repeatedly struck, during his teaching experience, by the sound discrimination *in dealing with scientific ideas* displayed by students trained in the humanities. As a rule they have shown a better sense of values than students whose experience has been primarily scientific. Is it not possible that the drive against the humanities has been too successful? These subjects concern themselves with the task of evaluating ideas. Does the science student, busy with the acquisition of descriptive details and technique, have any proper substitute for them?

The choice seems fairly clear. On the one hand we may rigorously select those whom we permit to go ahead as botanists and see to it that they are soundly educated. Even so there will be many useful workers interested primarily in manipulation, but their interest should not be a blind one. On the other hand we may encourage students of mediocre intelligence and narrow training to fill the ranks. If we choose the latter course we commit ourselves to a policy of helotism in the realm of ideas. In such case it will be a cause for thankfulness rather than chagrin if those who perform the routine have nothing to say concerning the significance of their work.

PAUL B. SEARS

UNIVERSITY OF NEBRASKA

FUNCTIONAL DIVISIONS OF THE NERVOUS SYSTEM OF INSECTS

FROM time to time attempts have been made to homologize structures in widely separated groups of organisms. This is interesting but apt to be rather unsafe. The functional divisions determined in the nervous system of vertebrates have aided greatly in the determination of the nature of the various parts of this complex system.

In insects there is a similar complexity of function and structure. An analysis of the parts of the nervous system of arthropods in terms of function has been going on for some time. In no other group, with the exception of the vertebrates, has so much been done. However, somewhat different methods must be used and our knowledge is far from complete. Regeneration methods, for instance, are not very successful, nor are degeneration tracts easily traced. The chief method, then, for determining peripheral and central parts is by the use of the intravitam methylene blue stain followed by dissection. In a few cases serial sections may be used, but the tough body-wall often hinders the preparation of perfect slides.

Two years ago I found an exceedingly valuable source of material for this study in the flat, transparent larva of the beetle Dendroides. In this insect it was possible to trace practically all parts of the nervous system in abdominal segments. In a successful preparation there was a bewildering abundance of nerve structures shown with a clearness and completeness of detail that was remarkable. This often included both the central and peripheral systems at the same time. There were details in the central ganglia, the nerves of the intestine, of the heart, the nerves of the spiracles, nerves to all the muscles of the segment including both afferent and efferent terminations and the extensive receptor system of the body-wall. It was from the results of such a study that it was determined, for instance, that muscle cells had both afferent and efferent terminations, the former by means of bipolar cells located on the muscle fibers, the latter by extensive complex end-plates supplied by nerve cells from the ventral ganglia by a special motor branch. It was also determined that at least ten nerve cells supplied each muscle fiber of larger size. It was determined that the so-called median nerve was composed of two parts and that the lateral nerves from these strands had components, from both above and below, from cells in the two nearest ganglia. The lateral nerves were traced to spiracles. It was determined that the so-called heart was supplied by strands from the motor branch of each ganglion; the fibers from these nerves were not all confined to the segment from which they spring. It was determined that the intestine was supplied by visceral ganglia which give rise to a superficial and a deep plexus with motor fibers from the central ganglia and sensory fibers from the intrinsic nerve cells of the plexus. It was found that the superficial nerve plexus contributed to the afferent and efferent supply of the Malpighian tubules.

Other recent studies have added much to our knowledge of the nervous system of insects, notably Zwarzin (*Zeit. f. wiss. Zool.*, 1924) and Orlof in the same publication. As a result of their work and mine the following seems to be true:

(1) The visceral system of insects consists of the so-called visceral ganglia in the head region with nerve extensions along the digestive tube. Receptor cells in the wall of the intestine of a bipolar or tripolar nature may in part be from muscles. The effector cells seem to be located in the visceral ganglia.

(2) The somatic system consists of bipolar cells ending in hollow hairs of the body-wall. Similar cells and some of a tripolar nature end in the body-wall without hairs. These also seem to be receptors. The effectors are located in the ventral ganglia of each segment and supply nerve endings to the body muscles.

(3) Fibers or cells or both often form a peripheral

network in the skin between the bipolar terminations. These may associate the different regions.

(4) The so-called unpaired nerves send lateral branches to the spiracles. They are not a part of the sympathetic system.

(5) Heart muscles in part seem somatic, judging from their nerve supply.

(6) Various functional divisions of the ventral ganglia made in terms of peripheral nerves such as shown by Zwarzin are suggestive but far from conclusive as yet.

WILLIAM A. HILTON

POMONA COLLEGE
CLAREMONT, CALIFORNIA

THE INDEX GENERALIS

THE "Minerva," or annual of the universities, which had a very modest beginning, but grew in the course of years until it had the proportions of a lexicon for a foreign language, had come to be more and more depended upon by university men as an indispensable book of reference. Published by Karl Trübner, of Strassburg, it came to a sudden end with the outbreak of the European war.[1] Now once more in possession of Alsace, it has been a matter of pride for the French to take over the task of supplying a university annual, and under the name *Index Generalis* they have issued an enlarged and improved "Minerva."[2]

Two ministries have made subventions for the publication and the huge task appears to have been taken very seriously. The value of such a work must depend very largely upon the correctness and the recent date of the information collected, and in no small degree upon the proofreading. It is a pleasure to be able to record the distinct success of the project in each of these respects. The volume which has just issued from the press is the second of the new series, the first having appeared a year ago.

Until new and satisfactory classified lists of scientists have appeared, the list of savants near the close of this volume can be made to serve. It covers no less than 366 closely printed pages and includes the names and addresses of about fifty thousand savants. Some difficulty seems to have arisen with the press work, for the forms could not have been very securely locked. Though many letters have fallen out, so large is the list and so accurate the alphabetical arrangement that most of the missing letters can be supplied.

Abbreviations have been used very extensively so as to reduce the compass of this work, and a little practice is necessary before one makes ready use of the volume. A feature of special interest is the complete list of members of all national societies of savants. A wise innovation has been the use of the English language for the sections devoted to the British and American institutions.

WILLIAM HERBERT HOBBS

UNIVERSITY OF MICHIGAN

[1] "Minerva" resumed publication under the same editorship in 1923. It is published by the successor of Karl J. Trübner, Walter de Gruyler & Co., Berlin and Leipzig.

[2] Index Generalis, Annuaire Général des Universités, Grandes Écoles, Académies, Archives, Bibliothèques, Instituts Scientifiques, Jardins Botaniques et Géologiques, Musées, Observatoires, Sociétés Savantes; Publié sous la Direction de R. de Montessus de Ballore, Professeur Libre à la Faculté des Sciences de Paris, Ouvrage honoré de souscriptions du Ministère de l'Instruction Publique et du Ministère des Affaires Etrangères. "Edition Specs," 17 rue Soufflot, Paris, 1924–1925, pp. 21–36.

BAUXITE AND SIDERITE

DR. E. N. LOWE, director of the Mississippi Geological Survey, who has published in SCIENCE, May 8, 1925, certain comments on recent papers of mine on bauxite, is correct in his belief that no discourtesy to him or to the Mississippi Survey was intended in my comments on the failure of two generations of geologists to capitalize Hilgard's description. I merely considered it as something of a joke on our profession to have a prospector make the discovery, for I also was among the geologists who had worked in the region without suspecting the presence of bauxite.

In Dr. Lowe's communication to SCIENCE it is not made clear that I published two papers, the first on "Bauxite associated with siderite," read before the Geological Society of America December 28, 1923, and submitted January 14, 1924, for publication by that society, and the second, a bulletin published by the United States Geological Survey about a year later on "Bauxite in Northeastern Mississippi." This latter bulletin is not mentioned by title by Dr. Lowe, but illustrations which were used in it are referred to, whereas none was used in the paper published by the Geological Society. It was stated that I forgot completely to mention that the Mississippi Geological Survey had promptly arranged with the prospecting company to secure the results of their accurate and detailed prospecting, but this statement surely can not refer to my Geological Society paper, which was prepared and submitted for publication before the state bulletin was available to me in any form for quotation or reference, nor could the U. S. Geological Survey paper (Bulletin 750–G) have been referred to.

At my request there were sent me page proofs of the state bulletin on March 21, 1924, nine weeks after the manuscript of my Geological Society paper had been sent to the society. The proofs were desired in