



Detritus and Decomposition in Ecosystems. Zafar Reshi and Sumira Tyub. New India Publishing Agency, Delhi. 2007. 259 pp. Price: Rs 750.

The rapid increase in ecosystem degradation world over and the consequent ecological crisis warrant immediate restoration measures to be undertaken to ensure their sustainable management. Such measures though discernible in different forms at various scales, by and large turn out to be utter failures and sheer wastage of huge investments, primarily because of the lack of proper understanding of the fundamental processes and mechanisms underlying ecosystem functions. On target and properly resonating with our apocalyptic forebodings, we now seem to be well on course for the meltdown of civilization by environmental destruction. The threat is real, but will one more book make a scrap of difference? If it comes from a well-versed person with in-depth understanding of the subject, it certainly should. I fear, however, that it will not, but not for reasons of apathy or unawareness. Rather, The Creation fails, particularly in developing countries, in a much more fascinating way.

Anyway, emergence of a book entitled *Detritus and Decomposition in Ecosystems* addressing a basic process of detritus decomposition that lies at the heart of ecosystem dynamics, is a timely contribution. The contents of this 269-page book are spread over eight chapters and more than 25 sub-chapters. A bird's-eye view of the book reveals that the cover page background duly justifies the title and the nicely articulated preface grabs the reader's attention at the outset. The book revolves solely around its theme and the authors have sequentially linked the chapters starting with nature and composition of detritus and its effect on environment

followed by processes and patterns of its decomposition together with associated biotic and abiotic factors, and ending up by linking its relationship with nutrient cycling.

The book under review seems an inimitable wedding of the most recent discourses with previous classical works in litter decomposition and the exhaustive literature cited in the book is an obvious reflection of the hard effort put in by the authors. The book blends tables and graphs with an easy-to-read text. It portrays well the process of decomposition, and shows how the diversity of decomposers is spatio-temporally variable, thus determining variation in the rate of decomposition over different eco-geographical gradients. Ecology, despite being a more abstract science, has ample scope for appropriation of philosophical terminology. Yet the language of the book is more ecological and biological, rather than quixotic and romantic. Amongst the noteworthy features of the book that make it different from other related publications are its unique style of relating tree diversity, disturbance regimes and herbivory with litter dynamics apart from climatic and time-lag factors. Meticulously prepared flow charts, especially that of classification of woody detritus; representation of the effect of litter on demographic processes; depiction of stages of detritus decomposition in addition to diagrammatic representation of the role of biotic and abiotic factors in litter decomposition speak volumes about the command that the authors have on the subject. The book, a bank of valuable datasets, is a ready reference for researchers in the related field with rich and up-to-date information duly supplemented with comprehensive literature base of contemporary standards.

Though the book is of immense use to students of diverse streams, including botany, environmental science and forestry, from the undergraduate to postgraduate level, a chapter devoted to methodology of studying detritus decomposition and related parameters would have made it more useful for researchers in the related discipline. The authors have left hardly any margin for detecting any error in the book. However, the figure captioned 'Decomposition process as a successional loop' on page 116 taken from the paper of Sinsabaugh *et al.* (2002) in the book entitled *Enzymes in the Environment* lacks its source. Climate exerts strong control

over rates of litter decomposition and climate change can influence litter decomposition rates directly or indirectly through changes in litter quality, thus having critical implications on carbon storage and dynamics in the present global climatic change. In chapter 3 under the sub-heading 'Patterns of decompositions' one fails to spot the mention of an important link of litter decomposition with carbon sources and sinks or how the changing environmental conditions would affect litter decomposition. Furthermore, a brief chapter summary as given in the second chapter, if given after every chapter, would have made it more reader friendly.

As the authors have rightly mentioned in the preface that perfection is an extremely rare achievement and takes a long time to be attained, yet incorporating useful suggestions in future volumes of the book would be a step in the right direction. Given the importance of this book to a cross-section of students, scientists and professionals alike in the field of ecology and environmental sciences, I strongly recommend it to adorn the shelves of their libraries.

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Discoveries in Photosynthesis. Vol. 20. Govindjee, J. T. Beatty, H. Gest and J. F. Allen (eds). Series on 'Advances in Photosynthesis and Respiration' (Series Editor: Govindjee). Springer, Dordrecht, 2005. 1304 pp. Hardcover; ISBN: 1-4020-3323-0; 295 Euros; 25% discount for members of International Society of Photosynthesis Research.

Discoveries in Photosynthesis is easily among the most outstanding and valuable books published in the biological sciences in the last 100 years. Insofar as the plant sciences are concerned, it may indeed be in the rank of a classic because it not only deals with one of the most remarkable processes sustaining life on our planet, but also because of its unique authoritative style where the greatest inves-

tigators of photosynthesis describe, in their own words the discoveries they have made or those made by their close colleagues, many of whom have passed away.

The book is an edited volume comprising write-ups of many authors and largely assembled from many articles in *Photosynthesis Research*, a journal also published by Springer, obviating problems of copyright and reproduction. However, even for an edited volume and despite part publications earlier, the collective work represents a gigantic effort comprising as it does more than 1300 pages, with as many as 132 authors from 19 countries contributing 111 chapters, including much new material. The book is richly illustrated with nearly 800 photographs (many of them informal, adding greatly to the charm of the book). In addition, there are many diagrams, tables and other supplementary material. I do not know of any comparable effort in the plant sciences or even the broader area of biology.

The preface is followed by a special dedication to the late M. D. Kamen (written by H. Gest, his first student). This is most appropriate, not only on account of the fundamental discoveries S. Ruben and Kamen made in the 1940s that oxygen produced in photosynthesis is from water (for which they used water labelled with O^{18}), firmly establishing photolysis of water as the key event in this process, but also because they produced the first samples of radioactive carbon which opened the way for unravelling details of CO_2 reduction cycle and much more in the broader field of biochemistry by many others. Following this dedication, the work traces advances in some 16 major sections providing an extraordinary overview of researches covering the entire field of photosynthesis. Among these, the first three are special sections of 'Editorials', 'Overviews and Timelines' and 'Tributes'.

The 'Editorials' honour, in addition to Kamen, such pioneers as the late R. Emerson (to whom the first editorial is dedicated), C. B. van Niel, R. Hill, L. N. M. Duysens and E. Rabinowitch (to whom the second one is dedicated), and W. Arnold, R. Stanier and G. Cohen-Bazire (the third editorial is dedicated to all three). The last editorial also honours 18 Nobel laureates starting from R. Willstätter, who unravelled the chemistry of chlorophyll to J. Walker who worked on ATPase

structure. The second section on 'Overviews and Timelines' has write-ups by Gest (giving the history of the term 'photosynthesis' which, many may not know, was coined in USA); J. Myers and two special chapters on 'Timelines' of discoveries in anoxygenic and as well as on oxygenic photosynthesis. The third section of the book then pays special tributes to late R. Hill, J. Franck, H. Gaffron, S. Ruben and H. Lundegårdh. [Govindjee has gone a step further in his dedications by placing a photograph of Myers, with this volume, on his web page (<http://www.life.uiuc.edu/govindjee>); Myers is one of the pioneers and is now 94.]

From Dedications, Timelines, and Tributes, one gets to what I may term the 'core' sections (11 in number) of the book dealing with many more discoveries and various details of the photosynthetic process, beginning with a section on 'Excitation Energy Transfer' and ending with those on 'Genetic' and 'Evolution'. In the first section of 'Excitation Energy Transfer', various authors (among whom are R. M. Pearlstein, J. Ames, S. Brody, J. Allen and P. and A. Joliot) discuss matters ranging from excitons, arising from the absorption of photons by chlorophyll pigments, to fluorescence, and excitation energy transfer within photosynthetic units. The reader is then led to the largest and perhaps the most important section of the 'core', that of 'Reaction Centres' (RCs) with as many as 14 contributions dealing with various discoveries ranging from the RCs in photosynthetic bacteria (e.g. chapters by R. Clayton, who first found them, and by J. P. Allen, who worked at Martinsried in Germany on their crystallization with the Nobel Prize-winning team of R. Huber, H. T. Mitchell and J. Deisenhofer) to those of higher plants (several chapters by H. Witt, J. Barber, N. Nelson, K. Satoh, P. Fromme and P. Mathis and of whom the last two were earlier part of Witt's group). One learns of many interesting experimental details: for example, Witt describes how detection of P_{680} in the RC of PSII presented unexpected problems – because of low signals not only repetitive flash technique had to be used but as detailed elsewhere, to avoid electrical noise (after much fruitless work) the laser spectroscopy set-up had to be split into two separate floors of a building with the power source and laser in the basement of the building and the plant material and the photomultiplier assembly for detect-

ing the absorption changes in an above-ground floor. The monochromatic light beam was led to the upper floor employing mirrors and pipes such as those used in sanitary installations!

The third section of the 'core' of the book deals with 'Oxygen Evolution' with contributions of G. Renger (who worked with Witt). It gives a broad historical overview that includes work of B. Kok and J. Babcock, both of whom unfortunately died somewhat prematurely. The fourth section 'Light Harvesting Complex and Pigment-Protein Complexes' deals with contributions on bacteria (e.g. by R. J. Cogdell and coworkers) and higher plants (e.g. by T. Ogawa, E. Cann and B. R. Green). The fifth section (and the second largest) concerns 'Electron Transport and ATP Synthesis', with articles dealing again with both bacteria and higher plants and including special contributions by G. Hauska, W. A. Cramer and D. S. Bendall on cytochromes and on plastocyanin by S. Katoh, as also photophosphorylation and chemiosmotic perspective by A. T. Jagendorf and W. Junge. A sixth section of the core part of the book on 'Techniques and Applications', completes the discussion on the role of light. This section has a valuable article by B. Chance, one of the great wizards of our times, who combined expertise of biochemistry with electronics and developed the difference spectrophotometer. This, in turn, in the sixties led to the first formulation of the modern versions of electron transport chain – not only of electrons moving down the redox scale from organic substances to oxygen as in the mitochondria, but also for photosynthesis in chloroplasts, where the chain exists in reverse for extracting electrons from water and driving them up to NADP leading to CO_2 reduction.

Following the discussion of chlorophyll pigments and the role of light and techniques employed to probe their role, the reader is led to a section on 'Chloroplast Development' and another entitled 'Reductive and Assimilatory Processes' dealing with CO_2 reduction and yet another on 'Transport Regulation and Adaptation'. Appropriately, since Kamen was a co-discoverer of both C^{11} and C^{14} , these sections begin with another photograph of his, this time receiving the Enrico Fermi Award from the US State Department. For many readers, it may be of interest to know that at one point, when the Second World War was being

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fought, young Kamen (then recently emigrated to USA) was dismissed on orders of the State Department from his position at the Lawrence Radiation Laboratory in California despite his great scientific achievements and sent to work in a salvage shipyard where unserviceable vessels were dismantled – all this to ensure that he passed no secrets to the enemy. This section has several articles, including those by A. Benson and J. Bassham (both of whom worked with the Nobel Laureate M. Calvin). It is interesting and relevant also to have a photograph of the 'Rat House' where Ruben and Kamen worked, but somewhat unnerving to note that it is the grass in the foreground where Ruben collapsed after inhaling phosgene during his pioneering work (he died two days later). There is also an article by M. D. Hatch. It is the work of all these investigators and their colleagues that led to the discovery of the C₃ and C₄ pathways of carbon dioxide reduction. Special mention may also be made of the contribution of S. G. Wildman, who, with J. Bonner (one of my professors) discovered the Fraction I protein, later identified as Rubisco and for which they built their own Tiselius-type moving-boundary electrophoresis apparatus in the basement of Division Chemistry (then headed by L. Pauling) and adjoining the Division of Biology.

The sections on 'Genetics' and 'Evolution' complete the core of the book. In the 'Genetics' section, there is an excellent chapter by late L. Bogorad of Harvard (I was privileged to work with him too for some time) who pioneered work on isolation of photosynthetic genes employing the recombinant DNA technique. Work by groups of Bogorad as well as R. Herrmann (though there is no article by him, his photograph does appear in one article) has been of the greatest importance – since it is only after genes were isolated, that the putative amino acid sequences of key proteins could be obtained and the final assault begun, i.e. work on the deduction of three-dimensional architecture of the photosystems, the RCs, and the remaining machinery comprising cytochrome-plastocyanin and the ATPase complexes.

Additional sections, one on 'Laboratories and National Perspectives', another on 'Retrospectives' with useful lists compiled by Govindjee on symposia and books on photosynthesis and finally on 'In Memoriam' comprising a list of in-

vestigators of photosynthesis with dates of birth and death, complete the book supplemented by extensive indices of authors, as subject matter, as also of all the pictures.

To conclude, Govindjee and his colleagues are to be congratulated for preparing this extraordinary book, indeed without a parallel. Of course, their task was somewhat lightened by the fact that Govindjee has long been associated not only as an Editor of *Photosynthesis Research*, but even as a Chief Editor. Nonetheless, this collection would have been impossible without the support of his colleagues (especially Gest), his own deep commitment to the spread of knowledge and intimate personal knowledge of all investigators. Emerson and Rabinowitch were icons of photosynthesis research, and their laboratory was a Mecca where a constant stream of luminaries undertook pilgrimage. Govindjee has thus known the pioneers in photosynthesis research from 1950s. And, it is because of his love for history that the stories of a whole generation of researchers and of their travails and successes have been preserved for posterity. But for him, we may have lost this valuable treasure trove of information and we, in India, are specially proud of this notable achievement.

I wish Govindjee's example (of work on this book) can be emulated by others in plant biology, especially plant growth, development and morphogenesis, where Linda Sage's *The Pigment of Imagination* is currently the only relevant book (though excellent, it portrays the history of development of only phytochrome and thus is limited in scope). Hopefully, Govindjee's effort will inspire others to record major advances of our science in the last century, before it is too late.

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Special Issue on Proceedings of International Symposium on 'Applied Geochemistry in the Evaluation and Management of Onshore and Offshore Geo-resources'. K. Surya Prakash Rao and V. Divakara Rao (eds). Indian Society of Applied Geochemists, 2006. Price: Rs 300.

The Indian Society of Applied Geochemists (ISAG) has brought out the Proceedings of International Symposium on 'Applied Geochemistry in the Evaluation and Management of Onshore and Offshore Geo-resources' held during 28–30 September 2005 at Atomic Minerals Directorate for Exploration and Research (AMD), Hyderabad, as a special issue of the *Journal of Applied Geochemistry* (JAG; 2006, 8). The editors are to be complimented for their efforts in bringing out the volume within a short period. The volume contains thirty-eight papers – nine on evaluation of petroleum source rocks and sedimentary basin with greater emphasis on geochemical studies, five on Coal Bed Methane (CBM), thirteen on ferrous-non-ferrous minerals, three on geochemical studies of onshore areas, seven on groundwater and pollution and one on air pollution.

D. K. Pande in his keynote paper has discussed the importance of geochemical studies for getting clues on the generation, migration and evaluation of oil and gas. He opines that great thrust has to be given for exploration and exploitation of CBM as it is going to be an alternate source of energy. In this regard, the role of ISAG is important in designing programmes for training professional geochemists in the search for CBM (p. 233). S. Pahari *et al.* have evaluated the petroleum source rocks of Mesozoic and Tertiary deposits of Cauvery basin, Sattapadi, Kudavasa and Karaikal (pp. 234–250). G. C. Datta *et al.* have presented the results of geochemical investigation of several aromatic biomarkers in Bombay 'High' and Bassein of western offshore to evaluate the lithology, palaeoenvironment and thermal activity of source rocks (pp. 251–265). Minati Das has given an account of the influence of clay minerals on hydrocarbon potential in the Jorajan, Assam basin (pp. 266–276). A case study of absorbed gas concentration survey in the Kutch-Saurashtra offshore is presented by D. K. Singh *et al.* Two prospects for hydrocarbon have been identified based on positive indication of threshold values