fund will receive $170,000,000, the university fund $30,000,000, and the remainder will go to the swamp-land fund, the income from one half of which goes to the school fund and the remainder to assist in maintaining our state institutions."

A DEPARTMENT of experimental breeding has been established in the College of Agriculture of the University of Wisconsin by the regents, who have appointed Dr. Leon J. Cole, of the Sheffield Scientific School at Yale, an associate professor of experimental breeding. Dr. Cole will take up his new work with the opening of the second semester, conducting investigations in the subject of experimental breeding with special reference to the laws of heredity and improvement of animal life. He will also give instruction to advanced students. Dr. Cole graduated from the Michigan Agricultural College and the University of Michigan in 1901. He continued at Michigan as a graduate assistant for two years before entering Harvard University, where he obtained the degree of doctor of philosophy in 1906, and was appointed representative of the United States Bureau of Animal Industry in breeding work at the Rhode Island Agricultural College, whence he removed to Yale University in 1908.

THE Kansas State Agricultural College has established a new department, that of milling industry, and selected to head this department Mr. Leslie A. Fitz, now in the office of grain standardization, United States Department of Agriculture, and in charge of cooperative milling experiments and other work at the Fargo, N. D., Station. Mr. Fitz will enter upon his new field March 1. The object of the new department is to take cognizance more fully of the great importance of bringing to the market a more perfect grain and to investigate means of utilizing this to the greatest advantage. It will concern itself with all questions touching upon the wheat crop, flour making and bread baking. Mr. Fitz has been connected with the Department of Agriculture for several years and has been intimately associated with several lines of wheat investigation. He was also engaged in the same work previously at the Kansas State Agricultural College, of which institution he is a graduate.

E. K. SOPER, of Cornell University, has been appointed instructor in economic geology in the University of Minnesota.

MR. W. ASTON, M.A., demonstrator in physics, Birmingham University, has been appointed assistant to Sir J. J. Thomson in the Cavendish Laboratory, Cambridge. He is succeeded at Birmingham by Mr. E. E. Fournier d'Albe.

DISCUSSION AND CORRESPONDENCE

EARLIER REFERENCES TO THE RELATION OF FLIES TO DISEASE

IN the last number of SCIENCE (January 7) there is an interesting note by Dr. E. W. Gudger on Edward Bancroft's reference, in 1769, to the belief that flies transmit the tropical disease known as "yaws." It is not generally known that as early as the sixteenth century there was definitely promulgated the theory that flies play a rôle in the transmission of the plague.

Dr. Josiah Nott, 1849, lists Athanasius Kircher as among the earlier writers who believed that insects served as transmitters of disease. Dr. Kelly, in his fascinating volume "Walter Reed and Yellow Fever," goes further and quotes from Kircher's "Scrutinium Physico-medicum," published at Rome in 1658, the remarkable statement:

> There can be no doubt that flies feed on the internal secretions of the diseased and dying, then flying away, they deposit their excretions on the food in neighboring dwellings, and persons who eat it are thus infected.[1]

Unfortunately, Dr. Kelly's translation stops

[1] Apropos of the present-day belief that blood-sucking and stinging insects may occasionally be direct inoculators of disease germs, the following statement from the same work is of interest: "In a recent plague at Naples, while a certain nobleman was looking out a window a hornet flew in and lighted on his nose and stinging him with the sharp point of its proboscis, caused a swelling. And when the poison had gradually spread and crept into the vital organs, within a space of two days (without doubt from the contagious humours which the insect had sucked up from a corpse), he contracted the disease and died."

just short of Kircher's clause in which he attributes this theory to Mercurialis.

Mercurialis, a celebrated Italian physician, who lived from 1530 to 1607, was one of the encyclopædic writers typical of the period. I have searched the available volumes of his works, including several editions of his extended treatise on the cause and nature of the plague.[2] So far I have failed to locate the reference in question, but it is evident that Kircher was indebted to Mercurialis for the suggestion.

The statement of Mercurialis can be regarded as no more than a lucky guess, but to Kircher we must give more credit. This astute Jesuit, born in 1601, was an indefatigable worker, and his writings are much more than mere compilations. There is no doubt that long before Leeuwenhoek's discovery Kircher had seen the larger species of bacteria, which he described in the following words:

> It is known to all that decaying bodies abound in worms, but not until after the wonderful invention of the microscope was it found that all putrid substances swarm with an innumerable brood of worms which are imperceptible to the naked eye, and I would never have believed it if I had not proved it by frequent experiments, during many years.[3]

Among the substances in which he found these "worms" he mentions spoiling meat, cheese, milk, vinegar and decaying serpents. He does not stop with the mere discovery, but he attributes the production of disease to the organisms, and formulates a theory of the animate nature of contagion. Interpreted in this light, the statement of Mercurialis assumes a new dignity. The germ theory of disease, which became dominant so soon after this period, fell into disrepute, to be revivified in the latter part of the nineteenth century. Only now are we putting to the test the theory of Kircher relative to the rôle which flies play in the dissemination of disease.

[2] "De pestelentia in universum, præsertim vero de Veneta et Patavina," Venice, 1577.

[3] "Scrutinium Physico-medicum," 1658 ed., p. 42. This is one of many references which might be cited. In his book "Ars magna lucis et umbræ," published twelve years earlier, there is to be found mention of these "worms," showing that Kircher's observations really had extended over "many years."

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Scientific Books

A Treatise on Zoology. Part IX. (Oxford Zoological Series). Vertebrata Craniata. First Fascicle—Cyclostomes and Fishes. By E. S. Goodrich. London, Adam & Charles Black. 1909. Pp. 518, 515 figs.

This is an advanced hand-book, scholarly in treatment and brimful of facts, bringing up to date the knowledge of a growing subject. It embodies also a number of original results which for the most part are based upon anatomical data: its facts are marshalled convincingly: many of its sections are admirably treated, especially those on the theme of bone, paired-fins and urogenital system. It considers fishes fossil as well as recent: its weakest side is its treatment of the results of embryology. The illustrations are numerous, usually well selected, scores of them original and important. From the book-making standpoint, the work is the equal of those which have preceded it in the Oxford series: among details one may be mentioned which may seem trivial to a strong-wristed reader—the paper, though apparently heavy, does not weigh pounds as in the case of several hand-books newly published in the United States.

Goodrich's book, in a word, is a very valuable contribution, and its preparation must have proved a formidable task. Weak spots it has, however, and reviewers will not fail to discover them. The fact is one should hardly expect that a single writer could follow the literature of so broad a subject without an occasional slip. As it is we may safely say that Goodrich has accomplished a conspicuously better task than any of his predecessors. We may pass over proof errors, which are not rare but of the usual type, and as we thumb over the pages point out such defects as these: "Myxinoids are normally hermaphrodite," the author not knowing, apparently, that the early findings in this matter are discredited. *Læmargus,* the great Greenland shark, does not "fertilize the eggs externally" as Turner