Williams, of the Ohio Agricultural Experiment Station, will be given at the joint dinner with the American Society of Agronomy on the evening of December 28 at the headquarters hotel.

The American Society for Horticultural Science will hold its meetings on December 28, 29 and 30. There will be sessions devoted to genetics and fruit breeding, small fruits, grapes, propagation of plants, tree fruits, growth and nutrition, vegetable crops, floriculture, ornamentals and economics. There will be a joint session with the American Society of Plant Physiologists on Thursday forenoon. The retiring president, Dr. H. A. Jones, of the University of California, will give an address at the annual banquet to be held Thursday evening. On Friday there will be a joint session with the section on agriculture, which will be addressed by Dr. C. G. Williams, director of the Ohio Experiment Station.

REGISTRATION AND RAILWAY RATES

GENERAL registration for the Atlantic City meeting of the American Association for the Advancement of Science and Associated Societies will be held in the ballroom of the Municipal Auditorium, which is centrally located on the boardwalk. This office will be open from Tuesday morning, December 27 at 9:00 o'clock to 12:00 o'clock Saturday noon, December 31. The registration fee for the Atlantic City meeting is $1.00. Every one interested in the advancement of science who expects to attend any of the meetings is urged to register.

General programs will be available at the registration offices from Tuesday morning to Saturday noon. Each registrant will be supplied with a free copy of the general program which will be a book of 300–400 pages. Non-registrants may purchase programs for $1.00 each.

Reduced railway rates by the standard certificate plan have been granted by almost all railroads in the United States and Canada. Persons attending the meeting should purchase a first-class, full-fare, one-way through ticket to Atlantic City, securing a certificate on the "Standard Certificate Form" reading "for the Atlantic City meeting of the American Association for the Advancement of Science and Associated Societies." Persons should leave their railway certificates at the validation desk to be called for later at the same place. Each person presenting an endorsed and validated certificate may purchase a continuous passage, one-way, return ticket for one half of the regular fare, by the same route as that followed on the trip to Atlantic City. The earliest dates at which tickets may be purchased range from December 20 for the most distant territory to December 23 for the nearest places. Certificates may be validated from December 27 to December 30. The last date on which return tickets may be purchased is January 4, 1933. There is a possibility that some of the railroads will offer excursion rates lower than the rates on the certificate plan. Members are urged, therefore, to consult their passenger agents before purchasing tickets.

CHARLES F. ROOS,
Permanent Secretary

THE NATIONAL ACADEMY OF SCIENCES

PAPERS PRESENTED AT THE ANN ARBOR MEETING. III

(*Continued from page 547*)

Diurnal variation in efficiency: NATHANIEL KLEITMAN (introduced by A. J. Carlson). Our diurnal sleep habit manifests itself in a certain degree of drowsiness which overtakes us every evening and gradually reaches an intensity that makes resistance to the onset of sleep well-nigh futile. Is this inclination toward sleep at the end of a day's activities dependent upon or independent of other periodic changes showing a 24-hour cycle? To answer this question a number of adult subjects were subjected to several simple tests at different times of the day, and variations in performance noted as regards the length of time required to carry out a certain task, or the number of errors made in a definite period of time, or both. The tests were made five times daily, for at least 20 days: A—immediately upon getting up in the morning; B—one hour later; C—just before lunch; D—just before supper; E—just before going to bed. The tasks chosen were such that they could be performed by the subject without outside help, and in the privacy of his own home. They were: *1*—copying a text; *2*—transcribing a text into code; *3*—sorting cards; *4*—dealing cards; *5*—multiplication of large numbers; *6*—mirror drawing; *7*—the ability to keep a stylus in a small hole without touching the edges; *8*—the ability to stand upright without swaying. The results obtained indicate a well-marked variation in performance during the day, efficiency of performance (reciprocal of time or errors), increasing up to noon or afternoon, then declining for the rest of the waking period. The body temperature varies in the same sense. There are indications that the temperature is dependent upon the tonus of the skeletal muscles, in that it falls upon lying down and rises upon getting up. If the variations in temperature can be used as a criterion of changes in tonicity of the body musculature, it would appear that the gradual decrease in efficiency toward the end of the day might be due to greater muscular relaxation, which leads to a decrease in the number of proprioceptive impulses reaching the cerebral cortex and makes it increasingly difficult to maintain the state of wakefulness, irrespective of

whether or not any fatiguing work was done during the day. It is hardest to keep awake during the early hours of the morning when the body temperature is lowest. Under ordinary conditions, going to bed in the evening results in a still greater muscular relaxation, and sleep is precipitated.

A metabolic change in surviving nerve and other tissues: RALPH W. GERARD (introduced by A. J. Carlson).

The in vitro respiration of nerve: T. H. CHANG, R. W. GERARD and M. SHAFFER (introduced by A. J. Carlson). We have previously reported that nerves kept in a medium containing a low calcium ion content show an increased respiration, similar to their heightened irritability. Even in the presence of adequate calcium, however, as in unbuffered Ringer solution, dog nerves (also brain, liver, kidney, muscle) at 37° show a marked rise in oxygen consumption after 6 to 7 hours (sooner in NaCl); whereas when suspended in dog serum such a late rise does not appear, at least for 20 hours. Further, at the start and until the rise begins, the absolute oxygen consumption in serum is greater than in Ringer (35 per cent. for dog vagus: $Qo_2 = 174$ in Ringer, 237 in serum), due to other factors than calcium. Serum was handled in various ways in an attempt to identify the factors increasing the original respiratory rate and preventing the late increase in oxygen usage. Despite results that spoke against a bacterial causation of the late rise, experiments under aseptic conditions finally proved bacteria to be responsible for it, the serum preventing their growth by moderately heat-labile bacteristatic substances in the protein fraction. The initially high values in serum seem to be related in part to a similar fraction. Some of the facts established during the study are appended, and it may be noted that such respiration studies afford an admirable means of studying the antibacterial action of blood, as well as contributing information about the effect of blood constituents on tissue respiration. The two effects of serum are not altered by preservation for 5 days at 5° C. Heating for 15 minutes at 80°, probably 2 hours (not half an hour) at 60° destroys the preserving action of serum, but does not lessen its ability to increase the initial respiratory rate of nerve. Serum diluted with Ringer acts in proportion to its dilution in both respects. A protein-free ultrafiltrate of serum is not bacteristatic, nor does it increase nerve respiration to any extent above the value in Ringer. Cerebrospinal fluid behaves like the ultrafiltrate. Egg white acts much like whole serum in preventing bacterial growth and increasing nerve respiration, as does also serum after repeated ether extraction. The above evidence suggests the importance of proteins, but their action may depend on colloidal as well as chemical factors. Thus, gum arabic added to Ringer also delays considerably the bacterial rise in oxygen usage but lowers the initial rate. Nerves kept in Ringer, even if hypertonic, gain in weight over several hours, in some cases more than a third the initial weight, whereas in serum the gain is small (or absent). Heated serum (80°) again behaves like Ringer. Crude lecithin suspensions prevent the late rise and greatly depress the initial respiration, by half to three fourths. Choline-free lecithin has little effect on the bacterial action, but decreases the initial respiration, less than does lecithin itself; and acetyl choline greatly and progressively lowers nerve respiration to near cessation and prevents the bacterial rise. Of serum extractives, urea has no effect, but the amino acid, glycine, added to Ringer or serum may give a 20 per cent. increase in initial respiration, without affecting the late rise. Lactic acid (contrary to the case of frog nerves at 20°) increases respiration; glucose does not. One third of the creatine-phosphate of frog nerve kept in Ringer at 37° breaks down in three hours, one half in nine hours. A nerve killed by boiling or grinding is attacked by bacteria much faster than one not so treated; so that the slower change in Ringer than in saline (possibly also for serum) may still document a better preservation of the tissue.

Observations on the nervous control of respiratory movements: ROBERT GESELL and C. MOYER (introduced by F. G. Novy).

Methods of synthesizing pure-breeding types with predicted characters in the jimson weed: ALBERT F. BLAKESLEE and A. DOROTHY BERGNER. Plant and animal breeders in the past have had little real control of the production of new types. By means of radiation treatment they have recently been able greatly to increase the rate of mutation without, however, controlling the kind of mutants produced. In the jimson weed (*Datura stramonium*) gross changes in the chromosomes as well as mutations in the individual genes have been abundant after radiation treatment. Segmental interchange may form new kinds of chromosomes made up of parts from normal chromosomes. A chromosome also may be broken in two and one part attached to another chromosome with the remaining part left as a free fragment. From a knowledge of the effects of the factors in the different parts into which the chromosomes have broken, it has been possible to build up pure-breeding types with predicted characters. The essential part of the procedure is the introduction of extra chromosomal material, responsible for the somatic characters desired. Only when this extra material is capable of being transmitted by the pollen as well as by the egg cells can a true-breeding type be secured. Three examples are given of such synthesized types secured by use of parts of the large 1 · 2 chromosome. The .2 half of this chromosome can be transmitted by the pollen, but the .1 half can not. The first type is one in which the .2 half was translocated to the end of the 11 · 12 chromosome, forming a large chromosome which may be written 2 · 11 · 12 and leaving a free .1 fragment. When the .1 fragment is eliminated and the plant made homozygous for the 2 · 11 · 12 chromosome, it has two extra doses of the .2 half and in consequence shows definite peculiarities in appearance, among which the sugar-loaf-shaped fruits are most conspicuous. A second type was formed by

combining the .1 fragment with the double half chromosome 2.2 and eliminating entirely the normal 1.2 chromosomes. When homozygous for both the .1 and 2.2 chromosomes the plant has two extra doses of the .2 half and takes on the characteristic appearance due to the extra chromosomal material. The third type with two extra doses of the .2 half was secured by rendering a plant homozygous for the following chromosomes;—2.14, 13.23, and the .24 fragment and eliminating the normal 13.14 and 23.24 chromosomes. The first type has 24 chromosomes, the other two have 26 and thus differ from normals in chromosome number. These three types are indistinguishable in gross appearance from each other, but are strikingly different from the normal jimson weed from which they have been made up to order, as it were, with definite plan and purpose. They perhaps merit the term of synthesized new "species," since they satisfy the criterion of breeding true and are more different from the normal type than some of the species which already have been described in the genus Datura.

The lipids and proteins of the colon bacillus. A study in bacterial synthesis: H. C. ECKSTEIN and MALCOLM H. SOULE (introduced by F. G. Novy). *B. coli* (Jordan) was cultured on synthetic media under aerobic as well as strict anaerobic conditions. The media were fat free, contained glucose and either cystine or alanine as the only source of nitrogen. The chemical nature of the proteins and lipids was determined. The lipids synthesized were characterized by their small content of unsatured fatty acids and rather large content of the phospholipids. The proteins contained tyrosine, tryptophane, arginine, histidine and lysine, regardless of the type of media or gaseous environment. Cystine was not synthesized.

Further studies on the feather germ reaction as a test for thyroid hormone: BRODA O. BARNES (introduced by A. J. Carlson). Juhn and Barnes[1] described a new indicator for thyroid preparations which involved subcutaneous injection of a small amount of thyroxine or thyroglobulin into a brown leghorn capon. The result was a deposition of black pigment in the feather germ of young feathers, which left a permanent record of the injection. It has been found that this indicator will differentiate between active and inactive iodine in the thyroid gland. Considerable variation occurs in the width of the pigmented area using the same dose in different birds. The minimal dose necessary for a positive response lies between 0.3 and 0.4 mgs. of thyroxine.

Biological significance of protective mechanisms inherent in the myocardium: CARL V. WELLER (introduced by F. G. Novy). The myocardium exhibits certain protective mechanisms which are seemingly inherent, and which are not possessed in the same measure by many other tissues of the human body. One of the most obvious of these is dependent upon the pattern of the arterial supply, resulting in an admixture of living and dead tissues, rather than a continuous area of necrosis, following the lesser occlusive lesions. Less easily explained is the comparative freedom of the myocardium from hematogenous metastases of malignant tumors. Similarly, in visceral syphilis there may be an extremely active aortitis, with spirochetes present in large numbers, yet the myocardium may show little or no change. Perhaps the most striking example of all is found in the inability of young trichinae to encyst in heart muscle, although a defensive myocarditis is produced by them. From such diverse examples one must conclude that these protective mechanisms are of biological significance and that they have been developed and perpetuated in order to maintain, in so far as possible, the integrity of the myocardium, so essential for the preservation of the organism.

Higher processes in the behavior of rats: JOHN F. SHEPARD (introduced by W. B. Pillsbury).

Notes on the eclipse table in the Dresden Codex (Maya hieroglyphic manuscript): CARL E. GUTHE (introduced by W. B. Pillsbury). On pages 51 to 58 of the Dresden Codex there exists a chronological table covering a period of 11,960 days or 405 synodic lunar months. The individual members of the table are six-month intervals regularly interrupted by a five-month interval. The table consists of three almost identical equal parts of 135 months each. The arrangement of this record clearly indicates that the Maya were acquainted with the periodicity of eclipses. The efforts of many students have disclosed a series of interesting relationships between this table and other Maya chronological units as well as periodical astronomical phenomena. Several unsuccessful attempts have been made to fit this table into a particular group of data in the hope of establishing a day-for-day correlation between the Maya and the European chronologies. Through an examination of the data on both solar and lunar eclipses visible in the Maya area, considered in terms of whole days (the Maya chronological unit), it becomes evident that this table is a compendium of information upon both solar and lunar eclipses in terms of synodic lunar months and that it could have been constructed from data secured by observation over a relatively short period of time.

SCIENTIFIC APPARATUS AND LABORATORY METHODS

A DELTA METHOD FOR STUDYING MICROSCOPIC SEDIMENTS

FOR twenty years I have had a practical interest in microscopic sediments because they have interfered more or less seriously with my examination of plankton catches in a Sedgwick-Rafter counting chamber. In the last few years I have given considerable attention to papers discussing them in the hope that I

[1] Juhn and Barnes, *Amer. Jour. Physiol.*, 98: 463, 1931.