The contents of the other two vials are of much greater interest. In each case, the material was taken from the stomach of a duck collected at Bayou Labatre, Alabama. One vial contains two small brown holothurians, somewhat damaged but with the calcareous particles in the skin not at all corroded or injured in any way. The condition of these specimens leaves no doubt in my mind that they were swallowed alive by the duck and that they had been in the stomach of the bird but a short time when the duck was taken. These holothurians are unquestionably some species of *Thyone,* and are very near, if not identical with, *Thyone scabra* Verrill, of the southern New England coast But *Thyone scabra* is not known from south of Delaware or from water less than ten fathoms deep. No holothurians of any sort are recorded from the Alabama coast. This duck's stomach therefore reveals the interesting fact that a species of *Thyone,* possibly *scabra* but probably distinct, lives in shallow water on the Alabama coast and serves as a part of the diet for bottom-feeding ducks.

The contents of the fourth vial confirms this conclusion and reveals further the notable fact that brittle-stars also serve as food for ducks. The material in this case is in very bad condition and is more or less digested, but the calcareous particles in the fragments of a holothurian indicate it is the same *Thyone* as in the other vial, though it has quite lost its pigmentation. Besides these *Thyone* fragments there are numerous armplates of a brittle-star. These are however, beyond identification and one can not even guess the genus, which they represent. The brittle-star was however an individual of moderate size and was certainly not the small and well-nigh ubiquitous *Amphipholis squamata.* No brittle-star is as yet recorded from the Alabama coast. It is to be hoped that the publication of the results of the collecting done by these two ducks may lead to equally effective efforts by some zoologist on the Gulf Coast.

HUBERT LYMAN CLARK

MUSEUM OF COMPARATIVE ZOOLOGY,
CAMBRIDGE, MASS.,

THE AMERICAN PHILOSOPHICAL SOCIETY. II

Morning Session—10 o'clock

ARTHUR A. NOYES, Sc.D., LL.D., Vice-president, in the chair

The components and colloidal behavior of protoplasm: D. T. MACDOUGAL, Ph.D., LL.D., director of the Desert Laboratory, Carnegie Institution, Tucson, Arizona, and H. A. SPOEHR. The living matter of plants is composed chiefly of mucilages and albuminous compounds in varying proportions mixed in the form of an emulsion or as a jelly. The molecules of solid matter are aggregated into groups which also include a number of molecules of water. Growth consists of the absorption of additional water to these groups, with more solid material being added at the same time, the process being termed hydration. The resultant increase may be detected by determination of increased dry weight, or measured as increase in length, thickness or volume. More exact studies in growth have become possible by the establishment of the fact that mixtures of 25 to 50 per cent. mucilage and 50 to 75 per cent. albumin show the hydration reactions of cell-masses of plants. It is also found that certain amino-compounds, such as histidine, glycocoll, alanin, and phenyl-alanin which are known to promote growth also increase the hydration of the *biocolloids* as the above mixtures are called. Following these empirical tests which have defined the character and field of research upon growth, measurements are now being made of the action of various ions or substances upon the components of protoplasm. Thus the strong metallic bases, potassium, sodium and lithium, exert a limiting action on hydration of carbohydrate (agar) in hundredth normal solution according to their position in the electromotive series, potassium being the strongest and reducing swelling most. Rubidium, however, did not take its place at the head of the list in the single series of tests made, for reasons we are not able to describe. At dilute concentrations (0.000, 1N) all these bases promote hydration, an effect also produced by amino-compounds. The inclusion of substances in a liquefied colloid, afterwards dried, produces a hydration effect different from that which results from placing the substance in the water in which the biocolloid may be placed. This fact has wide significance in the physiological action of cell-masses. Renewal or replacement of hydrating solutions may result in pulsations or rapid swellings followed by slow shrinkages or retractions. Gels similar to those entering into living matter may take on structure by which small masses or sections may display

highly differentiated action, increases in size and changes in forms after a manner which presents important possibilities in the behavior of cell-organs.

Respiration: W. J. V. Osterhout, professor of botany, Harvard University. A simple method of measuring respiration has been developed whereby determinations can be made at frequent intervals (as often as once every three minutes). The application of this method to the study of anesthesia shows the incorrectness of the theory of Verworn, according to which anesthesia is a kind of asphyxia, due to the inhibition of respiration by the anesthetic. In the study of antagonism it is found that the antagonistic substances may increase or decrease respiration, but when properly combined they show little or no interference with normal respiration. The study of the action of acids and alkalies shows that these substances may increase or decrease respiration and that the effect varies greatly with different organisms.

The behavior of the sulfurea character in crosses with Œnothera biennis and with Œnothera franciscana: Bradley M. Davis, professor of botany, University of Michigan.

Œnothera funifolia, a peculiar new mutant from Œnothera lamarckiana.

A third duplication of generic factors in Shepherd's purse: George H. Shull, Ph.D., professor of botany and genetics, Princeton University. In the third generation of a cross between a wild biotype of the common shepherd's-purse (*Bursa bursa-pastoris*) from Wales and Heeger's shepherd's-purse (*B. Heegeri*) there appeared a small number of plants of unique type, having a more coriaceous texture than in the plants of either of the two original strains involved in the cross. This new type has been designated *coriacea*. It differs from the common form, not only in texture, but the lobing of the leaf is reduced and simplified and the angles of the lobes are almost spinescent. The proportion of *coriacea* to the typical sibs in this F_3 family was 12: 187 or almost exactly a 1: 15 ratio. This suggested at once the presence of two independently inherited factors for the normal texture, the *coriacea* type being produced only when these two factors *K* and *L* were absent. Subsequent breeding has shown that *coriacea* breeds true when selfed, and has also confirmed the interpretation of this as a third case of duplication of factors in this species. The two characters previously shown to be thus constituted are the triangular form of capsule, and the division of the leaf to the midrib which brings to light the characteristic lobing found in the form designated *rhomboidea*. The duplication of the capsule determiners is practically universal while that of the leaf-lobe factor is less frequently found. Studies on the *coriacea* character are still too limited in extent to justify a statement as to the prevalence of duplication of the factor for the usual texture of the leaves.

Some effects of double fertilization in maize: Edward M. East, Ph.D., professor of experimental plant morphology, Harvard University.

The chemistry of the cell: Thomas B. Osborne, Ph.D., Sc.D., research chemist, Connecticut Agricultural Experiment Station. (Introduced by Dr. Harry F. Keller.)

The relation of oxygen to charcoal: George A. Hulett, Ph.D., professor of physical chemistry, Princeton University.

Products of detonation of TNT: Charles E. Munroe, Ph.D., LL.D., professor of chemistry, George Washington University, and S. P. Howell. TNT has not only proved a most efficient explosive for war purposes but, following the advice of the Bureau of Mines, the surplus has been now used in large quantities on various public projects with remarkable success, thus completely disproving the opinions given in various quarters following the armistice that it was unfit for industrial use, dangerous to store, and should be thrown away. Notwithstanding the success attained it is believed that with a more complete knowledge of its behavior even better results in its use both for military and industrial purposes could be attained. It is particularly desired to know the kind and quantities of products it yields on explosions. These are known broadly but it is also now known that they vary with the different conditions under which the TNT is exploded and this study has been made to gain more precise information regarding these conditions. It is already known that among the products are considerable quantities of carbon monoxide, hydrogen and some hydrocarbons, such as methane, together with free carbon in a soot-like form. Hence TNT is not suitable for use in underground work or close places because the gas evolved is poisonous and inflammable and can form explosive mixtures with the atmosphere in these close places.

A new map of the vegetation of North America: John W. Harshberger, Ph.D., professor of botany, University of Pennsylvania.

On the vibrations of rifle barrels: Arthur Gordon Webster, Sc.D., LL.D., professor of physics, Clark University.

FRIDAY, APRIL 23

Afternoon Session—2 o'clock

HAMPTON L. CARSON, M.A., LL.D., vice-president, in the chair

Symposium on Psychology in War and Education

Introduction: LIGHTNER WITMER, Ph.D., director of the Psychological Laboratory and Clinic, University of Pennsylvania.

Methods: J. MCKEEN CATTELL, editor of SCIENCE. The speaker reviewed the development of experimental and quantitative methods in psychology, and especially the transfer of its main concern from introspection to the study of individual differences in behavior. This has made possible the applied psychology which was of such service to the nation in time of war and will prove of increasing value in education and in industry. Efforts to alter conduct by a direct appeal to consciousness, as undertaken, for example, by the churches, the schools and the law courts, have yielded small results. But individuals can be selected for the work for which they are fit and can be placed in the human and physical environment in which their reactions are what we want. By cooperation with other sciences, it is also possible for psychology to change the environment, and behavior can be controlled more effectively by a change in the environment than by a change in the constitution of the individual. The older psychology must be put in its proper place; it can not be altogether discarded. As far as production goes, consciousness may be only a spectator; but it is the ultimate consumer.

Psychological examining and classification in the United States army: ROBERT M. YERKES, Ph.D., chairman of Division of Research Information, National Research Council, Washington. (By invitation.) Psychological examining in the United States army was made possible by the prompt action of American psychologists, who individually and collectively, in committees and conferences, formulated plans, prepared methods and induced the army and the navy to utilize psychological service. The methods of examining which were finally adopted are based upon principles previously used but they exhibit also new and important features which constitute significant contributions to the technique of practical mental measurement. The personnel for psychological examining was carefully selected in accordance with qualifications and the men were especially trained at the Camp Greenleaf School for Military Psychology. This intensive training in the rudiments of military science and military psychology ranks next in importance in its relations to the final success of the service to the superior quality of the army's psychological personnel. The initial purpose of examining was the discovery and prompt segregation or elimination of men of markedly inferior intelligence. The uses which were actually made of results of psychological examinations were extremely varied and covered the classification of men to facilitate military training, the selection of men of superior ability for training as officers or for special tasks, the segregation and special assignment of men whose intelligence was inadequate to the demands of regular military training, and finally the elimination of the low-grade mental defective. It was the demonstration of values in these and several other directions that converted military skepticism concerning the serviceability of psychology into belief and active support. After the official trial of methods approximately 75 per cent. of the officers concerned believed that they should be used further. On the signing of the armistice 90 per cent. of the officers of the army, if we may judge by the opinions of the commanding officers of camps and divisions, were highly favorable to the psychological service.

The relation of psychology to special problems of the army and navy: RAYMOND DODGE, Ph.D., professor of psychology, Wesleyan University. (By invitation.) To help mobilize the human factors that were needed by the army and navy to win the war, that was the task for which the psychologists of the country were organized under the leadership of the National Research Council. Two great achievements stand to their credit; first the sorting of the conglomerate of the draft army with respect to general intelligence under Major Yerkes; and second the discovery, indexing and assignment of trade experience, special skill and presumptive ability to perform the tasks needed by a modern army, under Colonel Scott. These achievements are regarded by experts as an important factor in the supposedly impossible undertaking of building a great fighting organization in a few months time. New demands were made on human nature during the late war, many of which were only imperfectly understood. The task of flying is a good illustration. Psychologists cooperated with the Air Service in studying the effects of high altitudes and in discovering test indicators of the ability to stand them. They were responsible for the mental tests in picking those who could learn to fly with a minimum expense and risk. Gas warfare and adaptation to the wearing of gas masks, the de-

velopment and maintenance of morale, the development of the less fit recruits, the acceleration of training and the reeducation of the wounded, the detection of promising candidates for special schools, finding human material for the best and quickest development of submarine listeners, of lookouts, and of gunpointers, all these were primarily psychological problems and the psychologists cooperated in their military solution. We had no military system developed to provide for these details. The enemy military authorities confidently regarded our lack of it as prohibiting effective participation in the war. The rapid development of a great fighting machine needed all our knowledge of human capacity and individual differences, and all our relevant laboratory techniques. Psychology took an honorable and not inconspicuous part in the democratic triumph of meeting a national crisis by the mobilization of the experience of non-military experts. To some of us it seems that we are again facing a national crisis in which the major symptoms are psychological. Again the enemy counts on our lack of organization. Our salvation depends on the re-mobilization of the expert experience of citizens.

Relation of psychology to the National Research Council: James R. Angell, A.M., Litt.D., chairman of the National Research Council, Washington (by invitation). The National Research Council is based upon forty or more scientific societies representing physics, astronomy, mathematics, engineering in all its branches, chemistry and chemical technology, geology and geography, medicine, biology and agriculture, anthropology and psychology. The council is organized to promote the interests of pure and applied science (both inside and outside the industries) in every practicable way throughout the United States. Its relation to psychology is precisely similar to its relation to the other sciences mentioned. In each instance, the supporting scientific societies elect representatives who compose the several divisions of the council, and these in turn, comprising as a rule about twenty men, selected for their eminence in their particular branch of work, come together and determine the special needs and opportunities for the improvement of research in their own fields. Special attention is paid to the possibilities of bringing about effective cooperation among research men and research agencies. Scientific investigation has hitherto been largely individualistic, and the most pressing need at the present moment is not so much the expansion of research agencies, although this is desirable, as the more effective employment of those already in existence. The Division of Psychology and Anthropology has formulated a number of cooperative projects, of which two may serve as illustrations. One of these has to do with the examination of the mental and physical characteristics of four important alien groups, *i. e.*, Mexicans, Scandinavians, Sicilians and Japanese. Some two thousand of each group are to be scientifically examined by the best modern methods. The result of this study ought, as regards these special races, to give us far more accurate and useful knowledge than we now have of the problem which confronts us in our present attempt to assimilate these racial stocks into our native American people. The other project contemplates an expedition to Central Africa in the upper regions of the Congo for a study of the same scientific sort upon the aboriginal natives who are still to be found there largely untouched by the influences of civilization. The expedition will be sent out under a psychologist who commands the languages of the regions, and with the methods at present available, scientific results may be expected of a character hitherto wholly impossible.

Psychological methods in business and industry: Beardsley Ruml, Ph.D., Philadelphia. (By invitation.)

The individual in education: Arthur J. Jones, Ph.D., professor of education, University of Pennsylvania. (By invitation.)

FRIDAY EVENING, APRIL 23

Reception from 8 to 11 o'clock in the hall of the Historical Society of Pennsylvania.

Robert Williams Wood, LL.D., professor of experimental physics, Johns Hopkins University, spoke on "Invisible light in war and peace" (with experimental illustrations).

Arthur W. Goodspeed

(To be continued)

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