everything is explained or proposed to be explained by too much, too little or just the right amounts of opioid peptides in our triune brains. After all, Somerset Maugham, in an exquisite essay on Zurbaran as a mystic painter (published in *The Vagrant Mood*, 1952), said plainly that mystical ecstasy, "generally the result of prayer and mortification", "may also arise through the influence of a drug, opium, for instance".

I have a lot of sympathy for some of the ideas and proposals described by Levinthal, and nothing would please me more than to be convinced that they are substantiated or even substantiable. There is little doubt that the opioid peptides are involved, somehow, in our homoeostatic handling of a variety of painful events. But even here I say *somehow*, as there are still many unanswered questions. For instance, I do not know of a definitive demonstration that acupuncture 'works' exclusively through the endorphin system. The 'proof' in such statements is usually that the expected effects are allegedly prevented by prior administration of naloxone, a powerful opiate antagonist. In the hands of critical investigators, such studies are difficult to perform and even more difficult to control. Moreover, we now know of effects of opioid peptides which are not naloxone-reversible.

A characteristic of many of these facile interpretations is the persistent confusion between the significance of blood levels of endorphins (which represent levels of endorphins of pituitary origin) and what happens or may happen in brain levels of endorphins, in one system of neurons or another. We have, so far, practically no way of knowing what is going on in such systems, even in laboratory experiments let alone the clinic. Intravenous injection of massive amounts of β-endorphin into animals or man has no effect whatsoever on measured functions of the central nervous system, because peptide molecules of this type do not penetrate the blood–brain barrier. Thus, relating the long distance runners' 'highs' to their blood levels of endorphins is meaningless.

Yes, the discovery of the chemical structure of the endogenous opioids found in our brains was a remarkable achievement. But it is still too early to know what to make of it, as basic knowledge or in daily life. Most of the original questions about the role(s) in health or disease of the enkephalins, the endorphins, and the other opioid peptides that were recognized later, still remain wide open. For all I know, some of Levinthal's enthusiasm — and, let's face it, that of most of us originally involved in these discoveries — may still be vindicated. □

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A growing sphere of knowledge

Ghillean T. Prance

Biodiversity. Edited by E. O. Wilson. *National Academy Press: 1988. Pp.521. Pbk $19.50. Distributed in Europe by Wiley, £16.80. To be published in hardback next month, £27.85, $32.50.*

UNTIL recently, 'biodiversity' — short for biological diversity — was a term used only by a few biologists. Today it is the subject of bills in the US Congress and of US Aid funding, and it was the central concern of a special meeting of the Pontifical Academy. Biodiversity has become the dominating theme of many scientific conferences, as it was at the August 1988 meeting of the American Institute of Biological Sciences held in Davis, California.

There is good reason for this rapid upturn of interest in the topic. In the past two years, alarming details have emerged of the rates of destruction of the tropical rainforest that harbours some 50 per cent of the world's biological diversity. Satellite photographs have shown that, in 1987, 204,000 km^2 of forest were burned in Brazil, and for 1988 the estimate is near to 250,000 km^2, much of the loss being of primary rainforest. A few years ago, environmentalists were called to task for suggesting that the annual worldwide total of rainforest destruction was 50 km^2. But the proven rate of destruction, the patent effect on climate and the number of species that are in danger of extinction have now combined to make biodiversity the centre of scientific and political attention.

Biodiversity, the book under review, is based on a national forum which took place in September 1986 at the Smithsonian Institution, under the auspices of the US National Research Council. Made up of 57 chapters written by specialists, it is a thorough review of the many aspects of the subject. Although the emphasis is on tropical rainforest, the threats to many other ecosystems, such as grasslands, oceanic islands, coastal zones and oceans are covered. Two of the main facets of biodiversity are stressed — species diversity, and habitat and ecological diversity. Genetic diversity is not considered in any detail.

There is a particularly useful section of five chapters on the value of biodiversity, and another on the contribution science and technology can make. Here, the role of botanical gardens and zoos is given prominence. Other topics covered include agroforestry and other sustainable systems of management, political aspects of protecting diversity and ethical issues. The contents of the final section, "Ways of Seeing the Biosphere", vary from a native American account from New Mexico giving the viewpoint of a Pueblo Indian, to a description of the Earth as a living organism by James Lovelock, the creator of the Gaia hypothesis.

Each contribution is brief and to the point, the most of them have references to further work on the particular subject dealt with. The book does not contain many new ideas or concepts; rather, its value lies in bringing together an appropriate diversity of human talent to address a topic that is vital for the survival of life on Earth. It is written in such a way as to be understood by the general reader and, with its broad scientific content, will be used for teaching courses.

In the two years since the national forum was held, immense amounts of further evidence of the threat to biodiversity have been gathered. Yet with its comprehensive treatment the appearance of this book remains timely. It deserves wide notice. □

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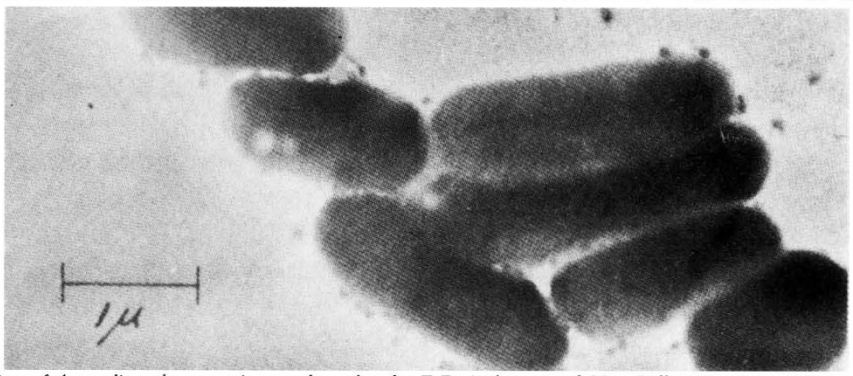

One of the earliest electron micrographs, taken by T.F. Anderson and Max Delbrück in 1941–1942, of bacteriophage on the surface of E. coli. *It showed (amongst other things) that phage never enter the cell, an observation made earlier and independently by H. Ruska in Germany. The picture is reproduced from* Thinking about Science: Max Delbrück and the Origins of Molecular Biology, *by Ernst Peter Fischer and Carol Lipson (W.W. Norton, $19.95; to be published in Britain on 18 January, £13.95). The book is a translation and revision of Fischer's* Licht und Leben, *reviewed by Max Perutz in* Nature **320**, 639 (1986).