

Book Reviews

Charles Darwin's *Beagle* Diary Richard Darwin Keynes (ed.). Cambridge University Press, Cambridge. 1988. Pp. xxix+464. Price £35.00. ISBN 0 521 23503 0.

Throughout the voyage of the *Beagle*, Darwin recorded his daily activities in what he generally referred to as his "Journal", but which, in order to avoid confusion with his publication *Journal of Researches*, is best referred to as *The Beagle Diary*. The text first appeared in print in a volume edited by Nora Barlow entitled *Charles Darwin's Diary of the Voyage of H.M.S. "Beagle"* published in 1933 and the manuscript, on which this and the present volume are based, was published in facsimile in 1979. This new version corrects a small number of unimportant errors in the earlier edition and has been revised according to the modern standards of transcription set by the editors of *The Correspondence of Charles Darwin*, also published by Cambridge University Press.

Though the diary reads as though it was written on a daily basis, Darwin normally wrote it only when on board the *Beagle* or when in a house on shore and did not take it with him on his lengthy excursions inland. The parts of the diary that deal with these journeys overland were evidently written up later, when back on board the *Beagle*, partly from the brief notes that he made in a series of eighteen pocket books that accompanied him in these journeys and partly from memory.

Anyone who has read Darwin's *Journal of Researches*, now better known as *The Voyage of the Beagle*, will find much that is familiar here, for about half of the 182,000 words in the manuscript diary were incorporated in the former, so that the two texts are identical in many places. When writing the *Journal*, however, Darwin decided to follow a geographical rather than a strict chronological sequence, so those places, such as Tierra del Fuego and the Falkland Islands, that were visited by the *Beagle* twice at an interval of a year or more, are confined to single chapters. The *Diary*, on the other hand, preserves the chronological continuity of the voyage and it thus has a freshness and immediacy lacking in the better known work.

One event in the voyage illustrates this difference between the two texts better than most. Thus, in the *Voyage*, the important discovery of the fossil bones of terrestrial quadrupeds at Punta Alta is discussed, in measured tones, in a section dated 5 October 1832, which was, in fact, just before Darwin's second visit to the site on 8 October. In the *Diary*, on the other hand, we are left in no doubt about his excitement about his discovery. Thus on 22 September, the date of his first visit, we read "We staid sometime on Punta Alta about 10 miles from the ship: here I found some rocks.—These are the first I have seen, & are very interesting from containing numerous shells & the bones of large animals". On the

following day, Sunday 23rd we read; "I walked on to Punta Alta to look after fossils; & to my great joy I found the head of some large animal, imbedded in a soft rock.—It took me nearly 3 hours to get it out: As far as I am able to judge, it is allied to the Rhinoceros.—I did not get it on board till some hours after it was dark". Again, on his second visit on 8 October 1832 he wrote: "After breakfast I walked to Punta Alta, the same place where I have before found fossils.—I obtained a jaw bone which contained a tooth: by this I found out that it belongs to the great antediluvial animal the Megatherium. This is particularly interesting as the only specimens in Europe are in the Kings collection at Madrid, where for all purpose of science they are nearly as much hidden as if in their primaeval rock". In other words, the *Diary* makes the reader feel that he was there at the time, whereas the *Voyage* is the measured and carefully considered account of the discovery written later. In modern terms, the contrast between the two texts is equivalent to that between telling one's colleagues about an important discovery made in the laboratory and writing up this discovery for publication in a prestigious journal sometime later.

The volume is, as one would expect, beautifully produced and contains many helpful and explanatory footnotes on relevant points of detail in the *Diary*. It also contains twenty-seven black and white illustrations of, mostly, the places that Darwin visited on the voyage and a very useful index. The editor, and the publishers are to be congratulated for producing this valuable addition to the modern collection of the literature of Charles Darwin, which will give much pleasure to all of those interested in his life and work.

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Basic Biotechnology—A Student's Guide P. Präve, U. Faust, W. Sittig and D. A. Sukatch (eds). VCH Verlagsgesellschaft, Weinheim, F.R.G. 1987. Pp. x+344. Price Dm. 56-. ISBN 3 527 26678 X.

Biotechnology is defined in the opening chapter of this book as "the use of biological processes within the framework of technical operations and industrial productions", which gives biotechnology a wide remit covering strain selection, optimisation of growth conditions, fermentation, biosensors and diagnostic kits, and in general the business end of the outpouring of biological knowledge from the technical progress of the last few years.

Although it might be considered a relatively new subject, one of the most entertaining chapters of this book traces the history of applied biotechnology to show that man has been using the products of microbial fermentation, in a more or less systematic way, for several thousand years. It is however, only in the last 50 years that applied microbiology (which I suspect is a more accurate description of most of the subject), has become big business.

The book begins with a resume of industrial microbiology—the bacteria, yeasts and fungi which are the basic production units of biotechnologists—and a short section on the classic methods used for strain improvement. Strain improvement in this case means persuading the strain to produce large quantities of the desired products. This is followed by an extensive chapter on the primary and secondary metabolism of these microbial strains. Primary metabolism will be more familiar to most people as the normal intermediary metabolism of the microbial cell, and many useful products arise as products of this type of metabolism in different species of bacteria. In addition, secondary metabolism, which takes over when the microbe begins to run out of nutrients, is responsible for the production of many antibiotics and other metabolites.

There is a chapter on plant biotechnology, which concentrates largely on the methods of plant tissue culture for hybridisation of plant species and generation of new variants. This was one chapter which I felt showed the age of the book, because it contained little of the recent advances in plant genetic engineering. Although this is still an embryo field, there is no doubt that it is a subject which will become of increasing importance in time.

A major part of the book is concerned with downstream processing, that is the design of the plant required for the bulk fermentation, and the methods used to purify the required products away from the medium and microbial debris. There are large sections on the design of reactors and fermentation vessels, and the methods used to optimising the operating parameters (flow rates, pH control etc.) which are critical to the cost effectiveness of the process.

Another major concern of the biotechnology industry is the purification of the product into a form which can be sold commercially, the product recovery process, and this rates a separate chapter in the book. This end of the biotechnology industry contains more of chemistry and engineering than biology.

The book is aimed at students with some background in biology, and is a condensed form of a much larger multi-volume text. In some places the compression shows, for instance the treatment of the techniques of genetic engineering is extremely brief. The book also suffers from the fact that it was first published in German in 1982, and even although some of the sections were revised up to 1987 when it was translated into English, other sections are substantially out of date in this rapidly moving field. I felt that this was particularly so in respect of recent advances in knowledge about the control of transcription and translation of the genetic material. I

would also have liked to see perhaps a bit more recognition of the problems encountered in introducing cloned genes into a non-homologous cell type, and the problems in achieving proper expression of these genes in the new host.

How useful is this book to the students at which it is aimed? In general it appears to be a good introductory level text. I must confess that I found the subject less than wildly gripping, and this is perhaps a reflection on the book, which is competent and thorough rather than exciting. The translation from the German has been competently done, and only in a few places is it obvious that the book was not originally written in English. The text is attractively laid out with line diagrams as illustration. The book does not pretend to be a comprehensive treatise on biotechnology, and there are some obvious omissions, but overall it appears to be a reasonable introduction to the subject and as such a worthwhile student text.

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Transposition. SGM Symposium 43 A. J. Kingsman, K. F. Chater and S. M. Kingsman (eds). Cambridge University Press, Cambridge. 1988. Pp. 375. Price £37.50. ISBN 0 521 35464 1.

Transposition has been found in all organisms in which it has been searched for. It is the movement of discrete segments of DNA between different (often random) sites in the genome. The process is probably a manifestation of evolution at the level of DNA: a segment of DNA that can transpose is at an advantage compared with other DNA sequences. Thus, any method that enables transposition will be favoured; this is reflected in the quite different ways in which transposition can be effected. The advantage of transposition for the host organisms is the genetic rearrangements that are entailed and mediated: transposition is certainly one of the major forces in evolution. It is also of immediate social importance: for instance, antibiotic-resistance in bacteria is very frequently mediated by transposable elements; and the AIDS virus is, of course, a retrovirus, which can be considered as a transposable element. So, an immediately-accessible and up-to-date review of the whole field is most apposite; the last such volume was in 1983, *Mobile Genetic Elements*, edited by Shapiro.

The Shapiro book would be hard to improve on as a general text on transposition (except in terms of modernity, of course), and has to be the yardstick for any other text at this level. How closely does this SGM volume approach it? As is generally the case with these SGM Symposia, the individual articles are good, often very good. And in many of the cases they deal with fields that Shapiro does not cover (could not, generally, because the data were not available), such as transposition in *Streptomyces* (Chater *et al.*), mechanism of phage