tially? At the moment, evidence can be marshaled to support various explanations. Although the results are inconclusive, they are nevertheless intriguing. Several papers in this section deal with the evolution of main sequence contact systems (W UMa stars), the most numerous sort of close binary system to be found in the galaxy. The vigorous, if inconclusive, discussion of the subject by the various contributors (Hazlehurst, Webbink, Flannery, Whelan, Vilhu and Rahunen, and van't Veer) is best summarized by the remark of the editors to the effect that the participants were unable to agree on an estimate of the lifetimes of W UMa systems to within a factor of 100!

The book belongs in the library of every serious student of stellar evolution.

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Immunity

The Generation of Antibody Diversity. A New Look. A. J. CUNNINGHAM, Ed. Academic Press, New York, 1976. x, 212 pp., illus. $19.75.

This compilation of a dozen essays on the subject of antibody diversity represents a genuine attempt to provide a fresh perspective on a subject of long-standing controversy. The dispute has to do mainly with whether the diverse information coding for multitudinous antibody structures exists completely in the genome of every individual ("germ line theory") or whether a small number of genes gives rise to the diversity by a series of mutational events during development ("somatic theory"). The editor himself clearly favors the latter theory and indeed extends it even further with his notion that diversification reaches its fullest extent as a result of antigen stimulation. Thus, there are three possible explanations for antibody diversity. First, there may be a large number of genes coding for the variable regions of light and heavy chains whose combinations can account for the large number of antibody structures known to exist. Estimates based on known amino acid sequences indicate that the number of such variable genes would have to exceed 10,000. In the second case, there may be a small number of genes ("pauci-gene" as opposed to "multi-gene") giving rise to a large number of antibody structures as a result of exaggerated mutational events occurring during the course of development. Finally, Cunningham's extension of the latter theory postulates that the increased diversity is prompted by antigen stimulation. In this case, combination with low-affinity antibodies on the parental lymphocyte surfaces would cause those cell lines to proliferate, which would in turn lead to a hypermutation-induced expansion of the antibody repertoire, with some of the antibodies having higher affinities. The theory has other attractive features, including plausible explanations of tolerance and self-nonself recognition in general.

Cunningham has chosen a set of authors who, in the main, provide circumstantial support for many of his own viewpoints. This is not to say that they all favor the notion of the necessity of antigen stimulation or even the idea that generation of diversity is primarily somatic. In fact, if my reading is accurate, two chapters definitely favor the germ line theory, five lean strongly to somatic schemes, and the remainder either sit on the fence or incorporate elements of both.

For example, D. G. Braun and his coworkers at Basel discuss the variability patterns of homogeneous antipolysaccharide antibodies ("clonotypes") and conclude that the different phenotypes observed in rabbits must be the expression of different genes in the germ line. At the other extreme, S. Tonegawa and C. Steinberg, in a chapter on RNA–DNA hybridization studies, present convincing evidence and arguments that there aren't nearly enough gene copies in the genome to account for antibody diversity.

There is a tantalizing chapter by David Baltimore and his colleagues on the unique occurrence of the enzyme terminal deoxynucleotidyl transferase in thymocytes, although the authors stop short of actually proposing that this enzyme is involved in the generation of antibody diversity. Other chapters providing apparent support for somatic models include a discussion of the somatic instability of mouse immunoglobulin genes by M. D. Scharff and his colleagues and a good chapter on lymphocyte population dynamics by G. Adam and E. Weiler. Peter Bretscher reviews some standard somatic arguments, especially as developed in his earlier collaborations with Melvin Cohn.

This a well-conceived book, one that anyone interested in the biology of the immune response can read with profit. On the other hand, the issue is clearly not settled, and the genuinely convincing experiments have yet to be executed. If anything, the distinction between "multi-gene" and "pauci-gene" seems to be growing fuzzier (how few is pauci?). And although Cunningham as editor and author has indeed tried to provide a new look at the problem, the large number of ad hoc arguments and models presented leads to an unavoidable and lingering sense of déjà vu.

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Biological Anthropology

The Measures of Man. Methodologies in Biological Anthropology. EUGENE GILES and JONATHAN S. FRIEDLAENDER, Eds. Peabody Museum Press, Harvard University, Cambridge, Mass., 1976. xl, 654 pp., illus. Cloth, $30; paper, $15.

Perhaps no one alive today has had such a profound effect upon biological anthropology as has William White Howells. It is with especial pleasure that one sees a tribute like this book, honoring Howells on his retirement from active teaching at Harvard, published while the principal continues to work away with no diminution, indeed with continuing growth, in his investigative powers. A bibliography included in this book reminds us of those many publications of Howells's that start with a 60-page report on the Mimbres Valley expeditions in the Peabody Museum Papers in 1932 and continue with six items, of which two are books, in the last two years. My reprint collection turns up yet five more contributions that have appeared since this volume was set in type.

The book also tells us of many other facets of Howells's contributions; the senior authors of the papers it contains were all students of Howells's, and many of the other authors have been heavily affected by his teaching. The range of institutions the authors now represent demonstrates that there has been no deleterious inbreeding here; and the spread of disciplines, methodologies, and citations in the various papers indicates enormous hybrid vigor. To those of us who have not been closely tied to the American scene, the nature of the interconnections of institutions and workers through Howells is most impressive.

The aim of the editors is, however, not only to provide a tribute to Howells but also to display the vitality of biological