reported, i.e. the photoreceptor itself moves into the nucleus where it can bind to some transcription factors and regulate gene expression. This was a bold new concept then, but now seems to be true for both A and B phytochromes and has received a lot of experimental support. This may be true for other phytochromes also. The review by Nagy and Schaefer has covered these aspects well. In addition, they also induce one to think about the role of the phytochrome pool that does not enter the nucleus and remains in the cytosol.

With regard to applications emanating from molecular physiological work, one area that has gained wide attention is abiotic and biotic stress-tolerance mechanisms. During the last few years, using genetic and genomic approaches, a large number of genes have been identified that are regulated in response to salinity, drought and cold stress. The Japanese group headed by Shinozaki has now analysed over 7000 genes of *Arabidopsis* and Bohnert's group has analysed thousands of genes using yeast and rice gene chips. The signalling pathways that lead to the induction of these genes are either dependent or independent of ABA and may involve different protein kinases, including MAP kinases. However, during the last 3–4 years, Zhu and his group at Arizona have discovered a novel pathway in response to salinity stress called SOS (salt overlay sensitive) pathway, that involves a calcineurin-like protein (SOS3), a kinase (SOS2) and plasma membrane Na^+/H^+ antiporter (SOS1). A detailed description of these components and others has been given in the chapter by Zhu on stress signalling. This group has now characterized other mutant salt-sensitive phenotypes also, like SOS4 and SOS5, which throw further insight into the mechanisms that lead to sensitivity/resistance to higher salt concentration. In his account on temperature stress, Iba from Kyushu University, summarizes the present work on heat-shock proteins and the role of osmoprotectants like glycinebeatine and detoxifiers of active oxygen species in contributing to temperature stress tolerance. He has also listed the major experiments where the ability of plants to tolerate high or low temperature stress was functionally demonstrated by genetic engineering. The effect of heavy metal stress is discussed in a chapter by Cobbett and Goldsbrough. They have covered in great depth, the present status of research on phytochelatins and metallothioneins with respect to gene cloning, organization, expression and the role of proteins in metal sequestration.

When plants are attacked by insects, they respond in various ways. This involves a wound-induced response and also a insect-specific elicitor response. A description of plant–herbivore interaction, induction of signals like jasmonic acids, octadecanoids, reactive oxygen species, etc; the signalling pathways and their crosstalk to other inducers, and the resulting metabolic changes have been well collated by Kessler and Baldwin. It is now known that the genes induced in response to insect attack are regulated via herbivore-specific transacting elements.

In addition to the various topics covered in this volume and briefly described above, the editors have now brought to focus a few model plants which are being used to understand some specific problems of plant biology or specifically their own biology. The years 2001 and 2002 saw a number of announcements regarding the completion of sequencing of rice genome, both *japonica* and *indica*. This has brought in a wealth of information which can be used for structural and functional comparisons with other biological systems. Shimamoto and Kyozuka have dealt with this topic and have concentrated on genes involved in reproductive development and those involved in defence signalling. Lately, a lower plant, *Physcomitrella patens* (a moss), has shown great potential for functional study of important genes. An account of this has been presented by Schaefer (from Lausanne University). If you wish to study the function of your gene and want to use this moss for your study, link to www.moss.leeds.ac.uk. (This information was passed on to me by Ralph Quatrano during his visit to our institute.) And finally to the lowest of all, the diatoms. These marine diatoms contribute about 20% of global primary productivity. The chapter by Falciatore and Bowler covers various aspects of diatom biology: how they perceive environmental signals like nutrients and light. One interesting facet of these organisms is that they can also sense and respond to the presence of other organisms like bacteria and have quorum-sensing phenomenon.

Last but not the least, there is the prefatory chapter which one always looks forward to reading. This time it is by no less a person than Benson, whose pioneering work on the use of radioactive carbon dioxide led to the qualification of path of carbon in photosynthesis. Like with many such chapters, from the present one too, we can draw a lot of inspiration and courage to take up challenging problems in biology.

The volume 53, with its contents and coverage, has stood by its new name of *Annual Review of Plant Biology*. It was mentioned in one of the reviews in this journal earlier that *Annual Reviews* should also consider publishing articles with colour illustrations. This is what one sees now in this volume. There are many workers who by habit would like to read *Annual Reviews* but then to those who would not, I recommend they should read it to upgrade their knowledge in the area of research in which they may not be directly working. To get fuller insight into the overall biology of a plant, one has to look at data from a genomic and a panaromic view, thereby intergrating information from different fields. I also recommend it to the teachers of botany who can update their teaching notes, as in many universities in India it is difficult to lay hands on all important journals and new books.

1. Sopory, S. K., *Signal Transduction in Plants: Current Advances* (eds Oelmueller, R. and Maheshwari, S. C.), Kluwer, Dordrecht, 2001.

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A Field Guide to the Common Invertebrates of the East Coast of India. S. Antony Fernando and Olivia J. Fernando (eds). Centre for Advanced Study in Marine Biology, Annamalai University, Parangipettai. 2002. 258 pp. Price not mentioned.

The Centre for Advanced Study in Marine Biology, Annamalai University must

be commended for bringing out a series of monographs and other contributions on marine bioresources. In this series, the centre has published this handbook as a field guide for identification of common marine invertebrates. In these days of liberal support for studies and research in biotechnology and biodiversity, identification of common invertebrates is of great importance. Hence, the Fernandos must also be complimented for bringing out this handy and useful field guide.

The handbook includes a brief description and a good labelled hand-drawing for each species. It provides guidelines for species-level identification of 250 species. Among these, ten species belong to Coelenterata, 12 to Ploychaeta, 43 to Crustacea, as many as 124 to Gastropoda, 42 to other molluscs and 18 to Echinodermata. No reason is given for the greater focus on Mollusca and for the exclusion of sponges, isopods and amphiobods, although the authors have clearly indicated that this field guide is not exhaustive. It must be mentioned that for about 143 species, useful common names are added. Details on habitat and size of the animal are also given, although it is not clear whether the given size refers to length of diameter of the animal in such case like the crabs, clams and sand-dollars. Interesting information on breeding habits, economic importance of polymorphic traits and oviparity in some snails (e.g. *Clithon*, p. 92) is also included. In his Foreword, V. Sampath has also commended the book.

However, a large number of unattended editorial corrections must be indicated: The field guide suffers from interspersed mosaic descriptions of telegraphic statement, phrases and complete sentences. Wrong expressions are not uncommon. For instance, for the description of a single species, i.e. *Dromia dehanni* (p. 50), a statement like 'All species are marine...', is not understandable; the same is repeated on p. 56. Examples for spelling and other mistakes are: '*Diopatra*,, is a very common genera' (p. 25); '*Cyprea moneta* maily live on inter-tidal reef flats...' (p. 117). While describing one or more species belonging to the same genus, as in the case of four species of *Panulirus*, the key characters which are useful to critically distinguish one species from other, must have been included.

Despite these avoidable errors, the field guide is a useful contribution and is recommended for zoology students, research scholars and others.

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Annual Review of Earth and Planetary Sciences 2002. Raymond Jeanloz *et al.* (eds). Annual Reviews, 4139 El Camino Way, Palo Alto, CA 94303-0139, USA. vol. 30, 593 pp. Price not mentioned.

Twenty-nine specialist authors have written 16 review articles for this volume. The quantity of recent information contained here is further evidence that, as in other areas in the last few years, the expansion of knowledge in the earth and planetary sciences has been rapid, and the pace is accelerating. The era of generalist earth scientists is over. Any one reviewer may not be expected to comment knowledgeably on all or even most of the articles in the volume. I present below, my idiosyncratic views on some of the articles.

Since all the articles contain substantial multi-disciplinary material, it is difficult to classify them unambiguously under categories such as geology, geophysics, geochemistry, geohydrology, etc. For example, titles of three articles contain the term 'fossil'. But they cannot be grouped automatically under palaeontology, and hence geology, because they contain copious references to geochemical, geophysical and planetary science concepts and techniques.

The theme of earthquake prediction is highlighted in this volume through an article by Keilis-Borok. Charles Richter wrote in *Elementary Seismology* published in 1958 that 'Prediction of earthquakes in any precise sense is not now possible. Any hope of such prediction looks toward a rather distant future. Cranks and amateurs frequently claim to predict earthquakes'. Reliable earthquake prediction is still a gleam in the eyes of seismologists. However, seismologists from Japan, the erstwhile USSR and the US made earthquake-prediction research acceptable in the 1960s. Keilis-Borok published his first article on the theme in 1964. His 2002 article is primarily a review of the work of a team at the Russian Academy of Sciences. The first part of the article re-emphasizes the importance of the topic. It also presents the view that, on the timescale of 10^2 years or less relevant to this problem, the lithosphere behaves as a nonlinear, hierarchical dissipative system and strong earthquakes are critical phenomena in this system. The main part of the article recalls four prediction algorithms developed by the above-mentioned team. All are based on suitable analyses of seismic activity data, i.e. latitudes and longitudes of epicentres, depths of foci, times of occurrence, and magnitudes of earthquakes of a region or the earth as a whole, as the case may be. It may be recalled that seismic activity is one of a host of time-dependent fields whose observations may be potentially useful for earthquake prediction. The aim of each algorithm is to identify, from the available seismic-activity data, time windows during which there is increased probability of earthquake occurrence. A prediction is successful if an earthquake does occur during an identified window. A prediction has failed, if an earthquake does not occur during a window or if it occurs outside the identified windows. Their record of successes is impressive. Current predictions are posted at http://www.mitp.ru and http://www.phys.ualberta.ca/mirrors/mitp. Keilis-Borok's passionate commitment to the cause of earthquake prediction is evident.

Fehler and Huang review recent progress on interpretation of seismic reflection data. Kirchhoff migration imaging has been improved by using multi-branched travel-timetables and assigning amplitudes and phases to waves along different ray paths. Progress in wave-equation imaging now allows phenomena such as focusing and diffraction to be taken into account for petroleum exploration.

Valentine *et al.* describe recent developments on numerical modelling of nonlinear multiphase fluid flows with heat transport and phase changes, by focusing on the modelling of fluid flows near an underground radioactive waste repository, two phase flows through random heterogeneous porous media, and fluid processes in magma systems of the earth. Two phase conditions near boiling point may exist close to packages of radioactive waste and may involve