Dr. Georg Karsten, docent in botany in Kiel, Dr. Richard Abegg, docent in physical chemistry at Göttingen, and Dr. Böhming, docent in zoology at Gratz, have been promoted to associate professorships. Dr. Reitzenstein has qualified as docent in chemistry at Würzburg and Dr. Simon as docent in physics in Göttingen.

DISCUSSION AND CORRESPONDENCE.

SUBSTITUTIONAL NERVOUS CONNECTION.

In a series of recent papers the writer has endeavored to show that the idea now apparently dominant that, with the single exception of the olfactory, the peripheral nervous connections are indirect rather than direct is an unwarrantable assumption. It has been found possible to demonstrate in the skin termini of nerves which are, so far as can be seen, unimpeachable instances of connection by continuity. These are then of the same nature as the connections of the olfactory cells with the fibres of the olfactory nerve. On the other hand, it appears that some of the most careful observers have detected simliar rod-cells with special nervous functions which are only in indirect communication with the nerve which conveys the stimulus. If it could be shown that the sensory cells are uniformly without nervous processes it might be assumed that they constitute by themselves a special class of nervous organs which normally do not acquire the neurite, but the admitted existence of such a process of the olfactory cells and the fact that these cells are otherwise so similar to the other instances of nervous endings, in which it seems to be proved that this sort of direct connection is absent, prevents the possibility of establishing such an independent class of structures. Still more, if our own observations are taken into account, it seems necessary to offer some other suggestion to account for the discrepancy in this particular. Take, for illustration, the case of the organs of taste, which, in spite of their evident resemblance to the olfactory termini, are generally stated to have only indirect nervous connections. I have elsewhere suggested the possibility that in the case of these sense organs the original proton is to be found in the same paired bands of cells from which the olfactory epithelium is derived. It is admitted that to these other elements have possibly been added by way of the gill clefts, but it seems only natural to suppose that the palatal portion, at any rate, may have had the origin suggested. If this were so, it is evident that there is no relation between the position of the peripheral proton and the source of the nerves supplying these organs. It might be suggested, therefore, that the original nervous communication having been lost, the new connection has been established in a secondary manner by the apposition of what at one time were free termini between the cells to these specialized cells. If the illustration chosen appears far-fetched, a more general illustration will indicate still more clearly the application of theory proposed. There can be no doubt that, on any theory of evolution of the higher vertebrates from the lower, a difficulty arises in the attempt to construe the fact that the lateral line organs with their homologues and allies do not seem to obey a constant law of nervous supply, while in the higher vertebrates it is difficult to follow the transformations which these organs have undergone. It is possible that these difficulties will largely disappear if the probability be admitted that, in the course of evolution, the original connections have been lost or diverted and that new ones have then been established by the application of some of the free nerve endings to the cells thus deprived of their original nervous connections. That some such changes have taken place seems to the writer more than probable. If this be admitted, it is not to be wondered at that in the lower vertebrates especially the two sorts of endings may be encountered side by side in different parts of the skin. It is not the present intention to enlarge on or illustrate this thought, which is thrown out in the hope that the suggestion may prove fruitful in the hands of others.

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THE EXHIBITION OF CETACEANS BY PAPIER MACHÉ CASTS.

To the Editor of Science: Mr. F. A. Lucas calls my attention to the following passage in an editorial notice of the new Cetacea Gal-

lery in the British Museum, in the July number of *Natural Science* (p. 10):

"No museum has hitherto solved the difficulty of exhibiting the outward form of the various kinds of whales which baffle the taxidermist's art on account of the oily nature of their skin. At last, however, Sir William Flower has solved the problem in a most satisfactory manner, and the result is a unique addition to the Department of Zoology in the museum over which he presides."

The solution referred to consists in exhibiting *papier maché* casts of one-half of the exterior of the various cetaceans, colored as in life, and placing the skeletons in the concavities of the casts.

Sir William Flower would, I am sure, disclaim originality for this excellent mode of exhibiting cetaceans, as it has been in use in the National Museum for more than fifteen years. In the Report of the Smithsonian Institution for 1882 (p. 125) will be found the following statement:

"Mr. Joseph Palmer, chief modeller, has been engaged during a large part of the year in mounting the skeleton and cast of a humpback whale, 33 feet in length, which now stands in the south main hall. This is the largest cast of an animal that has yet been made, and is unique in conception. Viewed from the left side, the visitor sees the cast of a whale in the attitude of swimming through the water. Standing on the right, he sees the concavity and inner outline of the half cast, in which against a suitable background is mounted the articulated skeleton of the animal."

This interesting specimen is now in the south hall of the Museum, where it has been exhibited since 1882. The idea of showing exterior and skeleton together originated, I believe, with Professor Baird, who took great interest in the specimen referred to, and never failed to point it out to his friends when passing through the Museum.

The Museum has a large series of painted casts of the smaller cetaceans, some of which were made as early as 1874, and a number of replicas were shown at the Berlin Fisheries Exhibition in 1880 and were afterwards taken to London at the time of the Fisheries Exhibition in 1883. Some of these, if I remember correctly, were left in the British Museum by Dr. Goode at the close of the latter exposition.

FREDERICK W. TRUE.

U. S. NATIONAL MUSEUM,
July 11, 1898.

SCIENTIFIC LITERATURE.

A Treatise on Magnetism and Electricity. By ANDREW GRAY, LL.D., F.R.S., Professor of Physics in the University College of North Wales. Macmillan & Co. 1898.

The first volume of this treatise awakens a strong desire in us to see the second volume which is promised. The author in his preface states that his effort has been to produce not a work on the mathematical theory of electricity merely, but also to describe the fundamental phenomena, and "to show how they fall into their places in the general scheme of electrical action, and to point out the consequences to which they lead."

There have been many attempts to simplify and amplify Maxwell's great work, and the student now has various aids to enable him to comprehend it, which were not accessible twenty years ago. A distinguished professor of physics once pointed out to me two editions of Maxwell's book, worn and dilapidated by constant use, and remarked: 'I am proud of them.' That treatise certainly contained strong food. Long grappling with it and night oil burned in studying it led to a certain grip of the subject, the evidence of which we see in such books as Professor Gray's. The student now has Poincairé's treatise; Helmholtz's lectures on the electrodynamic theory of light, Drude's Physik des Ethers; Oliver Heavyside's work; Professor J. J. Thomson's Electricity and Magnetism, Hertz's Modification of Maxwell's fundamental equations, Webster's Electricity and Magnetism, and the work before us.

A critic should carefully examine the aim of the author and should not take him to task for omissions that were made designedly, and should not endeavor to instruct him in regard to what he should have done, but rather should aim at weighing what has been accomplished. One should, therefore, carefully read Professor Gray's preface, and heed its words in regard to