



"The beach at Cape Crozier during early spring; flocks of Adélie parade back and forth waiting for the right conditions under which to make a departure." [From *Breeding Biology of the Adélie Penguin*]

tween the center and the periphery. Although peripheral sites were less successful than those away from the edge of the colony, the effect was found mainly among younger breeders. For those eight years or older there was little or no effect.

I found some problems with the organization of the book. Although the methods are clearly outlined at the outset, with excellent definitions of all the terms used, their influence on the subject population is not dealt with until later. Thus on p. 192 we suddenly learn that banding, the foundation of the study, caused a 28 percent decline in survival during the following year, and the reader has to mentally check over the previous results to see which might have been affected. Another important fact that is not made explicit until chapter 8 is that during the early years of the study, when most birds of known age were quite young, reproductive success was generally lower than in later years. This must cause a bias in the results of some analyses involving data from several years.

The final chapter provides a discussion of deferred maturity in seabirds. Because breeding Adélie suffer heavy predation by leopard seals close to their colonies, the cost of breeding, in terms of adult survival, is high. This creates strong selection against breeding before the age at which the chance of success is good. The authors also deal briefly with possible factors regulating the population. They point out that the Adélie population of the Ross Sea has been declining over the past 20 years, casting some doubt on the theory that Antarctic penguin populations are expanding in response to a decline in the stocks of large whales.

Essentially this work is more akin to a long scientific paper than a book. It is dense with data, mostly in tabular form

(over 100 tables and only 30 figures) and is aimed at professional ecologists. It is not casual reading, but no one interested in seabird biology or long-term population studies should be without it.

ANTHONY J. GASTON

*Canadian Wildlife Service,
Ottawa K1A 0E7,
Canada*

Effects of CO₂ on Plants

CO₂ and Plants. The Response of Plants to Rising Levels of Atmospheric Carbon Dioxide. EDGAR R. LEMON, Ed. Published for the American Association for the Advancement of Science by Westview, Boulder, Colo., 1983. xxii, 280 pp., illus. \$25. AAAS Selected Symposia Series, 84. From a conference, Athens, Ga., May 1982.

Carbon dioxide occurs in the atmosphere at a concentration of approximately 335 parts per million, but experiments have shown that the optimum level for photosynthesis (in C3 plants) is about 1000 parts per million. Consequently an enrichment of CO₂ in the atmosphere can be considered to be a boon, since significant increases in crop yield may be expected. Because plants play a dominant role in carbon flux and storage, enhanced productivity resulting in an increased biomass would, in turn, result in an increase in the flux through the nitrogen and other major cycles. This book describes how as a result of the use of fossil fuels the concentration of CO₂ in the atmosphere is increasing annually by over 1 part per million. The book considers the changes that are predicted to occur in the environment and discusses possible alterations in trends of plant growth in a situation where the atmospheric CO₂ values are approximately double present ones. This is predicted to

occur within the next 100 years if the increase in CO₂ levels continues at present rates.

The volume is the proceedings of an international conference on rising atmospheric CO₂ and plant productivity. Its first chapter briefly discusses the necessity of assessing the far-reaching results of the use of fossil fuels and emphasizes the need for further investigation of the effects of elevated CO₂ levels on plant growth. The second chapter gives an overview of the changes in CO₂ concentration that are predicted to occur and describes the major effects such changes would have on climate and plant growth. A doubling in atmospheric CO₂ would cause the mean temperature of the earth to increase by approximately 2°C and also cause a change in the global pattern of precipitation. The profound consequences that these linked events would have on the biosphere are considered. Though an increased atmospheric CO₂ concentration might prove to be a boon to agriculture because it would increase crop yields, it is also potentially hazardous because it could disrupt the dynamic equilibrium of the earth's atmosphere and energy budget. The dire implications for the future are well worth consideration.

The remaining six chapters form the core of the book. They review data on the response of photosynthesizing plants to levels of CO₂ approximately double current ones. The chapters are concerned with the many sites and levels of possible change to individual plants and plant communities over a spectrum of environmental conditions. It is evident that photosynthetic carbon fixation is increased by elevated CO₂ levels, and the opportunity to enhance plant productivity by exploiting increased atmospheric CO₂ is discussed. It is shown that the insufficient ambient CO₂ in the present atmosphere is a limitation to photosynthesis in C3 species and that a large portion of the newly fixed carbon can be lost by the process of photorespiration in these plants. It is concluded that a doubling of the atmospheric CO₂ will promote increased rates of CO₂ fixation, but there is no evidence to suggest that increased photosynthesis could prevent the rise in ambient CO₂. The discussion is taken one step further, to a consideration of more physiological aspects, such as whole leaf photosynthesis, stomatal response, and whole canopy transpiration. It is interesting to note that in addition to increasing the rate of photosynthesis an increased CO₂ level tends to alleviate water stress and salinity stress and in this way may further aid plant

growth and development. The effects of an increased CO₂ level on both terrestrial and aquatic plant and microbial communities are fully reviewed, although the chapters on these subjects are of necessity more speculative than those dealing with photosynthesis, where more pertinent experimental data are available.

This slim volume does not attempt to provide answers but to provoke thought and to establish a basis for the evaluation of the effects of increasing CO₂ on plant communities, and hence on agriculture. Herein is a comprehensive assessment of the known responses of plants to elevated CO₂ levels. The book is a thorough and concise treatise on a subject that is of paramount importance for the future.

CHRISTINE H. FOYER

Department of Botany,
University of Sheffield,
Sheffield S10 2TN, England

Books Received

The Adjustment and Testing of Telescope Objectives. H. Dennis Taylor. 5th ed. Hilger, Bristol, 1983 (U.S. distributor, Heyden, Philadelphia). xii, 103 pp., illus. Paper, \$13.50.

Advances in Cancer Research. Vol. 40. George Klein and Sidney Weinhouse. Eds. Academic Press, New York, 1983. x, 441 pp. \$54.

Advances in Chromatography. Vol. 22. J. Calvin Giddings *et al.*, Eds. Dekker, New York, 1983. xviii, 323 pp., illus. \$49.75.

Advances in Fuzzy Sets, Possibility Theory, and Applications. Paul P. Wang, Ed. Plenum, New York, 1983. xii, 421 pp., illus. \$55.

Advances in Immunology. Vol. 34. Frank J. Dixon and Henry G. Kunkel, Eds. Academic Press, New York, 1983. xiv, 311 pp., illus. \$39.50.

Advances in Magnetic Resonance. Vol. 11. John S. Waugh, Ed. Academic Press, New York, 1983. xiv, 282 pp., illus. \$49.50.

Advances in Materials Characterization. David R. Rossington, Robert A. Condrate, and Robert L. Snyder, Eds. Plenum, New York, 1983. xii, 680 pp., illus. \$89.50. Materials Science Research, vol. 15. From a conference, Alfred, N.Y., Aug. 1982.

Advances in Veterinary Science and Comparative Medicine. Vol. 27. Charles E. Cornelius and Charles F. Simpson, Eds. Academic Press, New York, 1983. xvi, 519 pp. \$58.

Aging and Cancer. F. F. Holmes. Springer-Verlag, New York, 1983. viii, 78 pp., illus. \$23. Recent Results in Cancer Research, 87.

Agriculture in the Twenty-First Century. John W. Rosenblum, Ed. Wiley-Interscience, New York, 1983. xxii, 415 pp., illus. \$29.95. From a symposium, Richmond, Va., 1983.

Air-Sea Exchange of Gases and Particles. Peter S. Liss and W. George N. Slinn, Eds. Reidel, Boston, 1983 (distributor, Kluwer Boston, Hingham, Mass.). xiv, 561 pp., illus. \$69.50. NATO ASI Series C, No. 108. From an institute, Durham, N.H., July 1982.

Allergic Reactions to Drugs. A. L. de Weck and H. Bundgaard, Eds. Springer-Verlag, New York, 1983. xxxii, 752 pp., illus. \$148. Handbook of Experimental Pharmacology, vol. 63.

Alternative Energy Sources III. T. Nejat Veziroglu, Ed. Hemisphere, Washington, D.C., 1983. Nine volumes. clxii, 4150 pp., illus. \$597. From a conference, Miami Beach, Dec. 1980.

The Amazing Race. Winning the Technorivalry with Japan. William H. Davidson. Wiley, New York, 1983. xvi, 270 pp. \$17.95.

Aneuploidy. D. J. Bond and Ann C. Chandley. Oxford University Press, New York, 1983. x, 198 pp., illus. \$69. Oxford Monographs on Medical Genetics, No. 11.

Annual Reports in Organic Synthesis—1982. L. G. Wade, Jr., and Martin J. O'Donnell, Eds. Academic Press, New York, 1983. xiv, 499 pp., illus. Paper, \$29.

Bifurcation Theory, Mechanics and Physics. C. P. Bruter, A. Aragnol, and A. Lichnerowicz, Eds. Reidel, Boston, 1983 (distributor, Kluwer Boston,

Hingham, Mass.). xii, 388 pp. \$58. Mathematics and Its Applications. From a colloquium.

Biochemical Research Techniques. A Practical Introduction. John M. Wigglesworth, Ed. Wiley-Interscience, New York, 1983. x, 239 pp., illus. \$41.95.

Biological Response Modifiers in Human Oncology and Immunology. Thomas Klein *et al.*, Eds. Plenum, New York, 1983. xiv, 320 pp., illus. \$45. Advances in Experimental Medicine and Biology, vol. 166. From a symposium, Tampa, Fla., July 1982.

Biological Rhythms and Medicine. Cellular, Metabolic, Physiopathologic, and Pharmacologic Aspects. Alain Reinberg and Michael H. Smolensky, with H. von Mayersbach *et al.* Springer-Verlag, New York, 1983. xiv, 305 pp., illus. \$69.50. Topics in Environmental Physiology and Medicine.

The Biology of the Mycobacteria. Vol. 2. Immunological and Environmental Aspects. Colin Ratledge and John Stanford, Eds. Academic Press, New York, 1983. xii, 554 pp., illus. \$99.

Biology of Vitamin E. Pitman, London, 1983 (U.S. distributor, CIBA Pharmaceutical Co., West Caldwell, N.J.). x, 260 pp., illus. \$35. Ciba Foundation symposium 101. From a symposium, London, March 1983.

The Birth of Particle Physics. Laurie M. Brown and Lillian Hoddeson, Eds. Cambridge University Press, New York, 1983. xxii, 412 pp., illus. \$44.50. From a symposium, Batavia, Ill., May 1980.

Body. Don Johnson. Beacon, Boston, 1983. x, 239 pp., illus. \$13.95.

Bone Marrow. Structure and Function. Mehdi Tavassoli and Joseph Mendel Yoffey. Liss, New York, 1983. xii, 300 pp., illus. \$48.

The Cartoon Guide to Computer Science. Larry Gonick. Barnes and Noble (Harper and Row), New York, 1983. vi, 249 pp. Paper, \$5.25.

The Cartoon Guide to Genetics. Larry Gonick and Mark Wheelis. Barnes and Noble (Harper and Row), New York, 1983. vi, 215 pp. Paper, \$5.25.

Catalogue of Chromosome Aberrations in Cancer. Felix Mitelman. Harold P. Klinger, Ed. Karger, Basel, 1983. 515 pp. Paper, \$79. Reprinted from *Cytogenetics and Cell Genetics*, vol. 36, Nos. 1-2.

Cell Pathology. Norman F. Cheville. 2nd ed. Iowa State University Press, Ames, 1983. viii, 681 pp., illus. \$58.50.

Cell Separation. Methods and Selected Applications. Vol. 2. Thomas G. Pretlow II and Theresa P. Pretlow, Eds. Academic Press, New York, 1983. xvi, 327 pp., illus. \$39.50.

Chemical Skills. Edward I. Peters. 2nd ed. McGraw-Hill, New York, 1983. xvi, 472 pp. Paper, \$16.95.

Chemistry and World Food Supplies. The New Frontiers. CHEMRAWN II. L. W. Shemilt, Ed. Pergamon, New York, 1983. xvi, 664 pp., illus. \$135; paper, \$75. From a conference, Manila, Dec. 1982.

Chemistry of Water Treatment. Samuel D. Faust and Osman M. Aly. Butterworth, Boston, 1983. xviii, 723 pp., illus. \$49.95. An Ann Arbor Science Book.

Child Neuropsychology. An Introduction to Theory, Research, and Clinical Practice. Byron P. Rourke *et al.* Guilford, New York, 1983. x, 389 pp., illus. \$30.

Chlorinated Dioxins and Dibenzofurans in the Total Environment. Gangadhar Choudhary, Lawrence H. Keith, and Christoffer Rappe, Eds. Butterworth, Boston, 1983. xvi, 416 pp., illus. \$42.50. From a symposium, Kansas City, Sept. 1982.

Classics and Moderns. John Hicks. Harvard University Press, Cambridge, Mass., 1983. xvi, 391 pp. \$32.50. Collected Essays on Economic Theory, vol. 3.

Controversial Nutrition Policy Issues. Giorgio R. Solimano and Sally A. Lederman, Eds. Thomas, Springfield, Ill., 1983. xii, 429 pp., \$34.75.

The Culture of Technology. Arnold Pacey. MIT Press, Cambridge, Mass., 1983. viii, 210 pp., illus. \$17.50.

Current Methods in Cellular Neurobiology. Vol. 4. Model Systems. Jeffery L. Barker and Jeffery F. McKelvy, Eds. Wiley-Interscience, New York, 1983. xii, 192 pp., illus. \$49.50.

Current Topics in Membranes and Transport. Felix Bronner and Arnost Kleinzeller, Eds. Vol. 19. Structure, Mechanism, and Function of the Na/K Pump. Joseph F. Hoffman and Bliss Forbush III, Eds. Academic Press, New York, 1983. xlii, 1043 pp., illus. \$95.

Cyclophanes I. Philip M. Keehn and Stuart M. Rosenfeld, Eds. Academic Press, New York, 1983. xii, 358 pp., illus., + index. \$65. Organic Chemistry, vol. 45.

Cyclophanes II. Philip M. Keehn and Stuart M. Rosenfeld, Eds. Academic Press, New York, 1983. xii pp., + pp. 359-725, illus., + index. \$60. Organic Chemistry, vol. 45.

Cytogenetics of the Mammalian X Chromosome. Avery A. Snadberg, Ed. Liss, New York, 1983. Two volumes. Part A, Basic Mechanisms of X Chromo-

some Behavior. xiv, 508 pp., illus. \$98. Part B, X Chromosome Anomalies and Their Clinical Manifestations xiv, 517 pp., illus. \$98. Progress and Topics in Cytogenetics, vol. 3.

Data for Science and Technology. Phyllis S. Glaeser, Ed. North-Holland, Amsterdam, 1983 (U.S. distributor, Elsevier, New York). xvi, 350 pp., illus. \$49. From a conference, Jachranka, Poland, Oct. 1982.

Decision Making in Drug Research. Franz Gross, Ed. Raven, New York, 1983. xii, 244 pp., illus. \$35. From a symposium.

Deep Space Telecommunications Systems Engineering. Joseph H. Yuen, Ed. Plenum, New York, 1983. xx, 603 pp., illus. \$55. Applications of Communications Theory.

Developing and Regenerating Vertebrate Nervous Systems. Penelope W. Coates, Roger R. Markwald, and Alexander D. Kenny, Eds. Liss, New York, 1983. xii, 272 pp., illus. \$56. Neurology and Neurobiology, vol. 6. From a symposium, Lubbock, Tex., Sept. 1982.

Development of Target-Oriented Anticancer Drugs. Yung-Chi Cheng, Barry Goz, and Mimi Minkoff, Eds. Raven, New York, 1983. xvi, 246 pp., illus. \$39. Progress in Cancer Research and Therapy, vol. 28. From a symposium, Chapel Hill, N.C.

Development of the Vascular System. Pitman, London, 1983 (U.S. distributor, CIBA Pharmaceutical Co. West Caldwell, N.J.). x, 254 pp., illus. \$35. Ciba Foundation symposium 100. From a symposium, London, Jan. 1983.

Developmental Neuropsychiatry. Michael Rutter, Ed. Guilford, New York, 1983. xvi, 632 pp., illus. \$50.

DNA for Beginners. Israel Rosenfield, Edward Ziff, and Borin van Loon. Norton, New York, 1983. 224 pp., illus. Paper, \$6.95.

Dynamic Aspects of Language Processing. Focus and Presupposition. J. Engelkamp and H. D. Zimmer. Springer-Verlag, New York, 1983. x, 100 pp., illus. \$23. Springer Series in Language and Communication, vol. 16. Translated from the German.

Dynamics. S. Neil Rasband. Wiley-Interscience, New York, 1983. xiv, 272 pp., illus. \$32.95.

DYNAMO User's Manual. Alexander L. Pugh, III, with Pilar Amalia Carrasco. 6th ed. MIT Press, Cambridge, Mass., 1983. xx, 290 pp., illus. Paper, \$15.

Efficient Use of Fertilizers in Agriculture. Published for the United Nations by Nijhoff, The Hague, 1983 (U.S. distributor, Kluwer Boston, Hingham, Mass.). vi, 352 pp., illus. \$50. Developments in Plant and Soil Sciences, vol. 10. From a symposium, Geneva, Jan. 1983.

Einstein and the Poet. In Search of the Cosmic Man. William Hermanns. Branden, Brookline Village, Mass., 1983. viii, 152 pp., illus. Paper, \$10.

Electroanalytical Chemistry. Basil H. Vassos and Galen W. Ewing. Wiley-Interscience, New York, 1983. xiv, 255 pp., illus. \$45.

Electrostatics 1983. Sampurnan Singh. Institute of Physics, Bristol, 1983 (U.S. distributor, Heyden, Philadelphia). x, 261 pp., illus. \$34. From a conference, Oxford, England, April 1983.

Electroweak Interactions at High Energies. R. Kögerter and D. Schildknecht, Eds. World Scientific, Singapore, 1983 (U.S. distributor, Heyden, Philadelphia). xiv, 383 pp., illus. \$44. From a workshop, Hamburg, Sept. 1982.

The Elements of Complex Analysis. B. Choudhary. Halsted (Wiley), New York, 1983. xii, 262 pp., illus. \$17.95.

Encyclopedia of Explosives and Related Items. PATR 2700. Vol. 10. Seymour M. Kaye, with Henry L. Herman. U.S. Army Armament Research and Development Command, Dover, N.J., 1983 (available as ADA 134347 from the National Technical Information Service, Springfield, Va.). Various pages, illus. \$43.50.

Encyclopedia of Statistical Sciences. Vol. 4. Icing the Tails to Limit Theorems. Samuel Kotz, Norman L. Johnson, and Campbell B. Read, Eds. Wiley-Interscience, New York, 1983. xii, 647 pp. \$79.50.

Endocrinology of Insects. Roger G. H. Downer and Hans Laufer, Eds. Liss, New York, 1983. xvi, 707 pp., illus. \$146. Invertebrate Endocrinology, vol. 1.

The Endothelial Cell. A Pluripotent Control Cell of the Vessel Wall. D. G. S. Thilo-Körner and R. I. Freshney, Eds. Karger, Basel, 1983. x, 206 pp., illus. \$69.50. From a symposium, Paris, July 1982.

Energy Resources through Photochemistry and Catalysis. Michael Grätzel, Ed. Academic Press, New York, 1983. xiv, 573 pp., illus. \$59.50.

Energy Today and Tomorrow. Living with Uncertainty. Joel Darmstadter, Hans H. Landsberg, and Herbert C. Morton, with Michael J. Coda. Prentice-Hall, Englewood Cliffs, N.J., 1983. xx, 233 pp., illus. \$25.95; paper, \$13.95. A Book from Resources for the Future.

Excavations at Nichoria in Southwest Greece. Vol. 3, Dark Age and Byzantine Occupation. William A. (Continued on page 422)