thropoda, such as the Onychophora, the Crustacea and the Trilobita. The conclusion is reached, however, that it was arachnoidian in type and had a common ancestor with the eurypterids, though it was not the direct ancestor of the latter group. A significant relationship is also noted between the Arthrocephala and the Crustacea (especially the metanauplius larva), indicating a common ancestry for these two large groups earlier in the Proterozoic.

Some idea of the difficulty of the task which originally confronted Professors David and Tillyard may be gleaned from the fact that to procure the few specimens of arthropods dealt with in this memoir, about fifty-five tons of hard quartzite were quarried, and about seven tons of carefully selected blocks were meticulously split into thin slabs. The present publication was to have been merely the first of a long series describing the other pre-Cambrian finds, but even as this review is written word comes of the death by automobile accident of Professor Tillyard, on January 13, 1937. It is to be hoped, however, that some one can be found who will be able to carry on these extraordinary researches of David and Tillyard in the same high plane in which they have so long prosecuted the work.

Notwithstanding the great reputation of the authors and the evident care which they have given to their work, critics are apt to wonder how it was possible to make the restorations on the basis of the type of specimens illustrated in Plates I to VI; and this wonder may persist despite the fact that many (though rumor has it, not all) of the Australian scientists who have examined this material are inclined to say that "seeing is believing." Furthermore, few students of the North American pre-Cambrian are likely to agree with the writers when they say, with the most naive of provincialism: "Only in a country like Australia, one of the most rigid shields of the earth, where even lower Cambrian strata retain in places their original horizontality, and the rocks are only slightly compacted, and where fossils like trilobites are exquisitely preserved, can one expect to find even the Proterozoic rocks so little altered as to preserve traces of former fossils."

CAREY CRONEIS

WALKER MUSEUM,
UNIVERSITY OF CHICAGO

SOCIETIES AND MEETINGS

THE OHIO ACADEMY OF SCIENCE

THE Ohio Academy of Science held its forty-eighth annual meeting at Columbus from May 13 to 15, 1937, under the joint auspices of the Ohio State and Capital Universities. The attendance was large (about 300), the programs, both general and sectional, well attended and as a rule enthusiastically received, and the atmosphere helpful and inspirational.

The meetings of the academy on Friday morning, May 14, were held in the auditorium of Mees Hall, Capital University, and were devoted, first, to the transaction of business and second, to a general scientific session. The chief items of business were the election of 38 new members and 13 fellows, adoption of a plan to observe in a fitting manner the semi-centennial of the organization of the academy two years hence, the selection of the College of Wooster, Wooster, Ohio, as the place for holding the 1938 meeting, the election of the present vice-presidents as a nominating committee for the 1938 meeting, the approval of the annual reports of the officers and various committees, and the election of the following officers for the ensuing year, *viz.*: *President,* Charles G. Shatzer, Wittenberg College; *Vice-Presidents*—A. Zoology, Warren Spencer; B. Botany, Raymond A. Dobbins; C. Geology, John L. Rich; D. Medical Sciences, Bruce K. Wiseman; E. Psychology, Harold E. Burtt; F. Physics and Astronomy, Dayton C. Miller; G. Chemistry, W. C. Fernelius; *Secretary,* William H. Alexander; *Treasurer,* Eugene Van Cleef; to the *Executive Committee,* Dr. Charles A. Doan and A. W. Lindsey.

The general scientific session was unusually rich, consisting of three outstanding features: First, an illustrated address on "Scientific Research in the Antarctic," by Dr. F. A. Wade, of Miami University, Oxford, Ohio; second, two reels of moving pictures showing "High Speed Moving Pictures of Selected Biological and Physical Phenomena," made by Professor Edgerton, of the Massachusetts Institute of Technology, secured and presented by Dr. Alpheus W. Smith, of Ohio State University; and third, an illustrated address on "Certificates of Growing Up and Growing Old," by Dr. T. Wingate Todd, of Western Reserve University.

Every one agrees that the annual dinner was another notable achievement. Dr. Laurence H. Snyder, chairman of the local committee on arrangements, presided most delightfully, introducing the various speakers and guests in a very happy manner. President George W. Rightmire, of Ohio State University, and President Otto Mees, of Capital University, welcomed the academy most graciously, and President Doan responded briefly. The toastmaster then introduced Dr. Otis W. Caldwell, of the Boyce Thompson Institute for Plant Research, the genial and popular general secretary of the American Association for the Advancement of Science, who discussed in a most

engaging and interesting manner the theme "Science and Higher Learning." Following Dr. Caldwell's pleasing address, came the event of the evening, namely, the presidential address, on the topic, "Modern Medicine—the Crossroads of the Social and Physical Sciences," by President Charles A. Doan. This address is, we believe, a noteworthy contribution to scientific literature and should receive wide-spread publication.

One must be impressed by the wide range and variety of scientific subjects covered by the 159 papers presented in the several sectional meetings on Friday afternoon and on Saturday; the meeting of three sections, namely, Zoology (A), Medical Sciences (D) and Chemistry (H), ran into Saturday afternoon owing to the large number of papers.

WILLIAM H. ALEXANDER,
Secretary

SPECIAL ARTICLES

THE SIGNIFICANCE OF THE ADRENALS FOR ADAPTATION TO MINERAL METABOLISM

RECENTLY Selye[1] has discussed the significance of the adrenals for adaptation. Briefly stated, he found that the removal of the adrenals increased the severity of the reaction produced in rats after exposure to variable surrounding temperature, excessive muscular exercise and toxic doses of various drugs. He found that rats became adapted to these stimuli, and after subsequent removal of the adrenals a severe reaction did not occur as a result of such treatment or exposure. Selye was of the opinion that the essential changes take place in the peripheral tissues and that the adrenal gland is involved merely in increasing resistance.

He assumed that "the symptoms of the alarm reaction are mainly due to the liberation from the tissue of some toxic metabolite (possibly histamine or some physiologically similar compound)," and finally pointed out that the changes which have been noted after adrenalectomy, such as circulatory disturbances, hypoglycemia, changes in concentration of sodium and potassium in the blood serum, deficiency in phosphorylation or increase in nonprotein nitrogen, all of which have been considered to be primary changes, are, in fact, symptoms of, rather than the cause of, adrenal insufficiency.

We have studied the changes which occur after adrenalectomy and agree with the conclusions of Selye in so far as they pertain to the ability of the adrenalectomized animal to acquire a tolerance to withstand toxic agents which throw stress on the organism.

Somewhat more than a year ago we[2] reported the effect of potassium when administered to adrenalectomized dogs which were maintained without the use of cortin on a diet which contained large amounts of sodium chloride and sodium citrate. It was found that if a diet which contained only traces of potassium was given for several months the adrenalectomized dog became extraordinarily sensitive to potassium in the daily ration. As little as 500 mg would bring about a severe prostration closely simulating acute adrenal deficiency. This experiment has been repeated in many dogs, but we have found that if the amount of potassium in the daily food is slowly increased the animal acquires the ability to tolerate it and much larger amounts of potassium are required to bring about a toxic effect.

Similar results were obtained by sudden shifts in the content of sodium chloride in a diet which also contained small amounts of potassium. If the sodium chloride was suddenly reduced to a minimum, profound collapse would occur and death would follow within forty-eight hours.

During stimulation of muscles in adrenalectomized rats it has been observed over a period of two years that there was an increase of potassium in the blood serum and as failure approached the concentration of potassium would rise to between 30 and 40 mg per cent. The administration of thyroxine improved the efficiency of the muscle, but failure was brought about more promptly and in each case it was found that the increase in potassium was more precipitous in the presence of thyroxine.

The concentration of potassium in the serum of some adrenalectomized rats is between 40 and 50 mg per cent. These animals may be apparently in good condition. Other adrenalectomized rats have died with typical symptoms of insufficiency with a concentration of potassium in the blood serum which was 10 to 15 mg per cent. lower. The important factor appears to be whether the animal has been able to acquire a tolerance which will withstand these increased concentrations of potassium. If sufficient time is given adaptation can occur.

Evidence that the adrenal gland is directly involved in the defense reaction against thyroxine but only in a transient way is shown by the following experiment: A series of rats after unilateral enucleation of the adrenal were treated daily with 0.1 mg of thyroxine. There was a prompt and marked enlargement of the remaining adrenal gland. The increase in weight was more than 200 per cent. However, after six weeks a regression in the size of the gland occurred and even-

[1] Hans Selye, SCIENCE, 85: 247–248, March 5, 1937.
[2] W. D. Allers, H. W. Nilson and E. C. Kendall, *Proc. Staff Meet. Mayo Clinic*, 11: 283–288, April 29, 1936.