defined and recompensed as though self-employed, an arrangement that Lozano clearly shows to be questionable. In fact, a third of the contractors in her sample previously worked as employees for the firms for which they now do contract work. These workers typically have moved their work site from the office to the home, usually relying on the resources of home and family (including children) to accomplish their work assignments.

Although Lozano serves her readership well by identifying the inadequacy of current concepts to characterize workers in this gray area, her book raises more conceptual problems than it solves, particularly in its reliance on the theoretical construct informal work. Until recently, that term was used almost exclusively to refer to unenumerated workers, such as petty traders and rag pickers in Third World countries, who use this income-producing strategy to survive. Within the context of the Third World the term is seen as problematic by some scholars, and Lozano herself in one of her final footnotes addresses the debate over its utility (see p. 198). Recently the term informal work has been brought to bear on selected economic activities in the garment and shoe industries in central economies such as Canada and the United States. Yet Lozano's book lacks clearly delineated arguments as to how well the term captures the economic activity of professional and technical contractors in the information-based economy of Silicon Valley.

Lozano also does little to interpret her findings in light of the extensive recent discussions within the United States regarding the notion of a two-tiered workforce, the concept of contingent or peripheral workers, or the fraudulent contracting out of clerical work to home-based workers. The majority of Lozano's references are from the early to mid-1980s and from the West Coast popular press, and she does not seem to have kept up with work published since then or with coverage of contingent work or fraudulent contracting out in, for example, the *New York Times, The Wall Street Journal*, or *Business Week*.

In addition, Lozano's set of interviews at best presents a limited purview of the workers' motivations for accepting this contracting arrangement. Her book is based on the results of interviews, conducted in 1983, with 35 independent contractors (33 of whom work in their homes) and with senior executives at 12 local firms, 5 of which had hired contractors from the pool of 35 she interviewed. These firms were exclusively in business services and electronic manufacturing. Of the 35 contractors, 18 engaged in professional or technical work, 9 in clerical work, and 8 in electronic assembly. Lozano characterizes all of them as having voluntarily made the "choice" to contract from home, without distinguishing between those who possess skills that are in demand in the workplace (most likely the professionals and technical workers) and those whose skills are in limited demand (probably those engaged in electronic assembly). Without such a distinction, it is impossible to know the degree of genuine choice the workers had in making their decisions. Therefore, it is difficult to accept Lozano's conclusion that all the workers "chose" this arrangement solely because of their dislike of working in an authoritarian workplace. There is also no mention of family concerns in the chapter discussing individual motivations for these arrangements. Women with young children often turn to such arrangements as a result of the lack of flexible scheduling alternatives, such as part-time or job-sharing options, in conventional workplaces. Had her interviews been more recent, Lozano would also have likely seen structural changes in the labor market as a major factor in why men and women end up on the periphery of the firm as contractors rather than in the core as employees. In effect, in Lozano's account the complexity of people's life circumstances is reduced to a single dimension: reaction to what is seen as an authoritarian workplace.

Finally, halfway through the text, Lozano reveals a bias when she reports that, in reaction to the statements of one of her interviewees, "I found myself frustrated with his apparent satisfaction with the arrangement, and blurting out that I thought the bank was exploiting him, I asked, 'Don't you really think they're just using you?' " (p. 94). Such an attitude is unfortunate. By listening to her subjects without sitting in judgment of them, Lozano might have allowed them to reveal the complexity of factors that led them to make the decisions they made.

In conclusion, as one of the first book-length treatments of contracting-out practices in U.S. firms, *The Invisible Work Force* should be credited for beginning to document this trend systematically. Yet its unjustified reliance on the theoretical construct informal work, the datedness and skimpiness of its empirical base, and the lack of contact with the broader discussion regarding the emergence of a two-tiered work force create insurmountable flaws. This is unfortunate, because a solid book with the aims of *The Invisible Work Force* is sorely needed.

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Birds on the Wing

Flight Strategies of Migrating Hawks. PAUL KERLINGER. University of Chicago Press, Chicago, 1989. xvi, 375 pp., illus. $60; paper, $19.95.

Migrating hawks flow in great rivers over mountain ridges, fill the sky from horizon to horizon over parts of Central America, and suddenly appear out of nowhere to land on a ship at sea, only to depart again after a few hours. Kerlinger, however, shows that hawks are not consummate migrants. They are found dead by the hundreds when they encounter unfavorable winds over the sea, and many species hesitate to cross even 20 kilometers of open water. In general, hawks fly more slowly and are more dependent on local weather and atmospheric conditions than are other long-distance migrants.

This volume is a first attempt to assemble information on the migratory behavior, physiology, aerodynamics, and ecology of an entire avian taxon and to develop a framework for evaluating alternative strategies the birds might use to accomplish migration with the least cost and the greatest benefit. This application of the methods of behavioral ecology to the study of migration could be an important innovation in a field that has progressed slowly in the past decades, and, if nothing else, Kerlinger has outlined some of the problems to be faced.

Kerlinger's analysis rests on a slender base of data. Counts of hawks moving along mountain ridges and coastlines are too biased to establish migratory routes, speeds, and altitudes. Instead of using such counts Kerlinger draws on a small number of studies using radio telemetry, radar, and banding returns. He reviews his own work in detail and gives brief summaries of other work. Of particular importance is the lack of information on alternative strategies. On those years when hawks are not seen at the traditional counting sites, we simply do not know where they go.

The strongest part of the work is Kerlinger's analysis of the factors affecting the three modes of flight used by hawks: powered flight, gliding along ridges, and gliding between thermals. Behavior and morphology combine to favor powered flight for the swept-winged, solitary peregrine falcon, whereas the gregarious broad-winged hawk more easily identifies the erratic opportunities for thermal gliding by watching for flocks of soaring birds. Long-distance migrants tend to maximize distance traveled rather than minimize energy expended. Kerlinger's simulations show that gliding along ridges or between thermals is more efficient than powered flight, and

hawks that are long-distance migrants tend to be adapted for gliding (although the birds fail to achieve his simulated migratory speeds).

The potential of behavioral ecology as an approach is not realized here, in part because of a lack of basic data on hawk migration but in part because the salient features of the discipline are not applied. Mathematical models that would allow evaluation of alternative strategies are not presented, and no currency is proposed in which to evaluate cost-benefit ratios. Kerlinger also expends energy attacking his critics (the acknowledgement section contains a list of agencies that declined to fund his research) that would have better been spent on more numerous and more sophisticated simulations.

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From Crystals to Earth

Rheology of Solids and of the Earth. SHUNICHIRO KARATO and MITSUHIRO TORIUMI, Eds. Oxford University Press, New York, 1989. viii, 440 pp., illus. $98. Translated from the Japanese edition (Tokyo, 1986). Based on a symposium, Tokyo, 1985.

For at least 15 years, it has been recognized by earth scientists and materials scientists alike that the plastic deformation of crystalline solids, whether metals or minerals, proceeds by the same physical mechanisms and that both communities would profit by exchanging information and problems. Structural geologists and geophysicists have hoped that a better understanding of the microscopic deformation mechanisms would help them understand problems at the scale of mountains or even of the earth's mantle, and this hope is reflected in the ambitious and somewhat awkward title of the present book.

Rheology of Solids and the Earth is based on the symposium "Plastic Flow and Microstructural Developments in Solids: From Crystals to Earth" held in Tokyo in 1985. The book contains contributions from distinguished Japanese materials and earth scientists, with some international flavor given by the addition of a paper by Mervyn Paterson.

The first two parts of the book, which deal with defects and plastic deformation in metals and oxides and in minerals, are of uneven interest. The very short overview of high-temperature creep by such an eminent specialist as S. Takeuchi must have been useful to the participants but says nothing that cannot be found in any textbook of materials science. Many papers would be more appropriately published in specialized journals. However, four stand apart as complete and useful reviews: those on self-diffusion in oxides (K. Ando), creep of oxides and spinel ferrites (Y. Okamoto), plastic deformation of olivine (S. Karato), and water-weakening in quartz (M. Paterson). Paterson's paper is an especially up-to-date and beautifully balanced overview of recent work and controversies.

The third part, Deformation Microstructures, is more homogeneous and deals mostly with textures and preferred orientations by deformation and recrystallization in metals and minerals. A. Fujimura's paper dealing with the preferred orientation of mantle minerals is especially interesting in that it includes information based on experimental deformation of the high-pressure phases of olivine: modified spinel and spinel.

The fourth and last part, Flow in the Earth, purports to deal with the application of "materials science studies of mineral and rock deformation to the problems of earth science." Of the five papers in this section, two describe microstructures of rocks from various Japanese metamorphic belts (M. Toriumi) and shear zones (H. Takagi); they are good structural geology papers, but I fail to see where materials science comes in. The other three papers deal with the application of dislocation and grain-size piezometers to periodotite nodules (K. Matsumoto and M. Toriumi), seismic anisotropy (S. Karato), and experimental shear zones in halite (T. Shimamoto).

Meetings bringing together earth scientists and materials scientists have done much to further a new approach to structural geology, tectonics, and geodynamics in recent years. But with respect to the editors' hope that "this book will serve as a useful guide to this newly growing area of interdisciplinary science," my feeling is that it comes a bit late for that and not quite in the proper shape.

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Books Received

Adipose Tissue and Reproduction. Rose E. Frisch, Ed. Karger, Basel, 1990. x, 142 pp., illus. $92.75. Progress in Reproductive Biology and Medicine, vol. 14.

Aging Brain and Dementia. New Trends in Diagnosis and Therapy. Leontino Battistin and Franz Gerstenbrand, Eds. Wiley-Liss, New York, 1990. xxvi, 648 pp., illus. $140. Neurology and Neurobiology, vol. 54. From a symposium, Padua, Italy, Sept. 1988.

Alternative Approaches to Lithic Analysis. Donald O. Henry and George H. Odell, Eds. American Anthropological Association, Washington, DC, 1989. xii, 256 pp., illus. Paper, $13.50; to AAA members, $10. Archeological Papers of the American Anthropological Association, no. 1. Based on a conference, Tulsa, OK.

Basic Principles in Transport. Rolf K. H. Kinne, Ed. Karger, Basel, 1990. viii, 160 pp., illus. $97.50. Comparative Physiology, vol. 3.

Biospheres. Metamorphosis of Planet Earth. Dorion Sagan. McGraw-Hill, New York, 1990. viii, 198 pp. $19.95.

Biotechnology Guide Japan, 1990–1991. Company Directory and Comprehensive Analysis. Nikkei Biotechnology. Stockton, New York, 1990. xvi, 591 pp. Paper, $250. Translated from the Japanese edition (Tokyo, 1989).

Biotechnology in Japan. Malcolm V. Brock. Routledge (Routledge, Chapman and Hall), New York, 1990. xiv, 156 pp. $55. Nissan Institute/Routledge Japanese Studies Series.

Biotic Diversity in Southern Africa. Concepts and Conservation. B. J. Huntley, Ed. Oxford University Press, New York, 1990. xx, 380 pp., illus. $35. From a conference, Rondebosch, South Africa, June 1988.

Birl Blow Flies (*Protocalliphora*) in North America (Diptera: Calliphoridae), with Notes on the Palearctic Species. Curtis W. Sabrosky, Gordon F. Bennett, and Terry L. Whitworth. Smithsonian Institution Press, Washington, DC, 1990. x, 312 pp., illus. Paper, $16.95.

Brain Mechanisms in Problem Solving and Intelligence. A Lesion Survey of the Rat Brain. Robert Thompson, Francis M. Crinella, and Jen Yu. Plenum, New York, 1990. 237 pp., illus. $32.50. Critical Issues in Neuropsychology.

Cathodoluminescence Microscopy of Inorganic Solids. B. G. Yacobi and D. B. Holt. Plenum, New York 1990. x, 292 pp., illus. $55.

Charge and Field Effects in Biosystems—2. M. J. Allen, S. F. Cleary, and F. M. Hawkridge, Eds. Plenum, New York, 1989. x, 389 pp., illus. $89.50. From a symposium, Richmond, VA, June 1989.

Dynamics of Astrophysical Discs. J. A. Sellwood, Ed. Cambridge University Press, New York, 1990. xviii, 257 pp., illus. $47.50. From a conference, Manchester, U.K., Dec. 1988.

Earth Right. H. Patricia Hynes. Prima, Rocklin, CA, 1990. xx, 236 pp., illus. Paper, $12.95.

Encountering Freud. The Politics and Histories of Psychoanalysis. Paul Roazen. Transaction, New Brunswick, NJ, 1990. xxii, 348 pp. $34.95.

Evolution of Laurussia. A Study in Late Palaeozoic Plate Tectonics. Peter A. Ziegler. Published for the Royal Geological and Mining Society of the Netherlands by Kluwer, Norwell, MA, 1989. x, 102 pp., illus., + plates. $69. International Lithosphere Programme Designated Publication no. 0163.

Fluorescence Analysis in Foods. Lars Munck and Alicia de Francisco, Eds. Longman Scientific, Harlow, U.K., and Wiley, New York, 1990. xii, 289 pp., illus., + plates. $147.

Friends or Strangers. The Impact of Immigrants on the U.S. Economy. George J. Borjas. Basic Books, New York, 1990. x, 274 pp. $22.95.

Frontiers. New Discoveries About Man and His Planet, Outer Space and the Universe. Isaac Asimov. Dutton, New York, 1990. x, 390 pp., illus. $19.95.

A Guide to Introductory Physics Teaching. Arnold B. Arons. Wiley, New York, 1990. xiv, 342 pp., illus. $39.95.

Handbook of Early Childhood Intervention. Samuel J. Meisels and Jack P. Shonkoff, Eds. Cambridge University Press, New York, 1990. xxii, 760 pp. $59.50; paper, $27.95.

Handbook of Physiology. Section 6, The Gastrointestinal System. Vol. 2, Neural and Endocrine Biology. Gabriel M. Makhlouf, Ed. American Physiological Society, Bethesda, MD, 1989 (distributor, Oxford University Press, New York). xii, 722 pp., illus. $195.

Human Evolution. Peter Andrews and Chris Stringer. Cambridge University Press, New York, 1990. 46 pp., illus. Paper, $11.95. Reprint, 1989 ed.

IgE, Mast Cells and the Allergic Response. Derek Chadwick, David Evered, and Julie Whelan, Eds. Wiley, New York, 1989. x, 282 pp., illus. $57.95. Ciba Foundation Symposium, vol. 147. From a symposium, London, U.K., April 1989.

Immunological Adjuvants and Vaccines. Gregory Gregoriadis, Anthony C. Allison, and George Poste, Eds. Plenum, New York, 1989. viii, 244 pp., illus. $65. NATO Advanced Science Institutes Series A, vol. 179. From an institute, Cape Sounion Beach, Greece, June–July 1988.

Liquid Chromatography/Mass Spectrometry. Applications in Agricultural, Pharmaceutical, and Environmental Chemistry. Mark A. Brown, Ed. American Chemical Society, Washington, DC, 1990. xii, 298 pp., illus. $64.95. ACS Symposium Series, vol. 420. From a symposium, Dallas, TX, April 1989.