

## New section on 'Reports and documents noticed'

'Reports and documents noticed' is a new section in *Current Science*. Many scientific, technical reports and documents of general interest to the scientific community remain in mimeo-graphed or printed report form, but are in circulation, nonetheless. Contrawise, many published documents do not come under the category of 'books' and remain in very limited circulation, despite being of wide interest. *Current Science* intends to carry extended notices of these documents, as also of those special issues of well-known journals that are devoted to a single topic. 'Notices' are annotated elaborations of the contents of these documents. They are not 'book reviews'. A document covered by this new section does not preclude it from being reviewed subsequently under the *Book Review* section.

—Editor

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**UK Government. Annual Review of Government Funded Research & Development, 1991.** Her Majesty's Stationery Office (HMSO), London, ISBN 0 11 430051 8, £25.

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The *Annual Review of Government Funded R&D* is roughly equivalent to our *R&D Statistics* brought out by DST. However, the UK document is produced by the UK Cabinet Office (our equivalent being the Cabinet Secretariat) and is very much more extensive. This review runs to 290 A4 pages. It is packed with statistical and descriptive information of R&D policies, programmes and funding of all of the Governmental agencies in the U. K. including what in India would be called 'socio-economic departments' (e.g. transport) (This latter information is unavailable, for the most part, in the equivalent Indian compilation brought out by DST).

Part one is an overview of UK Government funded R&D with com-

parisons with other major industrialized countries of the Organisation of Economic Cooperation and Development (OECD). Part two is a review of each UK government department covered. Most useful are four annexes including one titled: 'The primary purposes of Government S&T' and an elaborate index.

This document will be of special interest to all those concerned with the compilation, interpretation and inter-country comparison of statistical information on R&D.

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**Third World Science and Environment Perspectives, Nos. 5 & 6, Centre for Science, Technology and Environmental Policy Studies (STEPS), New Delhi, ISSN 0970-860X, Special issue: Earth Summit '92.**

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This special issue of STEPS Quarterly is devoted to the issues (that were brought) before the Earth Summit '92, held in Rio

de Janeiro, Brazil from June 1-12, 1992. It includes an explanatory article on: 'Agenda 21: Action plan for sustainable development for 1990's and beyond.' This action plan is supposed to be the basis for a new global partnership for sustainable development and environmental protection everywhere.

At the very top of Agenda 21 is 'Driving forces: value systems and lifestyles'. Said President Bush at Rio: 'The American lifestyle is not negotiable'. Amen.

The consequences of that assertion, mostly disastrous, are set-out in different ways in this special issue. Readers of this special issue should also read 'Rio: What the rich didn't want to hear' by Kirit Parikh (Director of the Indira Gandhi Institute of Development Research) in *Economic Times*, 20 July 1992.

V. SIDDHARTHA

51, Bharathi Nagar,  
New Delhi 110 003, India

## J. B. S. Haldane centennial

*J. B. S. Haldane is no doubt one of the titans of science (of this century). Almost without effort he could create new fields of scientific activity. Many feel that his publications—brilliant as they are—do not completely reflect his innate genius and his originality or the influence he has had on twentieth century science and scientists. I once had occasion to go for a long walk with him from the Indian Institute of Science to Lalbagh. I shall never forget this stimulating experience. One was amazed by his versatility, the manner in which he could throw out ideas on any and every subject, the propensity of quoting aptly from the classics. One felt that there was nothing in heaven or earth about which he did not know or on which he had no opinions. He sometimes appeared eccentric in his behaviour, but behind his rough exterior there was an extremely charming and kind man, full of humour, with plenty of jokes, many depreciating himself, a truly humble person with that curiosity which is the hallmark of most great scientists.*

*He left England (they say in a huff) and settled down in India. Here too he had many problems. He brought with him and published successfully in India the **Journal of Genetics**—which was started by the pioneering geneticist Bateson. After J. B. S. passed away and the tragic death of his wife Helen Spurway (of rabies from the bite of a pet wolf), the Indian Academy of Sciences, with the permission of the family, started publishing the journal. One is optimistic that it will once again become an international journal of repute.*

*This year is J. B. S.'s centennial. We requested many authors to write about him and his science. Our scientists were a bit too busy and it was difficult to extract articles out of them. Instead we requested V. Nanjundiah to select a few of Haldane's classic papers, which we publish along with a popular lecture by him on J. B. S. When the young of our country read these papers their appetites would be whetted and they would ask for more. (Incidentally, the collected works of J. B. S. Haldane have not been published. One wonders whether India should undertake this important task?)*

*I now reproduce extracts from a letter I received from Prof. Guido Pontecorvo (who was with us in India as Raman Professor) to show what an eminent biologist thinks of J. B. S.*

*I am a great admirer of J. B. S.; Haldane is probably the most stimulating and cultured person I have ever met. Every time I started a new line of research, I used to discuss it with him and get an immediate and useful reaction. This is why I should have loved to write in his memory. But with my physical health still below par, I do not think I can do a good job.*

—Editor

### Introduction

The five Haldane papers that follow my article constitute a small sample of his best work, but only a sample. The most glaring omission is that the 'popular' writings are unrepresented. Haldane's output is a fine, and therefore in situations demanding that a choice be made, troublesome, example of God's plenty. It is worth drawing attention to the fact that **The Causes of Evolution**, his masterly summing-up of evolutionary theory, preceded these papers. The astonishing variety displayed in this selection hints at why, as Leigh has recently pointed out in his introduction to the re-issue of **Causes**, Haldane did not build a system.

To take the papers in chronological order, **The Rate of Spontaneous Mutation of a Human Gene** (1935) contains deceptively simple mathematics. It was the first such estimate to be made; in addition to deducing a value for the rate, Haldane tucks in three nuggets: the time required for a stable balance to be struck between input by recurrent mutation and elimination due to

selection, the mean survivorship of a newly arisen mutation, and the suggestion that mutation rates differ between the sexes. This suggestion is turning out to be valid, and the importance of survivorship estimates has very recently resurfaced in relation to what—misleadingly—has been termed anticipatory mutation, as for instance in the population genetics of the fragile X syndrome.

In his book Haldane had stated "A study of the causes of death in man, animals and plants leaves no doubt that one of the principal characters possessing survival value is immunity to disease", and the theme is taken up for detailed examination in **Disease and Evolution** (1949). This, arguably the most influential of his contributions to evolutionary theory, has come into its own these days. It turns out that sexual selection and the evolution of sex, even the evolution of social behaviour, might be intricate consequences of the arms race between infectious agent and host.

**Animal Communication and the Origin of Human Language** (1955) shows Haldane at his discursive best. Two things about this paper puzzle me, however. The

first is Haldane's slurring over the fact (of which he was fully aware) that the first half of communication, the sending of a signal, primarily must result in some benefit to the individual sender, and not just to the species of which it is a member, if it is to evolve by natural selection. The second puzzle is that Haldane draws attention to the extraordinary efficacy of supernormal stimuli in eliciting a behavioural response and then shies away from discussing the phenomenon. (Admittedly this would have taken him off the main thread of the essay, but, as he might have said himself, so what.)

**The Cost of Natural Selection** (1957) has become a classic as much for its title as for its content. As always with Haldane the basic message is very simple. If evolution means the replacement of bad genes by good genes, the good genes in turn becoming a liability sometime in the future and so necessitating replacement by other good genes, the death of a staggeringly large number of individuals in each generation will accompany the transition. As a bonus, it is proved that the number of 'selective deaths' incurred by a population during the course of replacing one gene by another is almost independent of the intensity of selection—that is, independent of *how* bad a bad gene is. Consequently, because fecundities, population sizes and in general resources are limited, these deaths will have to be spread out over time: evolution by gene replacement has to proceed at a snail's pace. Kimura turned this reasoning on its head in order to infer that precisely because of the high cost, most of what happens in

evolution cannot involve bad genes being replaced by good genes. Rather, there must be a third category of genes, neither good nor bad, but indifferent; therefore, according to Kimura, much of the sound and fury of molecular evolution signifies nothing.

The final paper, **A Defence of Beanbag Genetics** (1964), offers a vigorous justification of the philosophy underlying the use of mathematics in evolutionary theory, especially in population genetics. But it does more. Haldane points out that when utilised carefully, mathematical analysis is a vigilant guard against the entry of verbal argumentation that is superficially plausible but at bottom fallacious. Secondly, by bringing into sharp relief differences between the possible and the actual, mathematics catalyses experimentation. The particular defence mounted by Haldane in this paper is dispensable today, even though it is true that mathematics, or for that matter numeracy, remains a tool of dubious value for most biologists (I wonder how many are aware of the horrors awaiting them in the brave new world of genome sequencing). The last sentence of **Defence** is poignant in the light of what followed.

VIDYANAND NANJUNDIAH

*Centre for Theoretical Studies,  
Indian Institute of Science and  
Jawaharlal Nehru Centre for  
Advanced Scientific Research,  
Bangalore 560 012, India*