structure is regulated through the ability of species to coexist by partitioning an array of resources. Hutchinson's brilliant student Robert H. MacArthur fashioned models from the local, contemporary population processes of Lotka and Volterra that predicted qualitative attributes of biological communities, setting off a flurry of empirical and experimental field investigations in the 1960's and 1970's to find support for the ideas. Ecologists, whose attention span is forcibly narrowed to the here and now by graduate school tenure, grant periods, and criteria for promotion, had at last found the largest of ecological systems brought within their own scale of time and space. History was deliberately relegated to the obscure shadows of classical biogeography, systematics and paleontology.

The scientific appraisal of the Hutchinson-MacArthur revolution has begun, and its basic position on history is becoming a major source of controversy. For Kingsland, this is not yet history. Even as she takes up Hutchinson and MacArthur there is a perceptible change in tone, seeming to expose a dispassionate historian struggling against the seductive power of intellectual excitement and promise. But the ultimate value of history derives from the absence of a boundary between it and the present. Although neither *The Background of Ecology* nor *Modeling Nature* lectures ecologists on their concepts, perceptions, or methods, the lessons of history will not be lost on readers of either book.

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Trends of Chemistry

Chemistry in America, 1876–1976. Historical Indicators. ARNOLD THACKRAY, JEFFREY L. STURCHIO, P. THOMAS CARROLL, and ROBERT BUD. Reidel, Boston, 1985 (distributor, Kluwer, Hingham, Mass.). xxiv, 564 pp., illus. $79.50. Chemists and Chemistry.

Those of us in the humanities find it hard to avoid feeling at least an occasional pang of envy as we survey the magnificent facilities and resources available to our colleagues in the natural sciences. We know, of course, that the sciences have not been immune from budget cuts in recent years. Nevertheless, to the outsider the natural sciences appear to enjoy an impregnable position in our society; their history seems like a tale of mounting status, wealth, and power punctuated only occasionally by such events as the depression of the 1930's and the inflation of the 1970's.

Chemistry in America, 1876–1976 does not overthrow all these conceptions, but it does make some of them untenable, at least as regards that science which has the largest community of practitioners, chemistry. The authors, four historians of science, have accumulated quantitative data whereby trends in the development of chemistry in America might be analyzed. They look at indicators as diverse as the employment of chemists, the pages devoted to chemistry in newspapers and encyclopedia yearbooks, and the frequency with which chemists have been appointed to college presidencies. Their conclusions are both simple and provocative. Chemistry, they tell us, has indeed grown steadily during the past century if its dimensions are measured in absolute terms; but when viewed against the growth of other occupations, disciplines, or professions, it has been in decline for the past half-century or more. Some examples may illustrate this point. Although chemists in the labor force have increased more than a hundredfold since 1870, chemists today represent a much smaller percentage of all professional and technical workers than they did in 1950 or even in 1920. In 1921 one out of every three persons engaged in industrial research was a chemist; in 1957 one out of every 19. Chemistry departments awarded one of every five doctoral degrees in 1940, but only one of every 15 in the early 1970's. The authors' tables yield scores of similar statistics. Where chemists used to hold leading roles in industrial laboratories, federal agencies, and universities, they now have been reduced to positions in ever larger supporting casts. Though they may still enjoy greater opportunities and privileges than colleagues in the humanities, their standing vis-à-vis engineers, physicists, and biologists has suffered erosion for decades.

What one makes of these findings will depend, at least to some degree, on one's disciplinary affiliation. If chemistry is indeed losing its share of the American market for scientific expertise, is that erosion a symptom of serious illness in the chemical profession? Does it, for example, indicate a loss of intellectual vitality? Or does it simply reflect a process whereby the science that was the first to become fully integrated into American institutions is now being joined by others that grow alongside it, but not at its expense? The authors refrain from making an explicit choice between these interpretations. On the one hand, they detect no sign that American laboratories are abdicating their position of leadership in research; although the American share of the world's chemical literature has declined in recent decades, the lion's share of the most frequently cited papers continue to come from American institutions. On the other hand, the authors repeatedly call attention to evidence of decay in exactly those things which any discipline requires for enduring prosperity: patronage, career opportunities, and public interest. Extrapolating from these trends, it seems improbable that intellectual leadership can long be maintained.

The authors, however, neither prognosticate nor prescribe. Nor, for that matter, do they attempt to interpret the past. Repeatedly they skirt precisely those questions which the historian would most like to see explored. Why was it chemists who played such a crucial role in the development of graduate education in America? What accounts for the extraordinary rapidity with which laboratory training established itself in schools and colleges at the end of the 19th century? How does the evolution of this science in the American setting compare with its history in Europe? The authors describe their goal as being akin to that of the medievalist who seeks to establish a pure text; they wish to establish reliable quantitative information that might serve as a prologue to more satisfying work on the history of science and science policy. In this they have succeeded richly; through painstaking effort they have retrieved an immense yield of valuable data. Nevertheless, I wish they had been less ruthless in suppressing their interpretative instincts and more forthcoming in discussing those issues which, after all, give those data meaning.

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The Stress Response

Changes in Eukaryotic Gene Expression in Response to Environmental Stress. BURR G. ATKINSON and DAVID B. WALDEN, Eds. Academic Press, Orlando, Fla., 1985. xviii, 381 pp., illus. $65. Cell Biology.

It has been 23 years since Ferruccio Ritossa discovered that heat and chemical treatments induce the formation of puffs in the polytene chromosomes of the salivary glands of *Drosophila* larva but only seven years since clues began appearing in the literature that virtually all organisms respond to environmental stress by rapidly changing their patterns of gene expression. Within minutes of an increase in temperature or the infliction of other stresses, there is a dramatic increase in synthesis of a limited number of proteins, referred to as heat shock or stress proteins. These proteins, which accumulate rapidly to become major cellular components, are thought to protect cells in some way from the deleterious effects of the stresses that induce their synthesis.

The unifying theme of this collection of papers on a variety of plant and animal systems is the universality of the response. About a third of the volume is devoted to aspects of the response in *Drosophila*, with the remainder equally divided between other animals and plants and fungi. The section on *Drosophila* contains chapters on the organization of the genes for the stress proteins, mechanisms for the regulation of expression at the transcriptional and translational levels, and the possible functions of the encoded proteins. On the whole these papers are quite successful in providing the reader with a sense of the current understanding of the stress response in *Drosophila*, for the authors have made an effort to put their own work into the context of the present state of knowledge in the field, as well as giving experimental results from their own laboratories. As an example, a paper by Southgate *et al.* provides a comprehensive summary of the organization and relatedness of the *Drosophila* heat shock genes, as well as a cross-species comparison of the conservation of these genes in evolution.

The two remaining sections are less organized, each being an assortment of papers dealing almost exclusively with the authors' own research on particular cell types, organs, or species. A paper entitled "Stress response in avian cells" by Schlesinger stands out; it is a lucid, well-organized review of the subject, dealing with the various stresses that can induce heat shock proteins and the tissue specificity of the protein induction and giving an interesting view of the complexity of the response. Unlike most collections of papers concerning the heat shock response, the book provides good coverage of work on plants. Of the 12 papers not dealing with *Drosophila* four are on plants. It is unfortunate that any discussion of the response in yeast has been omitted, since yeast is proving to be one of the systems most tractable to analysis.

Whereas the majority of the papers concentrate on the identification of the proteins synthesized, the stresses that induce their synthesis, or the regulation of the response, two papers in particular emphasize the possible functional aspects of the response. Li and Laszlo summarize their work on the thermotolerance of mammalian cells and the correlation of this thermotolerance with the presence of heat shock proteins. Ort and Boyer discuss the ways in which the adaptation of plants to various environmental stresses is related to photosynthesis and to productivity.

The volume will serve as a good source for readers who wish to obtain an overview of the research on the stress response that is being conducted in diverse organisms. Unfortunately, unlike other monographs in the series Cell Biology, it has no introductory or concluding chapter. An attempt to coordinate material is still very much needed in this diverse and often confusing field.

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The Environment of East Asia

The Evolution of the East Asian Environment. ROBERT ORR WHYTE, Ed. Tze-Nang Chiu, Chi-Keung Leung, and Chak-Lam So, Associate Eds. University of Hong Kong Centre of Asian Studies, Hong Kong, 1984. In two volumes. Vol. 1, Geology and Palaeoclimatology. xii pp. + pp. 1–413, illus. Paper, $HK120. Vol. 2, Palaeobotany, Palaeozoology and Palaeoanthropology. xii pp. + pp. 415–975, illus. Paper, HK$120. Centre of Asian Studies Occasional Papers and Monographs, no. 59. From a conference, Hong Kong, Jan. 1983.

The Centre of Asian Studies of the University of Hong Kong organized an international conference on the paleoenvironment of East Asia from the mid-Tertiary in order to initiate an interdisciplinary approach to the study of the environment in East Asia. The two volumes under review are the proceedings of that conference. Following a foreword by E. K. Y. Chen and a description of the scope and objectives of the book by R. O. Whyte, there are 59 papers more or less evenly distributed in five sections: geology, tectonics, orogeny, and geomorphology; paleoclimate and the evolution of modern climate; paleobotany, palynology, and the evolution of floras; paleontology and the evolution of faunas; and the physical and biological environment in which humans emerged. A few specialists not at the conference were invited to contribute to the book in order to make its coverage complete. In addition, the book contains two summaries by Whyte, one of the Italian scientific expedition to the Karakoram (or "Karakorum," as local pronunciation and etymology suggest) and the Hindu Kush and one of the International Karakoram Project that was organized by the Royal Geographical Society.

The geographical scope of the conference was defined as the part of Asia from 80°E to 150°E longitude (later extended to 75°E longitude to embrace also the Karakorum and associated ranges) and from 20°N to 50°N latitude. The People's Republic of China makes up by far the largest part of this area, and one of the outstanding features of the two volumes is that they contain a great many results of recent research from the P.R.C.

The central theme of the volumes is the changes that East Asia has experienced in geology, climate, and biota since about the Oligocene. In his introductory paper, Whyte stresses that the rapidly changing tectonic picture of East Asia since the beginning of the Neogene played an important role in controlling other natural factors influencing the evolution of East Asia. Along with most other contributors, Whyte emphasizes the effects of the uplift of the Qinghai-Xizang (Tibet) plateau and of the Himalayan range on the changes that occurred in the climate and biota of East, and especially, of Central Asia. The contributions do not converge on a consensus about the precise timing of the uplift of Tibet, but one gets the impression that none of the contributors seriously entertains the idea that Tibet was anywhere near its present elevation at the beginning of the Pliocene. Paleoclimatic, paleozoologic, and paleobotanic evidence seems to suggest that Tibet was elevated a couple of kilometers at most at the beginning of the Pleistocene. Many argue that Tibet's Pliocene elevation was about 1000 meters above sea level. The renowned Chinese master of Quaternary geology Liu Dongsheng and his co-author Ding Menglin concentrate on the climatic consequences of the uplift of Tibet and trace the effect of the plateau on atmospheric circulation back only to the beginning of the Quaternary. One can infer from the paper that the Neogene uplift of Tibet was insufficient to impede atmospheric circulation, and a contribution by Wang Pinxian supports this inference. In the section on paleozoology the authors are in agreement that the plateau was not a powerful barrier for faunal exchange until the late Pliocene.