Struggles and Discovery

In Praise of Imperfection. My Life and Work. RITA LEVI-MONTALCINI. Basic Books, New York, 1988. xiv, 220 pp. + plates. $18.95. Alfred P. Sloan Foundation Series. Translated from the Italian by Luigi Attardi.

Rita Levi-Montalcini was born in 1909 of Jewish parents into the patriarchal society of upper-middle-class Turin; she chose—during the rise of Italian fascism in the 1930s—to study medicine and then to embark on a career in biological research. That she overcame the obstacles of gender and religion and the objections of her Victorian family to become one of the most important biologists of her era is a remarkable achievement. The original edition of her autobiography is already a best seller in Italy, where Levi-Montalcini is nationally recognized, having won (with Stanley Cohen) the 1986 Nobel Prize for Physiology or Medicine for her work on nerve growth factor.

The most engaging sections of the book recount Levi-Montalcini's upbringing and her pursuit of a medical degree at the University of Turin, where her friends and classmates included Renato Dulbecco and Salvador Luria. She describes the major episodes of her early life with delicacy and emotion: the loss to cancer of her governess, whose resigned suffering led the then languishing teenager to consider medicine, and, somewhat later, the death of her father (an enterprising engineer who had introduced factory-made ice to the Piedmont). Such poignant reminiscences are nicely balanced by lighter anecdotes. Levi-Montalcini was initiated into research by Guiseppe Levi, a distinguished histologist and the charismatic professor of anatomy at Turin. When she became an intern in his laboratory, Levi assigned her the dubious project of deciphering how and why the developing human brain becomes convoluted. Once, when she was sent to the maternity ward of the Ospedale Maggiore to obtain suitable "material," an insufficiently bribed caretaker foisted upon her a full-term stillborn instead of the early fetus she had been told to fetch. When, during the bus ride home, she spied a small foot protruding through the newspapers in which her bundle had been carelessly wrapped, she decided that Levi had to suggest a more tractable course of embryological research. After several other false starts, she became expert in staining embryonic chick neurons with silver, a simple but elegant technique which allowed her to carry on research during the war with a minimum of equipment.

Perhaps the most compelling aspect of the book is Levi-Montalcini's description of the impact of fascism on the Turinese and the near destruction of her own incipient career by Mussolini's "Manifesto per la difensa della razza" (which barred "non-Aryans" from academic careers in 1938). Her struggle to persevere in an atmosphere of increasing chaos is deeply affecting. Surviving through anonymity, cleverness, and simple luck, she and her mentor Levi (also a Jew) managed to carry out an important series of experiments on nerve cell degeneration during the early 1940s. This work, performed largely in her bedroom under the most austere conditions, came to form an important part of the foundation on which modern concepts of nerve cell death now stand.

The latter half of the book, which largely covers Levi-Montalcini's career in the United States, is less satisfying. At the invitation of Viktor Hamburger, then professor of biology at Washington Univeristy, Levi-Montalcini came to St. Louis in 1947. The plan was for her to spend only one semester, just long enough to resolve a disagreement about the interpretation of independent work each had done earlier. Instead, Levi-Montalcini and Hamburger began a series of crucial experiments that led, over the course of five years, to the discovery of nerve growth factor (NGF). After 1953, when Hamburger backed away from these investigations to pursue other research interests, Levi-Montalcini and Stanley Cohen ingeniously pursued the NGF molecule and its biological significance. Although the text certainly conveys the excitement that led to the discovery of NGF and to an understanding of its biological role, readers will not learn why the protagonists thought their experiments important or why these discoveries changed the course of modern neurobiology, as they did. Crucial insights are depicted as a series of revelations, apparently devoid of the conflict and doubt that beset most scientific progress and divorced from any broader intellectual context.

The personal side of this part of the story is also oddly inadequate. Levi-Montalcini makes no allusion to a period of disaffection during the late 1960s, when, in despair over the lack of recognition she felt was then her due, she took up work on the cockroach nervous system. "For a long time people didn't mention how NGF was discovered," she has said in a recent interview (*Omni*, March 1988, p. 70) that is far more candid than her book. "My name was entirely left out of the literature. People repeated my experiment and didn't mention my name!" In fact, Levi-Montalcini is a fierce competitor who tends to categorize her colleagues as being for her or against her. This aggressive spirit, common to many of the best scientists and hardly surprising in someone who had to struggle against seemingly insurmountable odds, is not evident here. Nor does Levi-Montalcini confront the ambivalence of her relationships with Levi and Hamburger, both of whom are given little credit for their contributions to her success. The receipt of the Nobel Prize is mentioned only obliquely ("On Christmas Eve, 1986, NGF appeared in public . . . in the presence of the royals of Sweden," p. 201), and she studiously avoids disclosing her feelings about this and other belated honors. Perhaps as a result of these omissions, the last chapters of the book are increasingly disjointed. The death of a young friend in St. Louis, the deficiencies of the Italian scientific bureaucracy, the evolution of man, the fate of human race, and other tangential matters are discussed without obvious purpose.

In the end, one is left with the sense that both the scientific and personal stories have been only partly told. Perhaps this disappointment will be turned to advantage; the deficiencies in Levi-Montalcini's own account will surely encourage biographers to complete the task of revealing a brilliant and complex scientist.

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Patterns of Sea-Level Shift

Sea-Level Changes. MICHAEL J. TOOLEY and IAN SHENNAN, Eds. Basil Blackwell, New York, 1987. x, 397 pp., illus. $75. Institute of British Geographers Special Publications Series, vol. 20.

This compilation of papers on Quaternary sea-level changes conveys the evolution in thought over the past decade from the search for the chimerical global eustatic curve to an emphasis on careful determination of local, relative sea-level curves and regional patterns that can be integrated into a global four-dimensional record. This ne-

cessitates the understanding of geoidal shifts, water volume changes, tectonic movements, and meteorological and dynamical changes through time, as well as the careful evaluation of errors, both systematic and otherwise, in the determination of sea-level position and date.

The book is composed of four types of papers. The first type, consisting of an overview introduction by Michael J. Tooley and a concluding conspectus by Tooley and Ian Shennan, briefly reviews the history of Quaternary sea-level determinations and in particular of the International Geological Correlation Program Project 200, to which this volume is a contribution. Tooley and Shennan point out the importance of the 1953 storm surge in the North Sea and the ongoing debate over global greenhouse gases and projected future acceleration of sea-level rise as stimuli for research. Unfortunately, at times their commentary becomes overly political and gratuitously attacks other workers. Their advocacy of a uniform methodology in sea-level determinations is laudable, but, as they admit, too firm an adherence to a formulaic gathering and synthesis of data can be counterproductive. In general, however, these papers are useful.

Other papers consist of detailed local studies in Rio de Janeiro, by Stephen Ireland, and in the Moray Firth, Scotland, by B. Andrew Haggart. Both authors use the approach advocated by Tooley and Shennan, combining geomorphology, coring, paleobotany, and radiocarbon dating. These are competent studies, but their conclusions should not be hastily extrapolated to surrounding regions, given that local paleogeographic and climatic changes could explain some of the observed fluctuations.

Regional overviews form a third type of papers, which include outstanding syntheses of the North Sea by Shennan and of the Australian region by John Chappell. Shennan's analysis of a regional separation of subsidence and rebound from the regional eustatic signal is a significant advance. I would, however, question the regional significance of individual transgressive and regressive overlaps, because of dating uncertainties, compaction, and other local effects. I also question Shennan's reliance on individual point determinants in creating the wiggling Mörner reference curve. Nevertheless, when these 10^2-year scale fluctuations are factored out, the regional signal comes through loud and clear. Chappell demonstrates the necessity of understanding the precision and accuracy of the data, showing that some points are only unidirectional indicators of sea level and stating that absence of data is no justification for assuming a major regression. In the same group are papers by Paolo A. Pirazzoli on the Mediterranean and by Yoko Ota and Hiroshi Machida on Japan. Both are useful summaries of their regions. The studies on the west and east coasts of Africa, by Pierre Giresse and Lars-Erik Åse, respectively, suffer from a paucity of data. Until more detailed studies are done, regional overviews can contribute little here. Thomas M. Cronin provides an odd perspective on U.S. east coast studies, presenting information selectively and without diagrams or tables. It is perhaps impossible to summarize this heavily studied region in a short space, but the paper is disappointing. On the positive side, the methodology that Cronin advocates is rational. As Oaks and Dubar pointed out in 1974, long-distance geomorphic correlation of sea levels and coastal features is a flawed concept, and even correlation with the oceanic oxygen isotope curves is insufficient. Integration of physical stratigraphy, paleontology, geomorphology, and paleogeographic reconstruction with dating is the needed approach.

The fourth type of papers comprises two models: Nils-Axel Mörner gives a broad perspective on global changes, including geoidal and dynamic effects, and James A. Clark and John A. Primus present a numerical model of effects of ice-sheet melting and corresponding additions of seawater volume in light of postulated climatic warming. Mörner neatly summarizes the history of the growing awareness of geoidal, dynamical, and tectonic effects on sea-level change. His specification of regional versus global eustasy is an important concept, as demonstrated by the Shennan paper discussed above. Unfortunately, many of his assertions about loading, viscosity, and "flexurality" are unsupported. For example, his assertion that a loading of the ocean basin with water will be compensated by subsidence but that unloading will not result in rebound seems to ignore the time scales involved in lithospheric density adjustments over 10^6 to 10^8 years as opposed to glacioeustatic and hydroisostatic adjustments over 10^3 to 10^5 years. In direct contradistinction, Clark and Primus develop a detailed, numerical model of rapid elastic response of the earth to water redistribution that is testable with data from tide gauge and glacial studies. They also point out the correspondence of existing Holocene sea-level records to a model of global glacio- and hydroisostasy, with ongoing late Holocene adjustments explained by viscous

properties of the earth. More complete determination of the viscoelastic solution is needed.

The major contribution of this volume is the clarity of its message: an explicit determination of sources of error in sea-level determinants is required in every study; local, relative sea-level curves are the first step to a regional synthesis; regional eustasy can form a benchmark from which tectonic, isostatic, compaction, dynamic, or other geoidal trends can be determined; there is no "global eustatic" curve, but rather a changing four-dimensional trend surface that can be addressed with sufficient data; and there are compelling societal needs to study sea-level, because of present effects on the world's coastlines and projected trends of future rise in sea levels.

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Frugivorous Reptiles

Gray's Monitor Lizard. WALTER AUFFENBERG. University Presses of Florida, Gainesville, 1988. xii, 419 pp., illus. $39.

The varanid lizards, comprising 36 extant species ranging from 0.3 to 3.0 meters in total length, have long attracted attention as morphological, physiological, and ecological analogues of placental predators, usually without adequate background knowledge. Until 1976, Gray's monitor was known only from two old, puzzling museum specimens, and even its existence was in doubt. During 22 months of fieldwork, the author of this book achieved more than 100,000 contacts with 12 radiotelemetered animals, painstakingly examined more than 125 specimens for a variety of purposes, and also studied other local animals and plants. *Varanus olivaceus* emerges as a large species (total length to 1.75 meters), restricted to small areas in the Philippine Islands, the most frugivorous living lizard, and all the more interesting because several of its congeners are specialized carnivores.

Gray's monitor is a slow-moving, secretive, and very choosy forager, in contrast to most other varanids, with their frenetic behavior and catholic diets. Adults eat mainly the fruits of about ten species of trees, supplemented by land snails during lean times. The fruits tend to be oily, possess features that might enhance seed dispersal by slowing their passage through the gut, and are eaten only on the ground and when freshly ripe. A caecum and other unusual anatomical characteristics are functionally correlated with this peculiar lifestyle. As with many other tropical organisms, the future of Gray's monitor is uncertain, mainly owing to timber harvesting and illegal hunting.

Several blurry pages, a few stylistic inconsistencies, and an apparent publication lag (most references are pre-1984) detract from this book. Specialists will find minor things