Book Reviews

Geomorphologic Theory

Climatic Geomorphology. JULIUS BÜDEL. Translated from the German edition (Berlin, 1977) by Lenore Fischer and Detlef Busche. Princeton University Press, Princeton, N.J., 1982. xx, 444 pp., illus. Cloth, $50; paper, $18.50.

The lack of a generally accepted paradigm has plagued geomorphic research ever since its practitioners became disillusioned with the elegant concepts of landscape youth, maturity, and old age that were espoused by William Morris Davis. As one attempted alternative to Davisian theory, climatic geomorphology found its main adherents in Europe, where it was championed in France by J. Tricart and A. Cailleux and in Germany by J. Büdel. Because most American and British geomorphologists have emphasized the study of individual geomorphic processes, the synthesis provided by climatic geomorphology has considerable interest. The theory holds that modern relief-forming mechanisms differ as a function of climate and that their relief products define major morphoclimatic zones on the globe. Moreover, little of the extant relief is the product of modern relief-forming processes, but most is inherited from past morphoclimatic controls.

Büdel, now professor emeritus of geography at the University of Würzburg, has for nearly 50 years been an eloquent spokesman for the climatic morphogenetic approach to geomorphology. This translation of his 1977 volume, *Klima-Geomorphologie*, will bring Büdel's fascinating view of geomorphology to a wide audience. Unfortunately the book does little to dispel several well-known criticisms of climatic geomorphology. Indeed, climatic theories of landscape development are so generalized that few components of the worldwide schemes have been adequately tested. Much of the theory is descriptive, organizing various qualitative associations between landforms and climate. Numerous questions concerning process are simply left unanswered. We know, for example, that landforms considered diagnostic for interpreting past climate, such as bornhardts and tower karst, have profound lithologic and structural controls, yet Büdel consistently ignores much of structural and tectonic geomorphology.

By focusing on the origins of valleys Büdel renews the theme that James Hutton used to transform landscape description to a science. The prominence of valley cutting during the Pleistocene poses a special enigma to geomorphologists in central Europe, since neither Tertiary nor modern rivers seem to have been effective at valley cutting. Büdel explains this paradox by the ice-rind (*Eisrinde*) effect, an explanation that came from his work on the Stauferland expeditions to Svalbard (Spitzbergen). Fragmentation of bedrock by ground ice beneath a periglacial river is thought to facilitate vertical fluvial erosion during glacial phases of the Pleistocene. Modern rivers flow in relict periglacial valleys and are clearly ineffective at vertical erosion.

The Tertiary geomorphic activity in central Europe seems to have been characterized by the development of low relief plains, now preserved as erosion surfaces on the uplands (classically illustrated in the Middle Rhine Valley). Büdel argues that these surfaces are inherited from ancient periods of tropical planation. Even the pediments of winter cold-climate deserts, such as in Iran and the southwestern United States, are ascribed to predefinition by older etchplains of the "tropicoid paleo-earth." Though many geomorphologists may fail to see the tropical paleoforms recognized by Büdel in Spitzbergen and in the Alps, all will be intrigued by his lucid discussion of modern tropical relief. Excellent field examples raise stimulating questions concerning the nature and origin of tropical landscapes.

The translators have generally accomplished wonders with a German vocabulary for which English equivalents are commonly inappropriate. Terms such as *Rumpffläche*, *Eisrinde*, and *doppelte Einebnung* all have critical meanings in Büdel's system of morphogenesis, and their translations ("etchplain," "ice rind," and "double planation," respectively) can only partially convey important subtleties of usage. The author's literary style is refreshing in a scientific monograph, yet it can border on verbosity and mixed metaphor. Thus, Büdel writes, "Chemically derived paleosol relicts . . . indicate that current transformation processes are merely performing on the stage set by inherited etchplain environments." The glossary is an essential component of this work; an atlas would be a welcome addition for locating numerous reference points in central Germany, India, Ethiopia, Morocco, and the central Sahara.

Despite the limitations of climatic geomorphology as a unifying theory and of German writing as a model of clarity and brevity, this is certainly a worthwhile book. The publishers deserve great praise for bringing this major work to a large English-speaking readership. In addition to the important exposition of climatic geomorphic theory, professional geomorphologists will enjoy Büdel's insightful criticism of competing geomorphic doctrines and his light description of field experiences. One sympathizes with his image of the north European geomorphologist longing for work in the Alps while awaiting the coming rainy season at a tropical field site. Moreover, one can also appreciate his parable concerning a misguided process geomorphologist "of a generation who no longer read A. Penck." This fictitious scientist studied processes on Alpine upland surfaces by "modern" methods, including soil analysis, grain-size distributions, clay mineralogy, slopewash monitoring, morphometry, and statistical analysis. Büdel observes, "His conclusion was that these processes created the trough shoulders of the Alps. His evidence for the certitude of these results was the indubitable precision of the analysis." The neglected fact was that the measured modern processes are all completely ineffective in modifying landforms that are relict from ancient times and that were formed by processes controlled by a completely different climate from that prevailing today.

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The Disposal of Public Land

Westward in Eden. The Public Lands and the Conservation Movement. WILLIAM K. WYANT. University of California Press, Berkeley, 1982. xiv, 536 pp., illus. $24.50.

The Politics of Wilderness Preservation. CRAIG W. ALLIN. Greenwood, Westport, Conn., 1982. xvi, 304 pp. $27.50. Contributions in Political Science, no. 64.

The story of how land and other natural resources belonging to the American public were distributed during the 19th century is a depressing tale of fraud and plunder perpetrated by citizens high and

low on the social ladder, by large and small business enterprises, and by individual settlers. In the process, a resource-intensive economy developed along with a belief that American natural wealth was inexhaustible. The latter perception resulted in prodigality. It is a sad tale because of the waste and because, as William K. Wyant observes, "Maldistribution of the public lands has a profound persistent social and economic impact."

To the extent that Wyant and Craig W. Allin relate the early history of land disposal, they merely rephrase and summarize the scholarship of Vernon Carstensen, Paul W. Gates, Roy M. Robbins, and other historians. Their important contribution is in their description and analysis of issues and events in the recent history of public natural resources. Allin concentrates on wilderness preservation, accomplishing for the political history of that subject what Roderick Nash did for the intellectual history of wilderness in America. Wyant's focus is on land disposal in general, including mineral, timber, and grazing lands. The literary styles of the two books differ markedly. Allin's chronological narrative is a sober and lucid legislative and administrative history. Wyant, a journalist, chose a topical approach, but his topics are not always discrete. Often he reaches too far for a metaphor or allusion; for example, concerning Interior Secretary Krug's statement about the degradation of grazing lands he writes, "Krug's statement was another alarm bell that went unheard. The same kind of report was being made a quarter century later, haunting and familiar, like the 'On the Trail' part of Grofé's *Grand Canyon Suite* played by a high school band." Both writers close with a description of the Alaska land settlement.

Neither writer clarifies the role of scientists and engineers. There is almost no mention of them in the pages of *Westward in Eden*, except for an occasional passing reference to obvious figures such as John Wesley Powell, Gifford Pinchot, and William Pecora. On this matter Allin's work is not much more illuminating. He states that George Perkins Marsh's *Man and Nature* (1864) "placed science on the side of forest preservation." Ferdinand V. Hayden's expedition of 1871 returned with photographs of Yellowstone, and Hayden may have helped to write the legislation making it a park. The American Association for the Advancement of Science, meeting in 1873, heard a paper by Franklin B. Hough entitled "On the duty of governments in the preservation of forests." The Association passed appropriate resolutions that resulted in a bill in Congress to create a forestry commission. Hough was the first commissioner of forestry. He and his successor, Bernard E. Fernow, along with Charles S. Sargent of Harvard, were instrumental in preserving a part of the Adirondacks. The American Forestry Congress and the AAAS lobbied for the Forest Reserve Act of 1891, and a report by the National Academy of Sciences stimulated the creation of new forest reserves by President Cleveland. Anthropologists supported passage of the American Antiquities Act of 1906, a significant law because of the broad powers it granted conservation-minded presidents from Theodore Roosevelt to Jimmy Carter. The Ecological Society of America advocated wilderness reserves for scientific study, a position endorsed by the AAAS in 1921, but when the National Park Service created such reservations it received "no particular support from the scientific community," and they were abolished. Aside from such scraps of information, Allin leaves us in the dark about the place of science in the history of conservation, although according to a widely accepted historical interpretation technical experts were chiefly responsible for conservation during the Progressive era, and although the Wilderness Act of 1964 defines a wilderness area as an area containing "ecological, geological, or other features of scientific, educational, scenic, or historical value." Wyant and Allin do deal with government agencies employing scientists and engineers, but the agencies are treated as political, not scientific, institutions, and the influence of science is not factored in to explain their behavior. The omission leaves an impression that scientific considerations were of no importance in the political process, only economic, recreational, and esthetic concerns.

Both Allin and Wyant conclude that recent events signaled the end of an older governmental policy to dispose of the public domain and the beginning of a policy to protect it. Allin stands somewhat in awe of the achievements, accomplished so quickly, given the usual sluggishness of the congressional system. Wyant worries more about weaknesses in federal environmental protection and about raids on the public domain by "sagebrush rebels" and mineral claimants taking advantage of the archaic Mining Law of 1872. Allin's thoughtful explanation of why he believes present wilderness areas are likely to remain intact deserves quotation at some length. "If Americans adhere to the concept of spaceship earth, then wilderness will be cherished for its naturalness and for its ability to preserve ecological systems. It will be preserved as a symbol of the natural order to which we must adapt our civilization. If, on the other hand, Americans see science as savior, the anticipated technological fix will make it unnecessary to give serious consideration to plowing up our protected wilderness. The economic gain potentially available by doing so will appear insignificant compared to our ever-increasing ability to accomplish what we want by technological means."

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A Scottish Mathematician

The Collected Letters of Colin MacLaurin. STELLA MILLS, Ed. Shiva, Nantwich, Cheshire, England, 1982 (U.S. distributor, Birkhäuser, Boston). xx, 496 pp. $35.

Historians of mathematics have long asked why the differential and integral calculus made little headway in the British Isles during the 18th century, even though Isaac Newton, an Englishman, was one of its inventors. No single satisfactory explanation has emerged, although a rigid adherence to Newton's inferior notation and a preference for geometry over analysis are the most likely candidates. An alternative approach has been to point out exceptions to the general rule. In this approach Colin MacLaurin appears as the most notable exception.

MacLaurin's advocacy of Newton's mathematics and methods went well beyond a mere popularization of Newton's ideas, a fact that was well recognized on the Continent. In 1722 MacLaurin traveled to France, where in 1724 he won the prize of the Royal Academy of Sciences for an essay on the collision of bodies. The mathematicians at the French Academy, Clairaut, Maupertuis, and Dortous de Mairan, waited impatiently for his *Treatise of Fluxions* (1742) to appear (Jean d'Alembert used it in his famous *Traité de dynamique* of 1743), and they corresponded at length with him over the vexing question of the shape of the earth. Thus MacLaurin was a key figure not only in the development of the calculus after the *Principia* but also in the transfer of mathematical ideas between Britain and the Continent.

Now with the collecting and editing of MacLaurin's correspondence completed