ingly popular in comparative physiology and ecology, and three books on the topic have appeared during the past year. Two of these, by Schmidt-Nielsen and Calder, respectively, are reviewed here; the third is *The Ecological Implications of Body Size* by R. H. Peters (Cambridge University Press, 1983). Though some of the same ground is covered in all three books, Schmidt-Nielsen's deals principally with physiological and morphological scaling, Peters's with scaling of ecological factors, and Calder's with the entire spectrum. Both Schmidt-Nielsen and Calder have been major workers in the field of allometric analysis and have contributed much original research to its development and promotion. Their books and viewpoints are thus of particular interest.

Schmidt-Nielsen's book is the basic introduction to the topic. As we have come to expect from his other works, it is entertaining, instructive, and clear. The material, which is presented at a level appropriate for undergraduate biology majors, is developed logically and discussed thoroughly. The design is attractive, although the presence of the sea serpent on the dust cover is unexplained. The book proceeds from examples and definitions through a discussion of allometry of structural features to a discussion of scaling of metabolic rate. Delivery of oxygen to tissues and scaling of factors associated with activity and thermoregulation are discussed subsequently. The best sections are the initial ones, which elegantly demonstrate the utility and power of allometric analysis. The section on oxygen delivery has several undocumented assertions (for example, the length given for the minimum possible cardiac cycle). The section on activity repeats familiar material that Schmidt-Nielsen has reviewed several times; its references are highly selective and the discussion is not comprehensive. Philosophically, the author's viewpoint is that of an adaptationist; his statement on optimal design is a clear assertion of the economy of nature and the efficacy of natural selection. The criticisms of this viewpoint by Stephen Gould and Richard Lewontin are not so much met as ignored. A more spirited and robust defense of adaptationism would have been both enjoyable and educational. I have no doubt Schmidt-Nielsen could have provided a challenging and entertaining one.

Calder's book is a more comprehensive and advanced discussion of allometry, appropriate for graduate students or faculty with some knowledge of the topic. It contains a compendium of numerous equations gleaned from a very diverse literature and would be useful for that alone. The text spans the same physiological topics covered by Schmidt-Nielsen but also includes ecologically pertinent topics such as the effect of body mass on reproduction, growth, and life history and adaptive digressions from allometric expectations. The treatments of these topics are among the best sections of the book, along with an excellent section on thermoregulation. The recounting is often personalized with a fair amount of philosophizing. The weakness of the book is its organization. In the author's enthusiasm for his subject, he often fails to develop his presentation clearly. For example, the chapter on structural support jumps immediately into the match of empirical data with a model of elastic similarity. There is no prior development of models of geometric, static, and elastic similarity and their predictive consequences, nor is one presented subsequently. A reader probably would not be familiar with this topic and could not follow this discussion. Calder often attaches points of general importance for methodology and theory to discussions of other matters. For instance, the discussion of the important topic of intra- versus interspecific allometry is appended to a discussion of interordinal differences in metabolic rates of birds. It is consequently often difficult to locate desired material.

These are useful books in different ways and are important contributions to the popularization of allometric analysis. I wish, however, that they were more critical of the methodology of and future directions for the approach. Several points should have been developed that were not. These include some stipulations about appropriate sample sizes, mass ranges, and analysis of mean values and unequal sample sizes among species. Calder implies that sample sizes need not be large, but we have already seen a complete reinterpretation of locomotor costs of bipedality when the number of species examined was increased. This should be an important cautionary tale. The inappropriate use of b exponents to examine design limits (for example, to "test" symmorphosis) should also be discussed. An important analytical approach not discussed in these books is the analysis and removal of mass effects (for example, by regression), which makes it possible by analysis of residual variation, either intra- or interspecifically, to expose correlated factors. Phylogenetically the coverage of these books is generally restricted to birds and mammals, although this limitation was not always necessary or desirable. Future studies might profitably concentrate on analysis of observed pattern rather than more description. We are still, for instance, far from understanding the basis of the interspecific scaling of metabolic rate ($b = 0.75$), although the relationship has been apparent for over 50 years. The differential allometry of metabolic rate intra- and interspecifically as pointed out by Alfred Heusner is a serious challenge to those who would attempt to explain the physiological basis of metabolic scaling. Its analysis may provide important clues concerning the basis of these patterns. The explanation of Thomas McMahon relating metabolic rate to maximal power output is a useful first approach but fails to explain metabolic allometry in important organs, such as kidney, liver, and brain, that are unrelated to muscular power generation or oxygen transport. It seems to me that a harder look at the methods and future of allometric studies would have improved both volumes, especially Calder's, which is aimed at a more advanced level.

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An Expedition to Pakistan

The International Karakoram Project. K. J. MILLER, Ed. Cambridge University Press, New York, 1984. In two volumes. Vol. 1, xxx, 412 pp., illus. $79.50. Vol. 2, xxviii, 635 pp., illus. $89.50. From two conferences, Islamabad, June 1980, and London, Sept. 1981.

This two-volume set contains papers delivered at conferences that took place before and after the International Karakoram Project (IKP). The IKP was a major expedition into the remote Karakoram Mountains of northern Pakistan using the recently completed Karakoram Highway, which follows the old silk road between India and China. The project was undertaken, in a two-month period, during the summer of 1980 as part of the Royal Geographic Society's 150th anniversary celebration. It brought together earth scientists mainly from three cooperating nations, the United Kingdom, Pakistan, and the People's Republic of China. The principal studies involved glaciology, topography, seismology, housing as it relates to natural hazards, geomorphology, and geology.

The first volume contains papers delivered at the conference preceding the

expedition. About a third of the volume is thus devoted to descriptions of techniques for gathering desired data. About a fourth is devoted to descriptions of the results of studies in distant areas that used techniques intended to be used in the IKP. The remainder of the book mainly describes projects planned in Pakistan and neighboring areas. Six papers report new results from previous work in Pakistan that are of lasting value. Four papers report the results of glaciological studies by Chinese scientists. Israr-ud-Din of Pakistan reports the results of his studies of house construction in Chitral in relation to the geographic setting. H. M. Rendell reports new work on the Quaternary history of the Potwar plateau. This volume is largely superseded by the second volume.

The second volume contains the results obtained by the IKP. Much information is published here for the first time and not all of it can be reviewed. One of the most ambitious efforts of the IKP was a resurvey of the 1913 triangulation connection between India and Russia in an effort to detect tectonic deformation across the Karakoram. This effort entailed major mountaineering, for the stations to be reoccupied were mostly mountain peaks between 4000 and 6000 meters high. The survey itself was successfully accomplished, but significant tectonic deformation was not detected. A substantial effort was made in glaciology, and many new data were obtained that will be increasingly useful as these baseline studies are replicated. A microearthquake survey was made with a portable seismic network. Most of the seismicity was under the Hindu Kush to the west. However, important seismicity was observed for the first time in the Kohistan area of northern Pakistan (south of the Karakoram) and will provide guidance to future neotectonic studies. A large part of the volume is devoted to the study of housing and natural hazards. Many data on house construction and family use of homes were gathered that will interest ethnologists and anthropologists. A key element of the success of these studies was the presence of a female, F. D'Souza, for non-family males are not allowed inside the homes in this area. The housing team devoted considerable effort to attempts to determine the role of natural hazards in locating houses. Surprisingly in this area of very great natural hazard, they found that agricultural considerations, specifically preservation of cultivatable land and availability of irrigation supplies, essentially exclude natural hazards such as rockfall, mudflow, flood, and earthquake from consideration when new houses are located.

The longest part of the volume deals with geomorphology. Extensive data on current processes are reported. Perhaps the most unexpected result here is that a dissolved load yielding sediment of 90 tons per square kilometer per year was measured on the Hunza River, indicating that substantial chemical weathering occurs even in a high, cold, arid area where it had always been considered to be negligible. One of the best papers in the collection deals with the Quaternary history of the Hunza Valley. Eight separate glacial phases are recognized, the oldest of them more than 139,000 years old. The oldest stages are recorded by remnants several thousand meters above the Hunza Valley floor. The sole weakness of the study is a failure to consider the effects of tectonic uplift interacting with glacial episodes. With uplift rates of over 1 centimeter per year recorded in the area, the interaction must be significant. This is the first modern study of glacial chronology in northern Pakistan and will be of great value to other workers.

The IKP was an ambitious undertaking. Much was accomplished, but the project had the inherent weaknesses of short-term projects. In numerous instances previous work is not adequately recognized. Little effort was apparently made to assist Pakistani colleagues to continue the studies, particularly those that established baseline data. These proceedings volumes are not as tightly edited as one would wish, but they do contain substantial amounts of valuable information.

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