nautilus forms new chambers in its shell. The breathing of the animal is in striking contrast to that of many other cephalopods. In *Octopus,* for instance, the inflation and emptying of the respiratory cavity involves the combined action of the muscular mantle and the funnel; in *Nautilus* the operation is carried out exclusively by the funnel, the mantle being a thin membrane applied to the inner surface of the shell. From the fact that animal bait of almost any kind may be used with success in capturing the nautilus, it is probable that this mollusc feeds naturally on almost any animal substance. Apparently it inhabits normally the bottom of the sea, for those taken near the surface are nearly always moribund. The wounds of injured specimens heal at the edges, but without regeneration. Variation was most noticeable in the disposition of certain unsymmetrical organs. Thus the main siphuncular artery may arise from either the left or the right division of the posterior pallial artery. In one instance a *situs inversus* of the reproductive organs was observed, in that the vas deferens was found on the left side instead of on the right and the pyriform gland was on the right, instead of the left. These and many other new observations on the structure and natural history of the nautilus fill the concluding part of the 'Zoological Results' and bear witness to the energy and patience of Dr. Willey as a field zoologist and explorer, even though in the end he was obliged to abandon his quest for the developing eggs of the pearly nautilus.

G. H. Parker.

Harvard University.

SCIENTIFIC JOURNALS.

The Journal of Comparative Neurology for June contains four leading articles, besides the usual book reviews: (1) 'An Enumeration of the Medullated Nerve Fibers in the Dorsal Roots of the Spinal Nerves of Man,' by Charles Ingbert. There is given a figure of a typical cross section of each dorsal spinal root, with a tabulation of the number of nerve fibers in each fascicle of each root. The total number of medullated nerve fibers in the dorsal roots of the left side of a large man is 653,627; the total area of the cross sections of these roots is 54.93 sq. mm.; there are on the average 11,900 medullated nerve fibers per sq. mm. of cross-section of these roots. This paper will be followed by a similar enumeration of the ventral roots. (2) 'On the Phylogeny and Morphological Position of the Terminal Buds of Fishes,' by C. Judson Herrick. On both physiological and morphological grounds these organs are to be classed with the taste buds of the mouth cavity and not with either tactile or lateral line organs. (3) 'On the Nature of the Pericellular Network of Nerve Cells,' by Shinkishi Hatai. Supports in general the views of Held that this network is composed of the terminal arborizations of axones of other neurones and concludes that the networks of Golgi and Bethe are of the same type. (4) 'The Neurokeratin in the Medullary Sheaths of the Peripheral Nerves of Mammals,' by Shinkishi Hatai. A new technique brings out the details of the structure of the neurokeratin framework more clearly than has hitherto been done. This substance is arranged in two layers, one beneath the primitive sheath and the other along the axis cylinder, which are connected by bands of neurokeratin which run obliquely from the outer to the inner layer in a funnel-shaped pattern. Neither the outer nor the inner layer is interrupted at the nodes of Ranvier.

The statement recently quoted in this journal regarding the establishment of the *Journal for Infectious Diseases* to be edited by Professors Ludvig Hektoen and E. O. Jordan is inaccurate. The journal is supported by contributions from Mr. and Mrs. Harold F. McCormick, but no specified sum has been given to endow the journal. It is to be published by the Memorial Institute for Infectious Diseases, not by the University of Chicago.

DISCUSSION AND CORRESPONDENCE.

THE GRAND GULF FORMATION.

To the Editor of Science: The communication of Dr. Dall on the Grand Gulf forma-

tion in your issue of July 17 seems to call for some comments on my part, since I am originally responsible both for the name and definition of that formation as such. The situation appears to me to be this, that while Smith and Aldrich bring what seems to be irrefragable proof that what I have described as the Grand Gulf formation is newer than any well-defined Oligocene, Dall lays stress upon the reported dipping of the Grand Gulf under Oligocene strata in Florida and Texas, and suggests that the 'Grand Gulf Sandstone' of Wailes is the original genuine Grand Gulf, with which certain clays and lignitiferous strata have subsequently been, perhaps wrongfully, associated.

Now as a matter of fact, Wailes used the term Grand Gulf sandstone merely as a lithological designation, not as the name of a formation; and while he correlates with it the sandstones of some other localities, he describes under the same general heading other light-colored sandstones, belonging, respectively, to the Burstone and to the Lafayette. On the other hand, he distinguishes by the name of 'Davion rock' the undoubted equivalent of the Grand Gulf at and below Fort Adams, Miss. According to usage, I might have adopted any other name for the formation as a whole, since Wailes failed adequately to characterize it. But as I found the exposure at Grand Gulf to be a really generalized and representative one, I thought it best to apply Wailes' lithological designation to the formation as a whole. It rests with me, therefore, to justify my correlation of the sandstone formation of the central portion of the Mississippi embayment with the clay formations from the Pascagoula to the Sabine, leaving to others the proof of identity beyond these limits.

In the absence of specificially identifiable fossils, it is not easy for the field geologist to satisfy the critics at home as to the correctness of his perception of that often indefinable something called *facies,* which is nevertheless oftentimes as cogent as specific identities of fossils, especially with the modern view of species. Even in the absence of the chalcedonization which characterizes the genuine (and rare) Grand Gulf 'petrified sandstone,' the sandstones of the Grand Gulf age can not easily be mistaken in the field for any of those occurring in other horizons in the southwest. From the Bayou Anacoco on the Sabine, via Bayou Funne Louis to Harrisonburg on the Washita, and from Grand Gulf to Raleigh, Miss., its facies, both lithologically and stratigraphically, is unmistakable, although the chalcedonized rock facies is mostly absent and everywhere, except at Grand Gulf, quite subordinate; mostly in thin ledges or lenticular masses. The sandstones, mostly rather soft, tend to cleave vertically rather than horizontally, and are markedly poor in mica.

The clays occurring interstratified with sandstone layers and ledges are sometimes, but not always, as characteristic as the sandstone itself, but much more so when occurring independently in large masses, as is especially the case on Pearl River and its tributaries. Doubtless the physical analysis of these massy clays, which range in tint from blue and green to reddish-gray, would be found to indicate the characteristics which render them so strikingly dissimilar to those of other formations of the southwest, whether older or later. One of their characteristics is the almost total absence of mica, which is so abundant in the earlier Tertiary as well as in the later Lafayette and is there conducive to the prevalent lamination; indicating apparently a derivation from different sources, not so far inland as to reach the micaceous metamorphics. The clays mostly contain a very large proportion of fine siliceous silt, so that while plastic they are not usually very adhesive. They are (especially in Louisiana) not infrequently consolidated into a soft siliceous claystone.

A highly interesting feature of the Grand Gulf clays is the local occurrence of calcareous concretions and veins, which I think may fairly be attributed to the presence, locally, of a rather copious fauna of shells, whose shape has been destroyed by maceration. In the calcareous clays underlying the 'Anacoco Prairie' in western Louisiana, many of the

concretions can almost as readily be construed into the forms of Natica, Nerita and Paludina as they are shown in the somewhat similar clays of the Port Hudson age, on the islands of Petite Anse and Côte Blanche. Here every degree of transition from the almost perfect shell into the roundish concretions can be traced; and I do not despair of a similar state of things being found within the largest calcareous deposit of the Grand Gulf area on the Anacoco when it shall be examined more at leisure than it was possible for me to do in 1869.

So far then as the central portion of the Grand Gulf formation in Mississippi and Louisiana is concerned, I see no escape from the conclusion that the sandstones and associated clays are rightly considered as being of one and the same geological age and formation, whether representing the upper Oligocene or later stages of the Tertiary. The hiatus between it and the Lafayette is emphasized alike by the extension of the latter two hundred and fifty miles farther inland, and by the totally changed lithological character of the materials, a change so great that it is hard to believe that the same Gulf waters should have produced both at any short interval of time. The conformity of the Lafayette to the Grand Gulf, referred to by Dr. Dall, is rather a delicate question when dealing with a formation of which stratification lines and dips are hardly predicable. The Lafayette overlies the Grand Gulf as it overlies every other formation in Mississippi and Louisiana, and it is there undoubtedly the next succeeding formation; but intervening beds may be found elsewhere. What was the nature of the event that caused the remarkable change in the whole nature and distribution of the two deposits must still, I think, be considered an unsolved problem.

E. W. Hilgard.

Berkeley, Cal.
July 22, 1903.

ANTARCTICA.

To the Editor of Science: My many American friends will be amused by the innuendo that I hate Americans which runs through Mr. Balch's notice (in your issue of July 10) of my review of his book in the *Geographical Journal* for May. It has always been a privilege of men of science to criticise each other's work as if they were members of one family, and I can conscientiously say for myself that I am without prejudice as to race, creed or nationality. Should I or any other European geographer differ from Mr. Balch or Fanning or Morrell, it is not because they are Americans and we are not, but because we think that in certain points they are mistaken.

The Atlantic is too wide for a comfortable controversy in a weekly journal to be conducted across it; and I do not think it would serve any useful end to reply to Mr. Balch's letter in detail. I fear that my review is too long for you to reprint, but nothing shorter would give a correct impression of my opinions on the points dealt with in Mr. Balch's very stimulating book. I should be glad if both were widely read.

Yours is a land of millionaires; the Antarctic is still scarcely touched by explorers, and all nations would rejoice to see a well-equipped American expedition sent out to help to solve the present problems which after all are those most nearly concerning us.

Hugh Robert Mill.

62 Camden Square, London, N. W.,
July 21, 1903.

SHORTER ARTICLES.

A NEW MOSQUITO.

Since mosquitoes have attracted so much attention of late through the part they play in the transmission of certain diseases, anything new that pertains to them or their life history may be of importance. In view of this fact, a brief description of a new species—which has been given the name of *Eucorethra underwoodi*—should be of interest. While this particular insect does not bite, and for this reason should not perhaps be regarded as a true mosquito, it has, however, been classed as one since it belongs to the family Culicidæ. The larvæ of this insect were found by me on January 27, 1903, in the Maine woods in the eastern