosophical contents of the *Origin of Species* and their impacts during the past 150 years, as

well as some issues that still remain open. Prof. P. P. Majumder dwells on present day molecular genetic studies of human genome diversity and Darwin's seminal observations and predictions about human evolution. Human brain, however unique it may be, is undoubtedly a product of Darwinian evolution, just like any other organ such as heart, lungs, liver or kidneys; Prof. J. J. Ghosh discusses modern neuroanatomical and genomic studies to unravel its uniqueness. Study of animal behavior was one of Darwin's fondest scientific pursuits; Prof. P. Lahiri shows how these pioneering studies have now grown into a full-fledged scientific discipline of ethology. How vitamin C synthesizing ability was lost during the evolution of

some terrestrial vertebrate lines is thoroughly described by Prof. I. B. Chatterjee. Lastly, Prof. C. K. Das Gupta and his group have discussed the possibility of selection pressure as a guiding factor for protein folding in course of evolution.

We express our sincere thanks to the Indian Science News Association, the publishers of Science and Culture for assigning to us the rewarding opportunity of editing this special Darwin supplement. We are also most grateful to our distinguished contributors for their cooperation. □

*Abhay Sankar Chakraborti  
Ramendra Kumar Poddar  
Guest Editors*



**Abhay Sankar Chakraborti** is a professor at the Department of Biophysics, Molecular Biology & Bioinformatics, University of Calcutta. On completing M.Sc and Ph.D in Biochemistry from University of Calcutta and post-doctoral research at the University of Connecticut Health Science Center, Farmington, USA, he joined the Department in 1987 (at that time Department of Biophysics, Molecular Biology & Genetics). He served the Department as the Head for two terms. His research interests are drug-protein interactions, protein modifications in health and disease and diabetic complications and treatments with herbal agents.



**Ramendra Kumar Poddar** joined Professor N. N. Dasgupta in the Biophysics Division of the Saha Institute of Nuclear Physics after his M. Sc. in Physics and obtained his Ph.D in 1957 on the basis of studies on bio-medical application of radioisotopes, including pharmacokinetics of a radio-labeled drug in leprosy patients. Later on he completely shifted his research interests to molecular biology and genetics of DNA repair and gene expression. He joined the Department of Physics, University of Calcutta and later founded the Department of Biophysics, Molecular Biology & Genetics in the University of Calcutta in 1987. Although he has retired from active service in 1995, he continues teaching a short course entitled "Evolution : From Big Bang To Human Brain" in Calcutta University. He was also the Vice-Chancellor of Calcutta University (1978-84) and an MP (Rajya Sabha) during 1985-93.

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**Editor's note :** *The special issue has been sponsored in part by the Department of Biophysics, Molecular Biology & Bioinformatics, university of Calcutta.*

*As a mark of respect to Darwin, the evolutionary naturalist, Science and Culture had published an article on the occasion of 100 years of "Origin of Species". The article (by N. C. Datta) has been reprinted in this issue to help readers, when read with other articles, to understand what has been achieved on the subject in the last 50 years.*

## Letters to the Editor

March 24, 2009

Sir,

I am a regular reader of your esteemed journal since several years. I am also a Life Member.

I am writing this with reference to your Special Issue on Sir Jagdish Chandra Bose – Vol.74, 11-12, 2008.

I must say that all the articles on this great nationalist scientist are very interesting. What is missing is Bose's interest in Homœopathy and his contribution to the action of drugs in very minute doses "even one part in a billion".

Sir Bose gave an illustrated lecture in the British Homœopathic Society in Glasgow on June 23, 1926. The title of the Lecture was "The Action of Drugs on the Response of Matter".

The Hegemonic Medicine - Allopathy – ridicules Homœopathy because the homœopathic medicine is highly attenuated transcending Molecular Chemistry; it wants 'evidence'. Over the years several researches have been carried out and the action of the ultra-molecular dose has been shown to be 'evident'.

Sir Bose showed how certain chemical substances had great effect in very minute doses "even one part in a billion" and "if you increase the dose .... it does harm. The important thing, therefore, is to find what the critical dose is, remembering that the critical dose for different persons is quite different."

However, the scientific world should note that as early as the first quarter of the last century Sir Jagdish Chandra Bose has demonstrated the action of highly attenuated drugs.

With regard to the manner of 'cure' (by a highly attenuated drug). Sir Bose said "There is the question of the power of resistance, the inner power, that is what you are after. Drugs do not help you, except in helping you to get the inner power of resistance increased. It is our power of nerve resistance which has to be exalted." One should note these words which have come out of a great scientist.

Concluding his address Sir Bose observed, "... It is a vast thing, this unity of life. But if you think deeply you ask yourself." Is this world chaos, or is it cosmos?" Is there a great design? Are all living creatures guided by

the same laws? And, if so, are not all human efforts for mutual benefit and mutual help?"

Yours Sincerely,  
Dr.K.S.Srinivasan  
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24-03-2009

Respected Professor Roy,  
Namaskar,

The editorial article of Science and Culture – Jan-Feb 2009 –raises some very important issues on how so called new technology should be checked for its sustainability in an environment friendly manner.

Growing Technological illiteracy – knowingly or otherwise- amongst the policy decision makers holding important positions of bureaucratic system in developing countries like ours is certainly posing new challenges and your editorial will definitely help the nation.

....Potential dangers and hazards of new technologies and definitely demands a more balanced and responsible approach- but who will listen?

With kind regards,

Sincerely Yours,  
H S Goyal  
Motil Nehru National Institute of Technology,  
Allahabad

March 3, 2009

Dear Professor Roy

After returning from USA, I was extremely happy to receive your letter of January 1 and also the Special Issue of Science and Culture. I congratulate you for bringing out such a nice Special Issue which contains very nice articles. I particularly enjoyed the article by Dipankar Home and of course the very interesting article by Professor Dutta Roy.

With best regards

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