Nonlinear Partial Differential Equations for Scientists and Engineers. Lokenath Debnath, Birkhäuser, CH 4051, PB133 Basel, Switzerland. 1977. 593 pp. Price: SFr 118.

The book under review covers a fair span on nonlinear partial differential equations (PDEs). This book is self-contained: it gives a good introductory chapter on linear PDEs, almost all that may be needed later for nonlinear PDEs. Much of it, however, concerns nonlinear waves, hyperbolic, diffusive and dispersive, so it could more appropriately be called a work on nonlinear waves. It contains very little of (steady state) nonlinear elliptic equations.

The topics covered include nonlinear model equations, variational principles, first order PDEs, conservation laws and shocks, nonlinear diffusive and dispersive waves, solitons and inverse transform techniques, and, finally, the reductive perturbative/multiple scales methods to derive model equations. Thus, the book has a large scope. Its strong point, however, is large number of solved and unsolved examples, the latter with answers and hints. There is a clear print of the author's pedagogic style. It is in the tradition of the books by Ames (*Nonlinear Partial Differential Equations in Engineering, Parts I and II*) though it goes much beyond and much deeper.

Debnath's book would have to bear comparison with the classic work of Whitham (*Linear and Nonlinear Waves*, John Wiley, 1974), which has now inspired and influenced two generations of scientists and engineers. He himself has drawn much from Whitham's work, in particular the variational approach. There has also appeared recently another work by Logan (*An Introduction to Nonlinear Partial Differential Equations*, Wiley Interscience, 1994), which gives excellent treatment of nonlinear PDEs, including elliptic ones; it is readable and yet reasonably rigorous.

In a sense, Debnath's style is his own. There is much evidence of his own research interests which are in the area of nonlinear water waves.

The book under reference is likely to be quite popular since it includes in its covers a large material on nonlinear PDEs and nonlinear waves. The emphasis on examples, solved and unsolved, will make it useful for an upper undergraduate/graduate course on nonlinear PDEs.

The reviewer recommends it to all interested in the emerging discipline – the nonlinear science.

P. L. SACHDEV

Department of Mathematics, Indian Institute of Science, Bangalore 560 012, India

Molecular Embryology of Flowering Plants. V. Raghavan. Cambridge University Press, The Edinburgh Building, Shaftsbury Road, Cambridge CB2 2RU, UK. 1977. 690 pp. Price: US $150.

It was in 1950 that the book *An Introduction to the Embryology of Angiosperms* – authored by late P. Maheshwari, my father, appeared. Among the very first in the area in the English language, it became a classic and a best-seller and was indeed ranked by ISI (which publishes *Current Contents*) among the 25 cited books in the botanical world, some years ago. For students of plant sciences all over the world, especially for those wishing to study plant reproduction, it has been a bible.

Even though the book mentioned above is still being cited, in the period that has elapsed and which is almost half-a-century now, many developments have taken place in biology. We have come to know about the double helix, the role of nucleic acids and a multitude of other molecules and the science of biochemistry became well established. All these have brought about a revolution in plant biology as well. Already in the late fifties and sixties, the first biochemical studies had been started by pioneers such as on the mechanism of incompatibility by Linskens or on meiosis in anthers by Hotta and Stern. But in the eighties, the recombinant DNA revolution came in a big way leading to studies on isolation or identification of genes controlling meiosis, male sterility, incompatibility and development of embryo and seed. Obviously, there has been a pressing need for a new text to review these advances, not merely for chronicling the various studies but inspiring new work in a manner similar to the role played by Brachet's *Biochemical Embryology* in the animal world.

The book under review fulfils the long-felt need and may become another classic. Indeed, Raghavan needs to be congratulated for bringing together a remarkable wealth of information. The book is thoroughly researched: the references number around 5000 or so, listed in some 136 pages! As you glance over these pages, you find there almost every friend you have known or a scientist whose work you are acquainted with. In these days when edited or multi-authored volumes have become a necessity and are the rule, it is amazing how the author has managed to assimilate and summarize so much information, all single-handedly. It is obvious that the book is a result of scholarship and dedication of the highest order.

Besides being arranged logically in four 'core' sections, namely gametogenesis, pollination and fertilization, zygotic embrogenesis and somatic embryogenesis, an introductory chapter and a fifth section on applications have also been included. The first not only gives an overview of the subject but also explains many new techniques which should enable the reader to comprehend the text if they have no direct experience of work in the area of molecular biology. Likewise, it is an excellent idea to begin the first section with an overview of the recent path-breaking studies by Meyerowitz, Coen, Saedler and their colleagues on homeotic genes so that principles and basic mechanisms underlying differentiation of carpels, ovules, stamens and other organs are understood. Similarly, the last section is one that will be extremely valuable for those who are looking for applications. To come to the 'core' again, there is an excellent coverage of such topics as incompatibility (two chapters) and embryogenesis (four, two for zygotic and one each for somatic and pollen embryogensis). I also like the style of writing with not only General Comments after each chapter but small summaries after almost each smaller topic discussed in a particular chapter which usually follow a question asked at the end of a sub-topic something to the effect, What then are we to make out of the foregoing observations? Not only do

such questions lighten the reading, the reader is encouraged and helped to ponder over and glean the wisdom brought forth. Of course, often it is the lack of it (and the author himself is very plain and candid about it), and it is very hard to decide if we have really become wiser. For example, compared to advances in animals, we are at a very early stage and one wonders if the genes discovered so far in the context of embryogenesis have anything to do with pattern formation in the strict sense. In certain other areas, the progress is more pronounced. Thus, there is solid advance in respect of mechanisms unravelling incompatibility through work of Nasrallahs, Adrienne Clarke and others but the diversity of the mechanisms is bewildering. Turning to the publishers, the Cambridge University Press too has done an excellent job by way of type-setting, printing and general get-up, although I have to say that some line diagrams have suffered in quality in adjusting them to the width of a column in a page.

However, I do see some problems with the length of the book (as apparent from the author's preface, this has been an issue of some controversy right from the beginning). Thus although the book will certainly be of great use to the researcher and graduate student (and that is what the author has aimed at) and there is strength in an extensive treatment, a large void is still left.

For younger students and the general plant biologist interested in advances in plant biology as a whole (but one who is not a specialist of embryology), going through the text and culling out real advances may be a somewhat daunting task. Still, more people should be attracted to research in the area.

My thinking is that another smaller text is necessary, *combining* the knowledge gleaned from older anatomical investigations and the newer biochemical findings and somewhat more selective but still well illustrated – for example a few scanning electron micrographs such as of young floral primordia or of young ovules or pollen and stigma should be of value as also a few colour plates such as of Ca^{++} spiking in pollen tubes now seen with new fluorescent markers. To introduce basic concepts such as of homeotic genes or of the switch that triggers meiosis (now that a *MEI 2* gene similar to that in fission yeast has been claimed to exist also in *Arabidopsis*) or the role of surface receptors in fertilization, some reference could also be made to yeast, *Drosophila* or other animal models – if not in the main text, as boxed items. I think it is also necessary to introduce terms such as apoptosis since caspases, etc. must doubtless be involved in degeneration of tapetum or extra megaspores. Also, one topic that I felt deserved more space and attention is apomixis, since it is of great significance for tomorrow's agriculture, and a number of molecular biology techniques such as RFLP mapping, and differential display are being applied to clone the apomixis genes. And who other than Raghavan can do this job?

Nevertheless, publications of *Molecular Embryology of Flowering Plants* is in itself a landmark in plant biology and Raghavan has done commendable service to the botanical community. The book is a must for all libraries in universities and agricultural institutes.

S. C. MAHESHWARI

International Centre for Genetic Engineering and Biotechnology,
Aruna Asaf Ali Marg,
New Delhi 110 067, India.

Evolutionary Ecology of Freshwater Animals: Concepts and Case Studies. B. Streit, T. Städler and C. M. Lively, eds. Birkhäuser Verlag. PO Box 133, CH-4010, Basel, Switzerland, 1997. 366 pp. Price: not known.

The discipline of evolutionary ecology is an anastomosis of the diverse fields of population biology, population genetics, ecology, community structure, life-history theory, behaviour, evolutionary history and biogeography. The aim of this book as the editors claim and as the title suggests is to 'highlight some of the current hypotheses and approaches in the field using freshwater model systems as a unifying theme'. The contributors felt that many theoretical constructs in evolutionary ecology were based on terrestrial systems and they therefore wished to initiate communication between ecologists and evolutionary biologists who work in both terrestrial and aquatic ecosystems. The editors are obviously very keen on promoting research on freshwater systems and they enumerate several advantages for such a choice. Freshwater organisms are easier to work with because they are often small and have rapid population turnovers allowing for large sample sizes in experiments. Since freshwater systems are often transient at ecological and evolutionary time scales, they result in life-history strategies appropriate for variable environments. Also, for researchers interested in breeding system evolution, there are a variety of breeding systems in freshwater systems, e.g. cloning in bryozoans, parthenogenesis in cladocerans and rotifers, and self-fertilization in pulmonate snails.

The twelve papers in this book are divided into four sections: ecosystem structure and trophic interactions, life-history evolution, population biology and reproductive modes, and evolutionary processes following colonizations. Each paper is written as a very up-to-date review (many references are from 1997) and, moreover, a review with an obvious directive – to highlight the relevant conceptual framework, to review any freshwater research that has already been done within an evolutionary ecology perspective and, if not, to interpret the published work in the light of evolution.

It is in this spirit of conceptual synthesis that Leibold and Tessier have used models of Rosenzweig and Tilman's resource availability model developed for grasslands to examine resource competition in zooplankton and to relate it to the diel vertical migration of plankton between the hypolimnion and epilimnion. Brönmark *et al.*'s paper on benthic food chains is a fine exposition of trophic cascades wherein they refer to the HSS model (Hairston, Smith and Slobodkin) of tritrophic interactions in terrestrial community structure, according to which the world is kept green because predators control herbivores. This is examined in the fish–snail–algae and the crayfish–snail–algae systems. I liked the section on behavioural effects in food chains although the examples are mostly more than 10 years old, e.g. the famous sunfish study of Werner *et al.* (1983) in which juvenile sunfish shift their feeding into denser vegetation based on