The reformist arguments, on this issue of global concern, are not simply based on the redressing of injustices and the empowerment of the marginalized. They rest in part also on what for many urban dwellers is still just an idea rather than a position to which they have given any deep assent: the defensibility and indeed the high value of aboriginal thought and social practice. Most have yet to be convinced of these.

If the power of the pen ever needed to be demonstrated, however, the cases presented in this book would provide useful evidence. Papers by L. R. Hiatt and Kenneth Maddock show very clearly the highly functional relationship between the strength of the cultural evidence brought to light through the work of anthropologists, even that of scholars whose work essentially lay outside the judicial arena, and legal land gains by Australian Aborigines. At the end of the book Maddock asks his fellow anthropologists, "Should we be more coolly objective, or should we take up advocacy instead?"

At the very start of the book an implicit answer to this is given in the paper by Myers entitled "Burning the truck and holding the country." As anthropology it is impeccably and coolly couched within a wide comparative framework, and thus is about as "objective" as it could be. But at the same time its very content provides one of the most eloquent and most convincing arguments for Australian Aboriginal land rights one could find.

PETER SUTTON
Division of Anthropology, South Australian Museum, Adelaide, South Australia 5000

Dying Stars

White Dwarfs. G. WEGNER, Ed. Springer-Verlag, New York, 1989. xiv, 524 pp., illus. $58.30. Lecture Notes in Physics, vol. 328. From a colloquium, Hanover, NH, Aug. 1988.

White dwarfs mark the final stage in the lives of relatively low-mass stars, including, eventually, our own sun and most or all other stars with masses less than about six times that of the sun. These dying stars have used up their nuclear and gravitational energy sources and contracted to densities a million times those of familiar substances. They radiate the residual heat of their constituent atomic nuclei in a miserly fashion that keeps them dimly shining for 5 to 10 billion years. A few dozen astronomers, world-wide, devote most of their research to white dwarfs, and another couple of hundred are interested enough to come to an occasional meeting like the International Astronomical Union Colloquium whose proceedings are contained in the present volume.

Half a dozen or so questions would occur to a white dwarf lover who had been deprived for a couple of years of journals, conferences, and preprints. Good, clear, up-to-date answers (epoch August 1988) to essentially all of those questions are to be found somewhere in this book. Unfortunately, they are not easy to find. The volume has no index; the papers are printed, apparently, in the order they were presented and are not fully grouped by topic; and the abstracts of the longer review papers have been omitted to save space.

To save your having to hunt, here are a few of the critical questions and the answers presented at IAU Colloquium 114. The oldest white dwarfs set a limit to the age of the Milky Way galaxy, an important parameter in calculations of galactic and cosmological evolution. The oldest will also be the faintest, and thus difficult to look for. Despite the difficulty, it can now be said with some confidence that the number of white dwarfs per unit brightness interval drops sharply below 10^{-4} solar luminosities (papers by C. C. Dahn *et al.*, M. T. Ruiz *et al.*, and F. D'Antona). This may indeed mean that the galactic disk is not much more than 7 billion years old (the sun is 4.5 Gyr). But it may alternatively reflect physics missing from the cooling calculations whose effect is to prolong stellar life near 10^{-4} $L_{\odot}$ and then hasten the subsequent fading.

Another topic of recent acrimonious debate is the number of pairs of close binary white dwarfs with total mass exceeding a critical limit near 1.4 solar masses and periods short enough for the stars to merge in a few billion years. Such pairs are the current "best buy" for progenitors of the kind of supernova that occurs among old stars. Unfortunately, the short-period systems all seem to have low masses, and the massive systems all seem to have excessively long periods for the purpose. A new round of careful searches for white dwarfs with variable radial velocity has uncovered a handful of new candidates. D. Foss reported three, A. Bragaglia *et al.* two, and R. A. Saffer and J. Liebert one more (which unfortunately is already known to have too small a mass for the stars to explode when they merge). On the theoretical front, new models of merging white dwarfs were presented by three groups. M. Kato *et al.* are rather pessimistic about the requisite sort of explosions occurring, even if the white dwarfs are massive enough; W. Benz *et al.* are quite optimistic; and R. Mochkovitch and M. Livio decline to state.

Binary white dwarfs are also investigated for their own sake. Current questions concern whether the binary ones differ systematically from the single ones in either mass or magnetic field properties. The observed binary white dwarf masses are, indeed, higher than average for single stars, but M. Politano *et al.* conclude that this is an effect of observational selection and that the real distributions are the same. The fields, on the other hand, are genuinely different. Only 2 to 3% of single white dwarfs have measurable magnetic fields (ranging from 2 to 500 megagauss). Among the binaries, according to G. D. Schmidt and J. P. Lasota *et al.*, strong fields are much commoner (found for more than 20% of the stars) and confined to a narrower range of 10 to 50 MG. Curiously, no white dwarf fields between 10^5 and 10^6 gauss are known, though they would be conspicuous in detailed spectral analyses.

VIRGINIA TRIMBLE
Astronomy Program, University of Maryland, College Park, MD 20742, and Physics Department, University of California, Irvine, CA 92717

Plant Biochemistry

Second Messengers in Plant Growth and Development. WENDY F. BOSS and D. JAMES MORRÉ, Eds. Liss, New York, 1989. xii, 348 pp., illus. $96. Plant Biology, vol. 6.

This collection of reviews bravely and accurately encapsulates the current confusion regarding signal transduction in plants. Some chapters are less satisfactory than others, but the weaknesses have more to do with the material than with the treatment. Acetylcholine, for example, has been on the brink of recognition as active in plants for years, and still no one is sure whether it plays a role. The highlights in this regard are two exciting-to-read central chapters, one on a plant analogue of platelet-activating factor, the other on the plant versions of fatty acid-derived messengers. These compounds are clearly proving important, and it is noteworthy that though the latter share mode of production with the animal equivalent, the resemblance doesn't extend much further. Pride of place must go to the chapters of balanced evaluation in which evidence for each of the currently popular models of signal transduction is sifted and marshaled. It is a pleasure to report that the trustworthiness of some of the data is perceptively scrutinized and, even, occasionally found wanting.

One matter on which virtually all contributors agree: we do not understand signal transduction in plants. Various reasons are offered.

Guilfoyle blames the situation on a shortage of information (a pretty safe bet) and, as a substitute, treats us to animal examples. Plant scientists perennially hope to use discoveries made in animal systems as a shortcut to success. There is often a snare in a shortcut, in this case the ease with which it is possible to discover only and exactly what you expect to find. The hard evidence that PIP_2 cleavage to IP_3 and DAG takes place at all in plants is scant. If this process weren't so firmly documented in animals I doubt that it would still be pursued at all in plants.

Blowers and Trewavas blame the overwhelming complexity of biochemical interaction within a single cell and encourage us to gape at the range of subtleties of which this multidimensional cybernetic lacework might be capable. The approach can be extended to include all the states of all plant cells: the huge number of different plants, each with its own set of different cells, each cell type responding differently to each of a range of signals, and the pattern of response altering with time or in response to various signals. This versatility is amplified because plant cells are linked together interactively in transputer-type arrays without which responses like root gravitropism, solar tracking, and photoperiodic induction of leaves could not occur. In attempting to deal with signals and responses involved in just the reaction to pathogens, Thomas Boller gives us a glimpse of the bewilderingly rich variety of interaction and gently pokes fun at the inadequacy of the "second messenger" concept to cope with it.

No one can yet rule out the possibility that there exists some yet-to-be-discovered, single universal subroutine for signal transduction in plants, but the evidence collected in this book favors multifarity. So also would the haphazard nature of evolution. To bounce cells between homeostatically buffered, alternative states requires the temporary dislocation of homeostatic control—a miniature catastrophe. In evolution virtually all such catastrophes would be expected to be lethal, like mutations. Most of the non-lethal types would be resolved by the restoration of the original state. Of those few that result in a new order within the cell, only a minority will confer no selective disadvantage on the organism. Features common to more than one example of signal transduction may represent the equivalent of mutational "hot spots." On these grounds, precipitating a calcium crisis, by whatever means, seems to offer a safer dislocation than most.

Much of the evidence we have regarding events triggered by signal reception is based on correlation only. The possibility that many of these events are dead ends renders such evidence useless. Take, for example, the induction of cell division in cultured soybean cotyledonary cells in response to the plant growth substance cytokinin. The rapidly ensuing stimulation of hydrogen ion extrusion, hyperpolarizing the plasma membrane, and recruitment of ribosomal subunits into polysomes have both been shown to be unrelated to the subsequent cell division (M. Bevan and D. H. Northcote, *Planta* **152**, 24–31 [1981]; A. Parsons, S. Blackford, and D. Sanders, *ibid.* **178**, 215–222 [1989]). To establish the mechanism of signal transduction in plant cells we must have evidence of causal connection between early biochemical events generated by the signal and the eventual physiological or developmental response.

DAVID E. HANKE
Department of Botany, University of Cambridge, Cambridge CB2 3EA, United Kingdom

Some Other Books of Interest

Studies of High Temperature Superconductors. ANANT NARLIKAR, Ed. Nova Science, Commack, NY, 1989. Vol. 1, xiv, 381 pp., illus. $72. Vol. 2, xviii, 367 pp., illus. $72. Vol. 3, xviii, 413 pp., illus. $74.

Physical Properties of High Temperature Superconductors I. DONALD M. GINSBERG, Ed. World Scientific, Teaneck, NJ, 1989. x, 516 pp., illus. $84; paper, $48. Progress in High Temperature Superconductivity.

These volumes represent ventures to keep an advanced-level readership apprised of developments following on Bednorz and Müller's 1986 discovery of the occurrence of superconductivity at temperatures substantially higher than had previously been known.

First to appear was the *Studies* series, already comprising three volumes, with a fourth imminent. Each of the first volumes contains 15 chapters with a highly international authorship. Volume 1, for instance, opens with chapters on the oxygen hole mechanism of superconductivity by C. N. R. Rao and electronically driven instabilities in high-temperature superconductors by Kazushige Machida and includes chapters on the use of a strong coupling theory by Josef Rammer, twins in $YBa_2Cu_3O_{7-8}$ superconductors by C. J. Jou and J. Washburn, and the role of Mott-insulation, non-stoichiometry, and altered valence by G. J. Hyland. Each volume includes a subject index, tables of contents of its predecessors, and a list of papers planned for future volumes.

Physical Properties of High Temperature Superconductors joins a larger series that has already included nine volumes, mostly conference proceedings. In the opening chapter of volume 1 Ginsberg gives a history and overview of the field. There follow seven chapters on more specific topics: thermodynamic and macroscopic magnetic properties (Salamon; Malozemoff), neutron scattering studies (Birgenau and Shirane), normal-state transport and elastic properties (Allen *et al.*), rare earth and other substitutions (Markert *et al.*), infrared properties (Timusk and Tanner), and Raman scattering (Thomsen and Cardona). A subject index is included. In general, the papers give a bit more in the way of general background to their subjects than do those in the *Studies* series. Specific details of projected future volumes of the *Physical Properties* subseries are not given, but it is expected that some topics omitted from this one, such as nuclear magnetic and quadruple resonance, microstructure, and photoemission, as well as further developments in the topics already treated, will be included.—**K.L.**

Books Received

The Child in the Physical Environment. The Development of Spatial Knowledge and Cognition. Christopher Spencer, Mark Blades, and Kim Morsley. Wiley, New York, 1989. xiv, 302 pp., illus. $69.95. Wiley Series in Developmental Psychology and Its Applications.

Cochlear Mechanisms. Structure, Function, and Models. J. P. Wilson and D. T. Kemp, Eds. Plenum, New York, 1989. xii, 506 pp., illus. $97.50. NATO Advanced Science Institutes Series A, vol. 164. From a workshop, Keele, U.K., July 1988.

Computer Simulation and Computer Algebra. Lectures for Beginners. D. Stauffer *et al.* 2nd ed. Springer-Verlag, New York, 1989. xii, 155 pp. Paper, $22.

Drug Treatment of Cancer Pain in a Drug-Oriented Society. C. Stratton Hill, Jr., and William S. Fields, Eds. Raven, New York, 1989. xx, 380 pp. $86. Advances in Pain Research and Therapy, vol. 11. From a conference, Houston, TX, March 1988.

L'Echec des Surgénérateurs. Autopsie d'un Grand Programme. Dominique Finon. Presses Universitaires de Grenoble, Grenoble, France, 1989. 327 pp. Paper, F 128.

Functional Morphology of the Evolving Hand and Foot. O. J. Lewis. Clarendon (Oxford University Press), New York, 1989. viii, 359 pp., illus. $125.

Gene Regulation by Steroid Hormones IV. A. K. Roy and J. H. Clark, Eds. Springer-Verlag, New York, 1989. xii, 239 pp., illus. $59. From a conference, Fall 1988.

Genetics of Kidney Disorders. Christos S. Bartsocas, Ed. Liss, New York, 1989. xvi, 218 pp., illus. $58. Progress in Clinical and Biological Research, vol. 305. From a seminar, Rethymno, Greece, Oct. 1988.

Genetics of Neuromuscular Disorders. Christos S. Bartsocas, Ed. Liss, New York, 1989. xiv, 216 pp., illus. $48. Progress in Clinical and Biological Research, vol. 306. From a seminar, Rethymno, Greece, Oct. 1988.

Intestinal Metabolism of Xenobiotics. A. Sj. Koster *et al.*, Eds. Fischer, Stuttgart, 1988 (U.S. distributor, VCH, New York). xvi, 338 pp., illus. Paper, $96.50. Progress in Pharmacology and Clinical Pharmacology, vol. 7, no. 2.

An Introduction to Metamorphic Petrology. Bruce W. D. Yardley. Longman Scientific, Harlow, U.K., and Wiley, New York, 1989. xiv, 248 pp., illus. Paper, $37.95. Longman Earth Science Series.

Multipoint Magnetospheric Measurements. C. T. Russell, Ed. Published for the Committee on Space Research by Pergamon Press, Elmsford, NY, 1989. viii, 464 pp., illus. Paper, $120. Advances in Space Research, vol. 8, nos. 9–10. From a symposium, Espoo, Finland, July 1988.