Book Reviews

A Perfect Work of God

Galen on the Usefulness of the Parts of the Body. (Peri Chreias Morion.) (De Usu Partium.) Translated from the Greek with an introduction and commentary by MARGARET TALLMADGE MAY. Cornell University Press, Ithaca, N.Y., 1968. 2 vols., boxed, xiv + 804 pp. $25. Cornell Publications in the History of Science.

Written in Rome between A.D. 165 and 175, Galen's massive treatise on design in organic nature here first appears in English translation. *Usefulness of the parts,* known for centuries only in Greek, Latin, or Arabic, has heretofore enjoyed only two renditions into Western vernacular (both into French: Dalechamps, 1566; Daremberg, 1854–1856). Daremberg's familiar version was based on the Kühn standard edition of Galen (1822). Margaret May, while demonstrating full awareness of Kühn's text and acknowledging her indebtedness to Daremberg's translation and valuable annotations, has chosen as the basis for her rendition the critical edition of the Greek text by Georg Helmreich (Leipzig, 1907–1909), based on a fuller as well as earlier manuscript tradition. May's English version reads with a pleasurable ease which contributes much to the power of Galen's argument. The accuracy of the translation, however, and the reliability of May's textual interpretations can be judged only by the classicist or philologist (of which the reviewer is neither).

Galen's fundamental objective in this large treatise was to demonstrate that the structure of the human body was the direct product of intelligent and divine design. *Usefulness* was a "sacred discourse" composed as a "true hymn of praise to our Creator." The substance of Galen's demonstration was anatomical; that is, by careful and extraordinarily complete review of all parts of the body he would show that these parts and their associated structures were constructed in precise accord with the function or "action" assigned them by their Creator. The scope of the argument was truly exhaustive. Galen claimed to have proved that no body part made by Nature could be superfluous, defective, or without genuine "purpose." It was, moreover, impossible even to conceive a structure or structures which might "better" serve the designated function. Nature obviously had "neglected nothing," and in *Usefulness* Galen undertook to establish this conviction more firmly than had ever before been attempted.

This is the ancient and uncommonly viable argument from design: by contemplating the perfection of the object in nature we win knowledge of and offer praise to its maker. Nature itself is, said Galen, eternal testimony to the "wisdom, power, and goodness" of the Creator. May in her useful introduction to the translation describes the apologetic tradition in which Galen is writing. She also suggests, in a discussion much too brief to be compelling, possible Platonic roots (*Timaeus*) of Galen's conception of creative "Nature" or "God." The design argument is best known and disputed today in its Christian guise. The idea was, nevertheless, common coin in the Greco-Roman world (and elsewhere) and entered Christian thought largely through patristic writings. Galen in the second century of course antedated this development. He was, however, aware of "Moses" and of the fact that emerging Christian doctrine was incompatible with the views of those Greeks (Plato and himself) who had "treated correctly of natural principles." The Christian, unjustifiably in Galen's view, demanded divine omnipotence. The Christian God could bring forth beings *ex nihilo.* To Galen, devoted follower of Plato and Aristotle and fervent advocate of the necessity of a "material cause" which participated in all being, the Christian argument was incomplete and absurd.

No more, however, would he subscribe to the rival doctrine of exclusively material causation. While the Christian metaphysics was merely valueless, that of the ancient atomists was dangerous to sound philosophy. In the name of chance encounters of hard, impenetrable, and utterly hypothetical atoms it excluded from rational attention the important and, to Galen, indispensable providential quality so manifest in every living creature. *On the usefulness of the parts* was prepared largely as the definitive rebuttal of the atheistic materialism of the Greek atomists. Galen's great work, with its limitless instancing of design in organic nature, together with Aristotle's biological writings, offers therefore a base point for the lively genre of theistic apologetics as founded on the intricacy, harmony, and beauty of living things in nature.

Usefulness is divided into 17 roughly equivalent Books. Their sequence is in general by region and "action"—hand, arm, and leg; instruments of nutrition and of the *pneuma;* head, senses, and cranial nerves; spine and shoulder; reproductive parts; and "instruments common to the whole body" (arteries, veins, and nerves). In every section Galen sought to trace the "natural consecution" of the parts and that, of course, of the functions for which they were designed. Book 1 is a masterly exposition of the structure and flexibility of the human hand, unique instrument of a uniquely intelligent animal. The hand was long a favorite of design advocates, and Galen's description and argument invite comparison with Charles Bell's famed Christian apologetic, *The Hand: Its Mechanism and Vital Endowments as Evincing Design* (1833).

Not the least remarkable aspect of Galen's study is that it was accomplished in spite of the fact that the anatomical descriptions could not be based upon regular dissection of the human body. Such dissection had been characteristic of the early Alexandrian medical school but by Galen's time was being vigorously discouraged. In order, therefore, to describe and interpret the grandest creature in all nature Galen was forced to rely upon careful dissection of related animals and infrequently available human material. Even the Barbary ape, whose structure Galen so assiduously examined, was far removed from man. By comparison with man's, the ape's soul—in the Galenic metaphysical system, upon "soul" depended first "action" (function) and then "instrument" (the functioning structure)—was "ridicu-

lous," and so must be the ape's body; the latter was necessarily a "caricature of the human body." Fortunately, the zoological relationship between ape and man was far closer than Galen's theoretical demands seemed to allow.

In the living body, this "slime of fleshes and juices," Galen wrote, "there is yet an indwelling intelligence." To the student with an "open mind" here was real "evidence of a wise Creator," and he who could advance just this step would come to "understand the excellence of the intelligence in the heavens." Here is the core of Galen's argument in *On the usefulness of the parts of the body*. It and, even more, the wonderful interweaving of anatomical fact and physiological interpretation in the treatise have long been hidden from the English reader. May's translation now transforms this situation and makes easily available one of the most interesting and influential of ancient Greek medico-philosophical texts.

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Blood Protein

The Haptoglobin Groups in Man. R. L. KIRK. Karger, Basel, 1968 (U.S. distributor, Phiebig, White Plains, N.Y.). vi + 77 pp., illus. $4.80. Monographs in Human Genetics, vol. 4.

Haptoglobin is a hemoglobin-binding protein, present in the blood serum of many species, which was described unobtrusively some 30 years ago. The almost total indifference of investigators to this discovery was dramatically reversed when Smithies, in 1955, found that haptoglobin exhibited a remarkable genetic polymorphism. Since then many investigators in diverse fields have become actively engaged in carrying out studies of this interesting protein. Geneticists, biochemists, anthropologists, and physicians have all studied haptoglobin from their particular vantage points and have published their results in journals peculiar to their own fraternities. As a direct result, any but the most confirmed library hound is likely to be overcome by an attack of the snoozes if confronted with the task of assembling the scattered literature on the biology and biochemistry of the haptoglobin groups in man. All workers in the field are thus greatly indebted to R. L. Kirk, for his monograph is an admirable, up-to-date account, clearly and succinctly written, of the available information on haptoglobin. It will serve as a convenient reference book, for the author has tabulated the many mutant phenotypes in the haptoglobin system and has collated the world distribution of the various inherited haptoglobin groups.

Although the haptoglobin system has intrigued many scientists, it is probably of particular interest to those concerned with understanding the ways by which proteins evolve. The effect of nonhomologous crossing over, and other chromosomal rearrangements, on the structure of a protein molecule has been elegantly elucidated by detailed structural studies on this protein. Indeed, the chemical studies of haptoglobin are probably of more enduring interest than the plethora of uninterpretable data which have accumulated on the frequency of various haptoglobin mutants throughout the world. It is hardly astonishing that the gene frequencies for haptoglobin mutants vary in different populations; the significance of the variations, however, remains utterly obscure. Those who tenaciously adhere to the orthodox view that, if a gene exists in a frequency greater than can be accounted for by conventional rates of mutation, it is probable that the gene is maintained in the population by heterozygous advantage hold to a faith that in man is rarely experimentally testable. The brilliant example of the sickle-cell polymorphism and its importance in providing protection against infection with falciparum malaria may have given unwarranted encouragement to those who still seek to discover the biological significance of human biochemical polymorphisms by relentlessly tabulating variations in gene frequencies in different populations.

The volume is readable, well produced, and invaluable as a reference source, although it is not very much more than the sum of papers previously published. Ample illustrations, often redrawn from original sources, add to the clarity of the textual material. A more extensive discussion by the author, who has himself contributed very significantly to our knowledge of haptoglobin, of the general problem of human biochemical polymorphism would have added perspective and made the volume as stimulating as it is now informative.

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Views on Some Fossils

Notes and Comments on Vertebrate Paleontology. ALFRED SHERWOOD ROMER. University of Chicago Press, Chicago, 1968. viii + 304 pp. Cloth, $6.95; paper, $3.85.

A. S. Romer's new book *Notes and Comments on Vertebrate Paleontology* is an indispensable adjunct to his eminently readable and authoritative textbook *Vertebrate Paleontology*. Readers will recall that in the latter book broad coverage of the field is achieved at the expense of digressions into controversy which might or might not be enlightening, but which would certainly interrupt the flow of the story. In consequence, *Vertebrate Paleontology* has been criticized on occasion as being too neat, with too many answers and not enough questions. *Notes and Comments* resolves this point effectively and succinctly. In it Romer provides a view of the other side of the web that is vertebrate paleontology, to demonstrate how it has been put together, showing the patches and loose ends instead of the spectacular stretches of relatively continuous fabric that are usually portrayed. As he points out in his preface, to include this material in the text would have expanded it beyond all conscience. But by dealing with "personalities and polemics" separately, and including a supplemental bibliography of 509 entries, the author has the best of two worlds, that of factual coverage and that of opinion and philosophy, without enlarging the textbook to Teutonic proportions of four or five volumes.

Organization parallels that of the textbook, each chapter consisting of commentary on the contents of a specific textbook chapter. The general approach is historical and philosophical; a brief résumé of the history of knowledge of each group down to about 1933 is given, followed by discussion of progress (if any) since that date. Nothing is omitted, but the groups emphasized are, of course, those in which the greatest progress has been made or the greatest controversy aroused in recent times.

The book does not pretend to be an unbiased appraisal of the field, but is rather a very personal expression of the opinions and point of view of A. S. Romer, nowhere more evidently than in his approach to formal taxonomy and nomenclature. His pungent remarks on these matters in the introduction and at intervals thereafter will annoy or amuse, depending upon the