

noting that her untimely death almost coincided with the conference. The succeeding paper, by Sutton and Watson ("Questions for the future"), is a brief exposition of the history of research on the Lewisian complex and a sentient consideration of the problems posed by the Lewisian in the context of continental structure and growth. Two review papers follow, Park and Tarney on the Lewisian as a whole, with emphasis on the mainland, and Fettes and Mendum on the Outer Hebrides. In addition to discussion, the former presents new cross sections illustrating mainland Lewisian history, and the latter gives the first modern review of the Outer Hebrides and provides an excellent summary of recent research.

Next is a group of papers on the origin of granulites. First, the problem of the origin of the extreme depletion of large-ion lithophile elements of the granulites is considered, with an emphasis on models that involve depletion at a primary magmatic stage. Next, the adjacent amphibolite facies gneisses of the Gruinard district are treated in detail, and new data are presented. Three theoretical and observational papers on the granulite facies metamorphism complete the group; estimates of peak pressure and temperature vary about 20 percent.

A series of more specific papers follows, first on the geochemistry of marbles (one paper) and then on structural matters, mostly connected with Proterozoic shear zones (five papers). The next three papers, on geophysical matters, form a welcome addition to Lewisian studies; they discuss physical properties of the gneisses, crustal seismic reflection profiling, and paleomagnetism. The Lewisian section ends with a detailed discussion of the deep-seated Proterozoic dyke swarm.

The final group of papers are valuable comparative studies; the reviews of the Yilgarn Block and of the high-pressure granulites of Enderby Land are particularly instructive.

Altogether there is a wealth of information in this volume on the "high grade terrains" of the title. It is not, however, a textbook; the papers are not fully informative to the nonexpert on several major matters, notably the gray gneisses (the Laxford complex) and their relationship to the granulites. The "evolution" of the title is not accompanied by new geochronology or new insights into old geochronology; there is no systematic discussion of isotopic tracers except in the papers co-authored by Tarney. There still seem to be terminological problems; time is rather naively treated on occasion, and some rewriting of history may be noticed. Nevertheless, this book does justice to its famous subject: most of the many

hundreds of papers on this 5000 square kilometers are included in the reference lists. It will be a very useful addition to library resources on crustal structure for the next decade, and then a fourth Lewisian conference will be required.

R. ST. J. LAMBERT  
*Department of Geology,  
University of Alberta,  
Edmonton, AB T6G 2E3, Canada*

## Model Landforms

**Experimental Fluvial Geomorphology.** STANLEY A. SCHUMM, M. PAUL MOSLEY, and WILLIAM E. WEAVER. Wiley-Interscience, New York, 1987. xiv, 413 pp., illus. \$49.95.

Nearly two decades ago, Judge R. H. Kroninger, in ruling on the effects of logging in a California watershed, noted that numerous expert witnesses in geology and engineering presented conclusions that were "hopelessly irreconcilable on such critical questions as how much and how far solid particles will be moved by any given flow of surface water." The witnesses "were able to agree only that sediment will not be transported upstream" (*State of California, Marin County, v. E. Righetti et al.*, 1969). To students of rivers the words sting even today. For however hyperbolized the ruling may have been, it reminds us of a painful truth: we still do not fully understand complex, nonlinear fluvial systems with their internal thresholds and their evolutions that span geologic time.

Our excuses seem legitimate. The fluvial system consists of hundreds of major components in its drainage basins, conveyance channels, and alluvial fans or deltas and certainly many times that number of feedback loops. Like all good reductionists we have studied the subsystems, often to good effect, but are at a loss when we try to put the system back together. Those who have traditionally attempted to understand the whole system, primarily field geomorphologists interested in landscape evolution, have been confounded by incomplete records of fluvial responses to perturbations, or by superposition of responses, and have never traced a signal—say, a wave of erosion due to base-level lowering—throughout a natural river to its headwaters.

It is joyful news, then, when a book is born into a discipline so desperately in need of answers. Here under one cover are the products of 18 years of experimental investigations into the fluvial system by the archdruid of the technique and his students. The experimental apparatuses employed are the

rainfall-erosion facility (REF), a 138-square-meter sandbox with overhead sprinklers, and two tilting flumes. A typical REF experiment involves establishing a planar, sloping sand surface that is subject to some intensity of simulated rainfall from the sprinklers and documenting the evolution of the drainage net, the water and sediment yields, and so on. A typical flume experiment entails establishing a narrow ditch through the bed material and documenting the evolution of the channel pattern and sediment discharge, subject to various initial and boundary conditions. The objective of the experiments always is to "provide an insight into landform evolution and dynamics," not to provide quantitative predictions, because the models are not dynamically similar to nature. They are "simply considered to be small landforms."

Those who have followed the journal literature in this area will recognize many of the experiments. Parker and Mosley's tests of the Glock model for drainage network evolution are here, along with Parker and Harvey's experiments that led to the concepts of episodic behavior and complex response. Here also are the flume experiments on channel planform as a function of slope, water discharge, and sediment type that underlie Schumm's oft-reproduced classification diagram of alluvial channels. Gardner and Shepard's studies of entrenched bedrock meanders (in a cohesive clay and sand substrate) and the more recent studies of flume-channel response to local deformation of the bed (effected by jacking up the middle section of the flume) and alluvial fan morphology and dynamics round out the treatment. This presentation of previously published material is not necessarily redundant. The whole body of work now can be seen in toto and in much greater detail. In addition, each topic is placed in context by concise summaries of other work, especially field and theoretical studies. The resulting collection is not a treatise on experimental fluvial geomorphology, as its title implies, but more a peripatetic autobiography of sorts for the senior author. But it is a testimony to his breadth that the title fits at all.

This is a useful book, one that would please Judge Kroninger. It demonstrates an underused methodology for understanding teleconnections within the fluvial system, and it presents the basic experiments that have led to several important theories of landform behavior. But you must believe that the results from these "small landforms" can be applied to the world at large.

RUDY SLINGERLAND  
*Department of Geosciences,  
Pennsylvania State University,  
University Park, PA 16802*



## Books Received

**Advances in Age Pigment Research.** E. Aloj Taro, P. Gles, and F. A. Pisanti, Eds. Pergamon, Elmsford, NY, 1987. x, 427 pp., illus. \$94. Advances in the Biosciences, vol. 64. From a workshop, Vico Equense, Italy, May-June 1985.

**Alkaline Rocks and Carbonates of the World.** Part 1, North and South America. Alan R. Woolley. British Museum (Natural History), London, and University of Texas Press, Austin, 1987. vi, 216 pp., illus. \$65.

**Applications of Control Theory in Ecology.** Y. Cohen, Ed. Springer-Verlag, New York, 1987. viii, 101 pp., illus. Paper, \$16.30. Lecture Notes in Biomathematics, vol. 73. From a symposium, Syracuse, NY, Aug. 1986.

**Applied Geodesy.** Stuart Turner, Ed. Springer-Verlag, New York, 1987. viii, 393 pp., illus. Paper, \$44.60. Lecture Notes in Earth Sciences, vol. 12. From a course, Geneva, Switzerland, April 1986.

**Atlas on the Biology of Soil Arthropods.** Gerhard Eisenbeis and Wilfried Wichard. Springer-Verlag, New York, 1987. xiv, 437 pp., illus. \$120.

**The Biology of Dinoflagellates.** F. J. R. Taylor, Ed. Blackwell Scientific, Palo Alto, CA, 1987. xii, 785 pp., illus. \$180. Botanical Monographs, vol. 21.

**Biosphere.** The Realm of Life. Robert A. Wallace, Jack L. King, and Gerald P. Sanders. Scott, Foresman, Glenview, IL, 1987. xxviii, 780 pp., illus., + appendices and index. \$33.

**Cellulose Hydrolysis.** L. T. Fan, M. M. Gharpuray, and Y.-H. Lee. Springer-Verlag, New York, 1987. xiv, 198 pp., illus. \$101.50. Biotechnology Monographs, vol. 3.

**Cerebral Cortex.** Vol. 6, Further Aspects of Cortical Function, Including Hippocampus. Edward G. Jones and Alan Peters, Eds. Plenum, New York, 1987. xiv, 464 pp., illus. \$69.50.

**Cerebrovascular Diseases.** William J. Powers and Marcus E. Raichle, Eds. Raven, New York, 1987. xxii, 374 pp., illus. \$98. From a conference, St. Louis, MO, March 1986.

**Chaos in Biological Systems.** H. Degn, A. V. Holden, and L. F. Olsen, Eds. Plenum, New York, 1987. xii, 323 pp., illus. \$62.50. NATO Advanced Science Institutes Series A, vol. 138. From a workshop, Cardiff, Wales, Dec. 1986.

**Clouds in a Glass of Beer.** Simple Experiments in Atmospheric Physics. Craig F. Bohren. Wiley, New York, 1987. xx, 195 pp., illus. Paper, \$12.95. Wiley Science Editions.

**Dipeptides as New Substrates in Nutrition Therapy.** Peptide als neue Substrate in der Ernährungstherapie. S. A. Adibi *et al.*, Eds. Karger, Basel, 1987. viii, 196 pp., illus. \$42. Contributions to Infusion Therapy and Clinical Nutrition, vol. 17. From a symposium, Erlangen, F.R.G., July 1986.

**Elites and the Idea of Equality.** A Comparison of Japan, Sweden, and the United States. Sidney Verba *et al.* Harvard University Press, Cambridge, MA, 1987. xii, 331 pp., illus. \$30.

**Energy Nutrition of Women.** Geoffrey H. Bourne, Ed. Karger, Basel, 1987. x, 265 pp., illus. \$162. World Review of Nutrition and Dietetics, vol. 52.

**Forestry and the Forest Industries.** Past and Future. E. G. Richards, Ed. Nijhoff, Dordrecht, 1987 (U.S. distributor, Kluwer, Norwell, MA). xii, 428 pp., illus. \$92.50. Forestry Sciences.

**From Hamiltonians to Phase Diagrams.** The Electronic and Statistical-Mechanical Theory of sp-Bonded Metals and Alloys. Jürgen Hafner. Springer-Verlag, New York, 1987. xii, 404 pp., illus. \$69.50. Springer Series in Solid-State Sciences, vol. 70.

**A Handbook of Mexican Roadside Flora.** Charles T. Mason, Jr., and Patricia B. Mason. University of Arizona Press, Tucson, AZ, 1987. iv, 380 pp., illus. Paper, \$19.95.

**The Health of Nations.** True Causes of Sickness and Well-Being. Leonard A. Sagan. Basic Books, New York, 1987. vi, 233 pp., illus. \$19.95.

**Host-Parasite Cellular and Molecular Interactions to Protozoal Infections.** K.-P. Chang and David Snary, Eds. Springer-Verlag, New York, 1987. xx, 425 pp., illus. \$115. NATO Advanced Science Institutes Series H, vol. 11. From a workshop, Acquafredda di Maratea, Italy, Sept.-Oct. 1986.

**How Experiments End.** Peter Galison. University of Chicago Press, Chicago, 1987. xii, 330 pp., illus. Paper, \$14.95.

**Immunology.** A Short Course. Eli Benjamini and Sidney Leskowitz. Liss, New York, 1987. xxii, 390 pp., illus. Paper, \$22.95.

**Keeping the Dream Alive.** Putting NASA and America Back in Space. Michael C. Simon. Earth Space Operations, San Diego, CA, 1987. vi, 218 pp. + plates. Paper, \$11.95.

**Mathematical Aspects of Hodgkin-Huxley Neural Theory.** Jane Cronin. Cambridge University Press, New York, 1987. xii, 261 pp., illus. \$49.50. Cambridge Studies in Mathematical Biology, vol. 7.

**The Measure of Times Past.** Pre-Newtonian Chronologies and the Rhetoric of Relative Time. University of Chicago Press, Chicago, 1987. x, 292 pp. \$27.50.

**The Measurement of Moral Judgment.** Anne Colby and Lawrence Kohlberg. Cambridge University Press, New York, 1987. Two vols. Vol. 1, Theoretical Foundations and Research Validation. x, 397 pp., illus. Vol. 2, Standard Issue Scoring Manual. x, 977 pp. Spiral bound. \$165.

**Mechanistic Approaches to Interactions of Electric and Electromagnetic Fields with Living Systems.** Martin Blank and Eugene Findl, Eds. Plenum, New York, 1987. x, 443 pp., illus. \$85.

**Meteorite Craters.** Kathleen Mark. University of Arizona Press, Tucson, AZ, 1987. xvi, 288 pp., illus. \$29.95.

**Search for a Supertheory.** From Atoms to Superstrings. Barry Parker. Plenum, New York 1987. x, 292 pp., illus. \$21.95.

**The Second Creation.** Makers of the Revolution in Twentieth-Century Physics. Robert P. Crease and Charles C. Mann. Collier (Macmillan), New York, 1987. xii, 480 pp., illus. Paper, \$11.95. Reprint, 1986 edition.

**Second International Conference on Chemical Engineering Education.** (Cambridge, U.K., April 1987.) D. C. Freshwater, Ed. Institution of Chemical Engineers, Rugby, U.K., 1987 (U.S. distributor, Pergamon, Elmsford, NY). viii, 398 pp., illus. \$51.50. Institution of Chemical Engineers Symposium Series, no. 101.

**Solvation Thermodynamics.** Arieh Ben-Naim. Plenum, New York, 1987. xiv, 246 pp., illus. \$49.50.

**Survival Strategies for New Scientists.** Carl J. Sindermann. Plenum, New York, 1987. 264 pp. \$17.95.

**System Design for Human Interaction.** Andrew P. Sage, Ed. IEEE Press, New York, 1987. viii, 488 pp., illus. \$69.95; to IEEE members, \$52.50. IEEE Press Selected Reprint Series.

**Systems and Control Encyclopedia.** Theory, Technology, Applications. Madan G. Singh, Ed. Pergamon, Elmsford, NY, 1987. Eight volumes. lxxiv, 5611 pp., illus. \$2300.

**Taking Japan Seriously.** A Confucian Perspective on Leading Economic Issues. Ronald Dore. Stanford University Press, Stanford, CA, 1987. x, 264 pp. \$35; paper, \$11.95.

**Taxonomy of Porifera.** From the N. E. Atlantic and Mediterranean Sea. Jean Vacelet and Nicole Boury-Esnault, Eds. Springer-Verlag, New York, 1987. viii, 332 pp., illus. \$89. NATO Advanced Science Institutes Series G, vol. 13. From a workshop, Marseille, France, Sept. 1986.

**Technetium in Chemistry and Nuclear Medicine,** 2. Marino Nicolini, Giuliano Bandoli, and Ulderico Mazzi, Eds. Cortina, Verona, 1987 (U.S. distributor, Raven, New York). xxii, 354 pp., illus., + appendix. \$111.50. From a symposium, Padua, Italy, Sept. 1985.

**Thermal Flow in Porous Media.** Horia I. Ene and Dan Polisevski. Reidel, Dordrecht, 1987 (U.S. distributor, Kluwer, Norwell, MA). x, 194 pp., illus. \$64. Theory and Applications of Transport in Porous Media.

**Thin-Layer Chromatographic R<sub>f</sub> Values of Toxicologically Relevant Substances on Standardized Systems.** Deutsche Forschungsgemeinschaft. VCH, New York, 1987. 223 pp. \$49.50. Report of the DFG Commission for Clinical-Toxicological Analysis, no. 7.

**The Unfulfilled Promise of Synthetic Fuels.** Technological Failure, Policy Immobilism, or Commercial Illusion. Ernest J. Yanarella and William C. Green, Eds. Greenwood, Westport, CT, 1987. xxiv, 225 pp. \$39.95. Contributions in Political Science, no. 179.

**Viable Populations for Conservation.** Michael E. Soulé, Ed. Cambridge University Press, New York, 1987. xii, 189 pp., illus. \$44.50; paper, \$16.95.

**The Virioids.** T. O. Diener, Ed. Plenum, New York, 1987. xxii, 344 pp., illus. \$59.50. The Viruses.

(Continued from page 267)

detailed known pathway, that of bovine pancreatic trypsin inhibitor (BPTI), requires further information about the conformations of the disulfide intermediates. The major one-disulfide intermediate, with the only disulfide bond between residues 30 and 51, was shown by T. G. Oas and P. S. Kim (Whitehead Institute) to be approximated remarkably closely by two synthetic peptides, corresponding to residues 20 to 33 and 43 to 58, linked by that single disulfide bond. Using genetic engineering techniques with intact BPTI, D. P. Goldenberg (University of Utah) demonstrated that drastic single amino acid replacements of internal residues made varying, but often substantial, alterations of up to 6 kcal/mol to the relative free energies of the various intermediates, the transition states, and the final folded conformation. The conformational properties of such partially folded intermediates may now be elucidated using NMR techniques; when combined with genetic engineering technology, this should permit the conformational forces that direct folding pathways to be elucidated experimentally.

Protein folding in vivo as a biological phenomenon is becoming

increasingly amenable to study. Investigations of in vivo gene expression are uncovering many phenomena where folding (or the absence of folding) of the polypeptide gene product is apparent. These include (i) the need to prevent or reverse folding prior to translocating a polypeptide chain through a membrane, (ii) folding and assembling it once across the membrane, and (iii) targeting it to its appropriate cellular location. The involvement of other proteins in many of these steps suggests that it is dangerous to extrapolate protein folding from in vitro to in vivo circumstances. In any case, folding in vivo is certain to come under increasing experimental scrutiny. Finally, the dramatic medical consequences of single site mutations that alter procollagen assembly and folding in humans, described by P. Byers (University of Washington), left no doubt that the problem of protein folding is of more than academic interest.

## REFERENCES

1. C. C. Hyde, E. A. Padlan, S. A. Ahmed, E. W. Miles, D. R. Davies, *Fed. Proc.* 46, 2215 (1987); personal communication.