Ridley's method, but accurate determinations of primitive and derived are both critical for the validity of the test and potentially controversial. In addition, the method typically requires that the data for character and condition be scored nominally; thus it will not replace the more powerful statistical analyses discussed and used by Harvey, Clutton-Brock, and their colleagues, which remain extremely valuable whenever appropriate data are available.

In summary, this book could perhaps have been written as three papers. Although together they do not live up to the scope of the title, they are carefully prepared and clearly written and will be both useful and interesting for their respective audiences.

NANCY KNOWLTON
Department of Biology,
Yale University,
New Haven, Connecticut 06511

Scottish Geology

Geology of Scotland. G. Y. CRAIG, Ed. Second edition. Halsted (Wiley), New York, 1983. xiv, 472 pp., illus., + plates. $54.95.

For two hundred years Scotland has been the breeding ground for many of the fundamental principles and ideas of geology because of its superbly exposed, rich, and varied terrain containing and adjacent to many ancient seats of learning. Consequently, many of the great names of the earth sciences are closely linked with Scottish researches: Hutton's elucidation of the stratigraphical principles involved in unconformity, Peach and Horne's discovery and mapping of the Moine Thrust, Lapworth's work on the stratigraphical paleontology of graptolites, Clough's analyses of fabrics and minor structures that were to pave the way for modern structural work, Read's work on the granite problem, Sutton and Watson's mapping of the Lewisian to show how complex event sequences can be deciphered in basement terrains, Kennedy's demonstration of major sinistral offset on the Great Glen Fault, and Ramsay's structural work that has led to the techniques of modern structural analysis.

It was against this background of geological discovery that Craig and Walton, the editors of the first, 1965, edition of *Geology of Scotland*, set themselves the formidable task of finding a group of authorities to summarize the geology of this small but well-known piece of Europe, with successful results. For the second edition, Craig's task was compounded by the occurrence of the plate tectonic revolution and the availability of many geophysical data, so that the rocks are susceptible to new interpretations. Assemblages in which this is the case include the Southern Uplands, an extensive zone of Ordovician-Silurian turbidite, shales, and cherts, interpreted by Legget and McKerrow as a subduction accretion prism, and the Ballantrae Complex, interpreted by Church and Gayer as an early Ordovician ophiolite complex; these interpretations allow more cohesive, less ad hoc analyses and syntheses of these terrains.

A book on a region, such as this, must be primarily a reliable source of data that are not overinterpreted. The second edition, with the addition of excellent new chapters on Devonian stratigraphy by Mykura and Devonian magmatism by Brown, has succeeded very much better than the first in this role. It is perhaps invidious to select individual contributions, but special mention must be made of the masterly summaries of Carboniferous stratigraphy and magmatism by Francis and Tertiary igneous rocks by Emeleus. The role of a regional text must, as a source of data, to a large extent subjugate the more expansive role as a purveyor of analysis and synthesis, but it is nevertheless a pity that there is not more interpretation of the Lower Palaeozoic rocks in the context of a broader regional Caledonian, perhaps even Appalachian, view. The broader view is to some extent provided by the beautifully organized and written introductory chapter by Harris on the growth and structure of Scotland, but more short, interpretative sections in individual chapters would enhance coherence for a non-British reader. However, in fairness, the overwhelming mass of data makes any interpretation vulnerable. The geological corollaries of plate tectonics are very complicated and still rather poorly understood on the medium and small scales. It is therefore easier to erect novel and provocative explanations for poorly known regions than for areas like Scotland.

Geology of Scotland is a scholarly work that will be the definitive source book for many years to come. The authors deserve praise for summarizing so many data in so modest a space. The work should be on the personal bookshelves of geologists worldwide; it is good reading and an inspirational source.

JOHN F. DEWEY
Department of Geological Sciences,
University of Durham,
Durham DH1 3LE, England

The European Landscape

Geomorphology of Europe. CLIFFORD EMBLETON, Ed. Wiley-Interscience, New York, 1984. x, 465 pp., illus. $79.95.

The phenomenal diversity of the European landscape is matched only by the remarkably different approaches and assumptions of those who seek a scientific understanding of it. This book, a compilation of writings by members of the International Geographical Union Commission on Geomorphological Survey and Mapping, is the first comprehensive survey of the geomorphology of Europe. Similar regional landform analysis, sometimes called "physiography," was once the major activity of geomorphologists. In the first half of this century, regional landscapes were explained in terms of their structure, processes of erosion, and stage of development. Although this type of analysis continues in many countries, it has generally fallen from favor in Britain and the United States, where attention in recent decades has focused on small-scale landforms and short-acting processes that are most amenable to quantitative measurement, statistical analysis, and incorporation into a systems-analytical framework.

The key to appreciating this volume is the international perspective on geomorphology provided by abundant examples of what different geomorphologists do. Unfortunately, because author affiliations are not given, the matching of regional problems to regional methods of problem-solving becomes an exercise in library biographical searching. Moreover, the frustration of such searching is compounded by the more extensive representation of some nationalities (and nations) than of others. The major contributions in the book come from and deal with the United Kingdom (C. Embleton), the western Soviet Union (A. A. Aseev, N. V. Bashenina, O. K. Leont'ev, and others), Sweden (S. Rudberg), Czechoslovakia (J. Demek), and Spain (M. Sala). Shorter contributions come from Poland (R. Galon), France (F. Joly), Germany (J. F. Gellert), Switzerland (H. Leser), Austria (J. Fink), the Netherlands (J. A. ten Cate), Yugoslavia (I. Gams), Bulgaria (I. Vaptsarov), and Italy (G. B. Castiglioni and A. Sestini). Of the 16 geomorphological regions into which Europe is divided in the book, Hercynian Europe, with its Appalachian-type relief, receives 66 pages of discussion whereas the Balkans receive only 13 pages. Description of the fascinating landscapes of Greece is attempted in two pages.

Such imbalance is probably unavoidable in a complex international enterprise. Indeed, the shifting approaches and emphases provide a fascinating perspective on national geomorphic preoccupations. French geomorphology emphasizes climatic morphogenesis, and, although its direct practitioners are underrepresented in this volume, its methodology is well illustrated in Sala's treatment of Spanish landforms. Numerous geomorphic maps elaborate the relationships among landforms that derive from exogenic processes operating under both present and past climatic regimes. In Spain river terraces and piedmonts (glacis) are generally explained in terms of climatic change.

For the British Isles emphasis is placed on planation surfaces, drainage evolution, and the effects of Quaternary glaciation. Probably because of minimal German participation in the volume, the treatment for Germany is largely descriptive, including basic geology and landforms. In contrast, the extensive discussion of Hercynian and Carpathian central Europe by Demek is analytical, striking a balance in explaining an endogenically produced structural framework that is modified by diverse exogenic processes controlled by climate.

The sections authored by Eastern Europeans provide useful insight into their science. A central theme is the adherence by Russian geomorphologists to the concept of identifying morphostructures, that is, relief generated by a combination of active tectonism and climatically controlled degradation. Morphostructures can be regional, such as the Fennoscandian shield, or local, such as a fault-controlled valley. They are produced by alternating periods of uplift (with resulting dissection) and stabilization (yielding various kinds of planation surfaces). In Russia and Eastern Europe river terraces and planation surfaces are interpreted within a tectonic framework. Happily an extensive reference list and an index of obscure places and concepts aids in documenting the important contributions of Eastern European geomorphologists.

The Russian contributions to the volume are also fascinating for their avoidance of plate-tectonic theory as a unifying concept. This highlights a schism between the geomorphic thought of Eastern and Western Europe that permeates the whole volume. Yet the total effort remains true to a theme of large-scale geomorphology. This is a theme that has been neglected in recent decades, as geomorphologists occupied themselves with the study of relatively small-scale processes. However, the advent of new technologies for global remote sensing and unifying models for the operation of global tectonic and climatic systems has created an opportunity to put large-scale geomorphology on a firm scientific basis. Though this book contains only limited reference to these modern developments, it may aid in contributing to the baseline of regional geomorphology from which a revitalized science of global morphological dynamics will emerge. Certainly the book leaves no question about the value of geomorphic research. Despite the methodological arguments of various geomorphologists, geomorphology remains the analysis of the dynamic interface between our rocky planetary surface and its mobile atmosphere and hydrosphere. The importance of that interface to all life makes it worthy of our best scientific scrutiny.

VICTOR R. BAKER

Department of Geosciences, University of Arizona, Tucson 85721

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