new edition, cut back on the space given to the origins of agriculture and related topics. When the grand but relatively simple explanations of agricultural origins are under siege is an odd time to be losing interest.

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Introduction to Climatic Geomorphology

J. Tricart and A. Cailleux

Longman, London, and St. Martin's Press, New York, 1972. xv + 295 pp., diagrs., maps, index. £5. Translated from the French by C. J. Kiewiet de Jonge.

Landforms of the Humid Tropics, Forests, and Savannas

J. Tricart

Longman, London, and St. Martin's Press, New York, 1972. xvi + 306 pp., diagrs., index. £5. Translated from the French by C. J. Kiewiet de Jonge.

Reviewed by Karl W. Butzer

THE first, French photo-offset edition of Cailleux and Tricart's *Introduction to Climatic Geomorphology* appeared in 1955 as the first of a set of five, completed with Landforms of the Humid Tropics in 1965. This long-overdue translation covers two of these volumes; yet to be published are those treating glacial, periglacial, and arid environments. The set constitutes the most complete and authoritative synthesis of "climatic geomorphology" ever attempted, bringing together two generations of international research relevant to an understanding of weathering, soils, geomorphic processes, and landforms specifically associated with major world environments.

The argument of climatic geomorphology is systematically developed in the general volume, beginning with a critical discussion of the Davisian cycle of erosion, showing its inadequacy to explain polygenetic landscapes in humid temperate France, arid landscapes in the Sahara, and humid tropical landscapes in Guinea. The authors follow with an analysis of the direct and indirect influences of climate on geomorphic processes, including the role of the vegetation and soil interface. Zonal, intrazonal, and azonal processes or forms are then defined, and broad environments, both latitudinally and altitudinally differentiated, are delineated as "morphoclimatic" regions. The concept of equilibrium in geomorphology is then discussed, and interruptions of this equilibrium for interacting environmental parameters analyzed—in particular the role of Tertiary and Pleistocene paleoclimates ("morphoclimatic shifts") and the impact of man. The final section presents a synopsis of the characteristic processes and forms of the basic world ecozones, anticipating the subsequent volumes.

The more specialized climatic geomorphology of the humid tropical forests and savannas begins with an outline of climatic variables, weathering processes, and major environmental subdivisions. Tricart discusses how worldwide processes, such as fluvial and littoral agencies, are modified in tropical environments. The bioclimatic environment of tropical forests is considered next, including the unusually active chemical weathering, the significance of mass movements and overland flow, and the characteristic landforms produced in different lithologies (sandstones, schists and shales, granite and gneiss). For the seasonally humid "savannas" the discussion begins with factors determining the nature of the vegetation, followed by sections on the nature and role of duricrusts, termites, sheet erosion, and the development of savanna plains. The impact of man and past environmental changes are considered in conclusion.

It is easy to criticize these volumes with the cumulative advantage of a decade of quantitative processual studies and ever greater facility in objective morphometric analyses, but these books must be understood as classical presentations of geomorphology as it evolved in France, Germany, and Poland between the 1920s and 1950s. There are many flaws, but the freshness of the environmental approach to the world's

major ecozones remains stimulating and, to the cultural and economic geographer, both accessible and valuable. Actually there is little demonstrably incorrect about the data or views, although the distinctiveness of landforms evolved unidirectionally or polygenetically in any one environment remains difficult to demonstrate statistically. We are therefore faced with a qualitative art—firmly grounded in weathering, soils, and sediment studies, and based on wide-ranging field experience—yet lacking in the ultimate proof that one or other hypothesis of landscape evolution is correct, or that scenic differences of slope profiles and landform constellations are real rather than perceived.

As a volume, the introduction is self contained, and a must for all students of geography who aspire to appreciate the environmental diversity of our planet. The humid tropics volume is less catholic in its outlook, evidently compiled in more of a hurry, and badly misses the impact of British and German fieldwork in Africa during the last ten years, yet no anglophone geomorphologist can now justify ignoring either volume, and recent British reviewers of the status of climatic geomorphology may even find partial access to the basic systematic writings and the rather differently slanted fieldwork peculiar to this branch of modern geomorphology.

The translation, by Kiewiet de Jonge, may be unimaginative, but it is accurate and comprehensible. We owe Kiewiet de Jonge a debt of gratitude for making these volumes available to wider, monolingual audiences; his task was a difficult one, making an acceptable translation of these voluminous works and then finding a publisher, at a time when publishing houses were under financial strain and generally unwilling to experiment with translations. It is to be hoped that the remaining volumes of Tricart and Cailleux's Niebelungen Ring will be translated as soon as possible. Hopefully, too, however, the principal author will before then put some of his academic staff to work to improve the quality and number of the illustrations, and above all, to subject the texts to at least a "light" revision, with updating of the bibliographies.

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Man's Impact on Terrestrial and Oceanic Ecosystems.

W. H. Matthews, F. E. Smith, and E. D. Goldberg, eds.

M. I. T. Press, Cambridge, Massachusetts and London, 1971. xiv + 540 pp., maps, diagrs., bibliog., index. $19.50.

Reviewed by F. Kenneth Hare

THE Study of Critical Environmental Problems (SCEP) was a workshop held in July, 1970, at Williamstown, Massachusetts, under the direction of Carroll Wilson, to whom this volume is dedicated. The workshop's report (the SCEP report) was aimed at the Stockholm Conference on the Human Environment. Although hastily prepared, it was a highly effective piece of lobbying by a group of U.S. scientists, led by meteorologists and ecologists, who wanted to influence Stockholm's outcome. The present volume reprints parts of the SCEP report, but also contains the impressive array of background papers prepared by forty-two ecologists and others.

The opening chapters (Part I) deal with the general ecological effects of man's activities. They include an analysis of the effects of pollution on the structure and physiology of ecosystems by George Woodwell, Bostwick Ketchum's study of estuarine and coastal habitats, and a review of the health effects research program of the National Air Pollution Control Administration. Part II contains chapters presenting deeper analyses of the impact of pollution on terrestrial ecosystems, and Part IV does the same for the oceanic ecosystems. Sandwiched between (in Part III) is a series of chapters on climatic change and its potential impact on agriculture, forests, and forest disease. The remainder of the long book deals with monitoring, with modelling techniques (including some purely physical models that seem out of place), and a series of papers on remedial action and environmental management.

It is always difficult to appraise collections of working papers. They differ in quality and depth of analysis, and the array leaves gaps that a single author might well have sought to fill.