time, it should not be forgotten that most of the physicians now in the Medical Reserve Corps have not only left the comforts of their homes, but also have given up practises which in the majority of instances yielded far more income than the pay they would receive as medical officers of the Army even if they had conferred on them the highest rank that the proposed law would provide. Among these medical reserve officers are many of the most prominent men in our profession, including the leading men in the specialties, as well as our best surgeons and internists.

When the war broke out there were less than 450 medical officers in the regular Army Medical Corps. To-day there are commissioned, including officers of the regular Army, the National Guard and the Medical Reserve Corps, at least 17,000 physicians. Less than 1,000 are in the regular Army Medical Corps. Under the present law these regular Medical Corps officers are entitled to the grades of lieutenant-colonel and colonel; and in the case of the surgeon-general, to that of brigadier-general;[1] the highest rank that can be conferred on any one of the other 16,000—that is, on any reserve medical officer—is that of major.

May we remind our readers that the men in active service will be prevented by the regulations from using their influence in this matter, and that the duty of pushing this measure rests on those who stay at home? Every physician has representing him in Congress one man in the House of Representatives and another in the Senate. If every physician will let his representatives know that this proposed measure should become a law, and if in addition he will enlighten his neighbors in regard to the matter, an effective public opinion will be created. The time is opportune; congressmen are at their homes. Write or speak to your representatives now; get your neighbors to do likewise—not for the good of the medical profession, but for the good of the service.—*The Journal of the American Medical Association.*

[1] Surgeon-General Gorgas has the rank of major-general by special act of Congress.

SCIENTIFIC BOOKS

The Biology of Twins. By Horatio Hackett Newman, Associate Professor of Zoology, and Dean in the Colleges of Science, University of Chicago. University of Chicago Press, 1917. Pp. 1–185. 55 figures in the text.

Polyembryony, or the production of more than one individual from a single fertilized egg, although a phenomenon occurring constantly in some groups of animals, and occasionally in others, including man, is as yet unmentioned in our text-books of general zoology, where the impression is given, or the statement even definitely made, that, except as the result of experiment, a single zygote, resulting from a normal fertilization, invariably results in the formation of a single individual.

That in the Texan armadillo a single egg always produces four individuals, and that a much more numerous progeny results from a single egg in certain of the gall-wasps (*Copidosoma*), are facts that are now forcibly brought to the attention of zoologists through the long and arduous labors of the two associates, H. H. Newman and J. W. Patterson.

While the original papers are necessary for one seeking the details, the essential points obtained by these and other investigators to date have been placed in a single small volume where, appearing in a not too technical dress, they are readily and conveniently available, not to zoologists alone, but to the thinking public in general.

The work is based upon the Texan armadillo (*Dasypus novemcinctum*), which produces four young at a birth, all of the same sex. After an introduction and a preliminary chapter, setting forth what is commonly known concerning twins in general, mainly human, and their probable relation to double monsters, there follows in Chapter II. an almost complete sketch of the development of the nine-banded armadillo. This sketch includes "the whole range of stages from ovogenesis to birth, with but one gap which, it is hoped, the near future will see filled in." This gap is that of the early cleavage stages, but as a partial substitute for these Newman refers to his paper of

June, 1913 (*Biol. Bull.*), in which he records his observations on certain non-fertilized eggs, in which cleavage advanced parthenogenetically as far as the eight-cell stage, apparently in normal manner. In this chapter the gastrulation, the germ-layer inversion, and the formation of first two and then four embryos from the embryonic area, are given in order, followed by the subsequent separation of the four distinct embryos, each with its own amnion and placenta. Corresponding to their origin, two secondary embryos from the two primary ones, the four are distinctly paired, the two of each pair revealing a more complete identity than does either one when compared with a member of the other pair, and this relationship in certain extra-embryonal features, such as the approximation of the placentas of each pair, is shown in anatomical relations up to birth.

The condition in other species and genera of armadillo is presented in Chapter III., which shows that the number of young varies from *eight* (occasionally 7–12), polyembryonic ones in *Dasypus hybridus,* to *Euphractus villosus,* which is not polyembryonic, but produces fraternal twins from two separate eggs, or, occasionally, bears only a single young. The facts for this chapter are furnished largely by the work of Fernandez of the Museo Nacional at La Plata (Argentina), who has made special studies on the armadillos of South America, and whose first account of the polyembryony of *Daypus hybridus* appeared in 1900 (*Morph. Jahrb.*) almost simultaneously with the first paper of Newman and Patterson on the same phenomenon in *D. novemcinctus* (*Biol. Bull.*).

Chapter IV., although short, has a special interest since in it the author discusses causes of polyembryonic development, thereby bringing in something of the many theories that have been brought forward to account for human twins, at least those of the *duplicate* or monochorial type. The author considers the phenomenon one of fission, "if by fission we mean merely the physiological isolation of several secondary points in a single embryonic vesicle, and the consequent acquisition by these points of independence in growth and development" (p. 93). He assumes a considerable amount of differentiation to have occurred before these points become isolated, "so that genetic factors are unequally distributed in the various regions which give rise to the new apical points," and thus if two embryos are developed from closely adjacent territory they are likely to be more nearly alike than those which are a greater distance apart on the blastoderm. This accounts for the phenomenon, substantiated by hundreds of observations, that the closely adjacent twins of a pair, where the placentas are nearly in contact, are closer duplicates that are individuals taken from the two pairs.

Chapter V. considers the phenomenon of the free-martin in cattle, or the occurrence of a normal male twin with an imperfect twin, variously considered an hermaphrodite, an imperfect female, or an imperfect male. The author was fortunately able to avail himself of the work of Lillie and his pupil Miss Chapin, previous to its publication (*J. Exp. Zool.,* July, 1917) and thus presents this work as revealed by the latest investigation. This shows conclusively that the free-martin is a sterile female, with abortive gonads, and with certain of the secondary characters of the male due to the influence of male hormones from the associated male, obtained from the blood circulating in the common placenta. This is a totally different phenomenon from that presented by armadillos, as the twins are here of the fraternal type (*dizygotic*), and in the latter true duplicates (*monozygotic*).

The two final chapters, VI. and VII., show the various contributions to general biological problems afforded by the study of twins, especially in the case of variation and heredity, and here the work of the author and his associate on armadillos, where the scales of the carapace are used to show the amount of identity, links up extremely well with that of Wilder on human twins, who has employed in a similar way the conformation of the friction-ridges of the palms and soles. Indeed, there is probably more than a general correspondence in method between these two independent series of investigations, since it is altogether likely that the human friction-ridges are

formed of rows of integumental scales, and that they are thus the same sort of organ as are the bands of the armadillo carapace, which Newman finds so convenient for the comparison of individuals.

The last and longest chapter, Chapter VII., gives a detailed study of the results of both lines of investigation, and presents, with numerous illustrations the strange correspondences in detail in the external characters of monozygotic twins, whether found in the carapace of the armadillo, or in the palm and sole ridges of man. These two series of studies serve to strengthen each other, and are shown to be essentially similar phenomena, of great biological significance. In the facility with which embryonic material of every stage may be obtained the armadillo has a decided advantage over man as a *Versuchstier,* although in the enormous amount of detail presented by human palms and soles, and the readiness with which they may be compared in the form of prints, there are certain distinct advantages in the study of man. If once the essential identity of the phenomenon of polyembryony in *Dasypus* and *Homo* be generally recognized, those parts of the history of human duplicate twins (and perhaps, of double monsters as well) which are beyond our power to observe directly, may be satisfactorily supplied through the study of the corresponding stages in the armadillo; while the correspondences in the friction-skin configuration of human monozygotic twins may be added to those observed in the carapace of the armadillo to show the amount of power possessed by the germplasm, or some other element or elements of the egg, to determine the details of the adult soma. H. H. W.

Economic Geology. By Heinrich Ries, A.M., Ph.D. Fourth edition. John Wiley and Sons.

The appearance of the fourth edition of this excellent and standard book on the subject, in the midst of a year of battle largely as to supplies of war materials, deserves attention, since the change of publishers has been marked by thorough rewriting and extensive additions.

The statistics and references are brought down to 1914–15, showing the first effect of the war, but not the rebound. Not only are there 25 per cent. more illustrations, but many of the less legible ones are redrawn and greatly improved. Compare, for instance, those on pages 529 and 545 of the new with the corresponding figures on pages 367 and 378 of the old. A large number of half tones taken by the author show that the descriptions of the various ore deposits are not mere compilations. This is perhaps the main use of some of them, for undated views of a mine do not show what now is. Would it not be well if in scientific works the date of views were always given?

The main improvement of the book, however, is that it now includes descriptions, in but slightly smaller type, of the chief rival ore deposits in other countries, and thus makes possible a much more comprehensive handling of the great question of ore deposits. For instance, the Swedish deposits of Kiruna receive first-hand treatment, and there is a plate of a section of Luxembourg iron ores. While the treatment is and must be brief, there are always one or two recent references to start one on further search. The summaries of different views as to the origin of ores, for instance, Cuban ores, though brief, are well done. While the author does not hesitate at times to express his own views, yet he gives rival views. The account, for instance, of the oölitic iron-ore deposits could hardly be improved for so brief a statement.

While of course the publications of the United States Geological Survey have been largely used, they are by no means the exclusive source, and the various publications of the mining engineering societies have been also duly consulted.

The table of geographic and geologic distribution of coal in the United States is a new and valuable feature, and the general subject of coal receives very satisfactory treatment. If the source of the analyses of coal on pages 8 and 9 is given it has been overlooked by the reviewer.

The treatment of copper has been brought to date by reference to the Nonesuch Lode.