Tuesday morning, December 27. At the first session Professor Arthur B. Moehlman, of the University of Michigan, will present a study of teacher supply and demand. Other experimental studies of general educational problems will be described by Professor E. D. Grizzell, Professor L. A. Pechstein and Professor Norman M. Grier. The Tuesday afternoon session of Section Q will be devoted to experimental studies of collegiate education, and the Wednesday morning session will be devoted to experimental studies of elementary and secondary education. On Wednesday afternoon there will be a symposium on "General Problems of Education." Professor E. R. Hedrick, of the University of California at Los Angeles, will speak on cooperation in educational problems. Professor W. B. Carver, of Cornell University, will discuss substitutes for thinking in the study of mathematics. Professor F. K. Richtmyer, of Cornell University, will speak on "Physics is Physics," and Professor Harry A. Cunningham, of Kent State College, will discuss science laboratories in teachers' colleges. A session devoted to miscellaneous educational problems will be held on Thursday morning.

The program of Section K (Economics, sociology and statistics) will be more varied than usual and will be devoted to sessions on sociology, statistics and econometrics. At the first session of Section K and the Econometric Society, which will be held on Monday evening, December 26, papers on economic theory will be presented by Professor H. T. Davis, of the University of Indiana, and Professor Edward Thiess, of the Technical University of Hungary. Professor W. F. Ogburn, chairman of Section K, will preside at a session on sociology Tuesday morning, December 27, and will present a paper. Other papers on sociology will be presented by Charles A. Ellwood, Dorothy S. Thomas, F. Stuart Chapin, Robert Faris and Wilson Gee.

On Tuesday morning there will be also a joint session with the American Mathematical Society for the reading of papers on mathematical statistics. Dr. W. A. Shewhart, of the Bell Telephone Laboratories, and Dr. Max Sasuly, of the Brookings Institution, will present papers at this session. Tuesday afternoon will be devoted to miscellaneous papers on statistics, economics and sociology. At 4:30 Tuesday afternoon a joint session will be held with the Mathematical Association of America. At this session Professor G. C. Evans, of the Rice Institute, retiring chairman of Section K, will speak on "The Theory of Money."

All day Wednesday Section K will meet with Section M (Engineering) for a symposium on "The Stabilization of Employment." At this session papers will be presented by Gerard Swope, Irving Fisher, John Lyle Harrington, Leo Wolman, Dugald C. Jackson, Alvin Hansen, C. F. Kettering, H. L. Rietz, K. T. Compton, Elmer J. Working, Walter Rautenstrauch, Royal Meeker, James W. Angell and W. N. Loucks. (See SCIENCE for November 11.)

CHARLES F. ROOS,
Permanent Secretary.

THE NATIONAL ACADEMY OF SCIENCES

PAPERS PRESENTED AT THE ANN ARBOR MEETING. II

(*Continued from page 522*)

Some aspects of neurohumoralism: GEORGE H. PARKER. By a small transverse cut in the tail of a fish the chromatophores posterior to the cut may be denervated. Such denervated areas become light or dark under appropriate environments but more slowly than the surrounding skin. These slower changes are due to the transfusion of neurohumoral substance from the adjacent changed areas. The rate of transfusion is such that the process must be regarded as cellular and not due to lymph or blood currents. Layers of cells thus form transmitting systems in contrast with lymph and blood. This is common in coelenterates, but, as the example shows, the process also occurs in higher forms.

How the primitive ants of Australia start their colonies: WILLIAM MORTON WHEELER. See p. 532.

Time of embryonic segregation in aphids as determined from intermediate types: A. FRANKLIN SHULL (introduced by F. G. Novy). Nearly twice as great a proportion of the intermediates between gamic and parthenogenetic aphids are of the sorts required by the time-of-segregation theory as could be accounted for by mere random combination. Nevertheless, nearly one fourth of the total number do not fit that theory without modification. To explain these exceptional forms in harmony with the theory requires that the time of segregation be frequently irregular or that there be a rapid fluctuation of the physiological level which constitutes the "turning-point" of development or that the thresholds of stimulation of the several parts vary greatly. The accumulation of the regular or expected intermediates near the gamic extreme has received no satisfactory explanation.

The distribution of birds in northern Guatemala: JOSSELYN VAN TYNE (introduced by F. G. Novy). The Museum of Zoology of the University of Michigan undertook two years ago to cooperate with the Carnegie Institution of Washington in a survey of the Maya area of Central America, this survey to extend over a number of years. The Museum of Zoology is responsible for the biological phase of the survey. The first field party from the Museum of Zoology accompanied the Carnegie Institution's archeological expedition to Uaxactun in northern Guatemala, and researches made on these collections are the basis for certain zoogeographical con-

clusions outlined in this paper. In very brief, it may be said that the climate of the Yucatan Peninsula, of which northern Guatemala forms the base, is marked by aridity, increasing to the northward and reaching a maximum at the tip of the peninsula. Surrounded on three sides by the ocean and cut off on the south by the humid rain-forest, it is biologically in some respects an island. The avifauna is relatively poor in number of species but is a very interesting one. It is composed of four principal elements, as follows: (1) Certain endemic genera and species, clearly relicts of a very ancient fauna. (2) A small tropical rain-forest element derived from the Caribbean slope of Central America. (3) An arid tropical element which ranges up the Pacific coast of Central America and reaches Yucatan by way of the Isthmus of Tehuantepec. (4) A boreal element derived from North America and found mainly in the "pine ridge" areas at the base of the peninsula.

Some problems of the Hawaiian flora: DOUGLAS H. CAMPBELL. A study of the plants of the Hawaiian Islands is of interest not only to the botanist, but to the geologist and geographer, owing to the remoteness of the archipelago, and the relationships of the plants to those of other regions. The extreme isolation of Hawaii is reflected in the remarkable percentage of endemic species, the greatest known. The theory which has been advanced, that the islands are the result of submarine volcanic activity and have always been completely isolated, is not supported by a critical examination of the plants. It is quite impossible to account for the majority of these as having been introduced from outside. To account for the predominance of forms whose nearest relatives belong to the Southern Pacific regions, *e.g.*, New Zealand, Australia and Malaya, we must assume the former existence of land connections between Hawaii and these southern regions. Both the remoteness of these regions and the character of the plants make it impossible that they could have reached the islands by any means of transport over the ocean. The Hawaiian archipelago comprises over 6,000 square miles; the most completely isolated area of equal size in the world. The nearest mainland, North America, is over 2,000 miles distant. Between the islands and the Pacific Coast, there are agencies, *viz.*, N. E. trade winds, ocean currents and migrating birds, which are sufficient to account for the American elements in the flora; but a very much larger number have no American relationships.

Host specialization of Erysiphe graminis tritici: EDWIN B. MAINS (introduced by F. G. Novy). A study of the wheat race of the powdery mildew of grasses, *Erysiphe graminis tritici,* has resulted in distinguishing two physiologic forms of the mildew, which differ rather markedly in their ability to develop in several wheat varieties. Inoculation of a rather extensive series of wheat varieties with physiologic form 1 has shown that these varieties can be divided into a number of groups according to their mildew reaction. The majority were susceptible. Fewer were moderately susceptible or moderately resistant. The varieties, Norka (C. I. 4377), Dixon (C. I. 6295), Huron (C. I. 3315), Red Fern, Sonora (C. I. 4293), Chul (C. I. 2227), Axminister (C. I. 1839), Erivan (C. I. 2397), Khapli (C. I. 4013), Yaroslav (C. I. 1526), Vernal Emmer (C. I. 1524), Emmer (S. D. 293), Einkorn (C. I. 2433) and several selections of Illinois No. 1 were outstanding for their pronounced resistance. The varieties Hope (C. I. 8178), Progress (C. I. 6902), and Michigan Amber (29–1–1–1) varied considerably in their reaction. Physiologic form 2 of the mildew has been studied on fewer varieties, mostly those resistant to physiologic form 1. It can be distinguished from the latter by the reactions of a number of the varieties. Norka (C. I. 4377), however, most sharply differentiates it, being very resistant to physiologic form 1 and very susceptible to physiologic form 2. The varieties Dixon (C. I. 6295), Red Fern, Sonora (C. I. 4293), Khapli (C. I. 4013), Vernal Emmer (C. I. 1524), and Illinois No. 1, selections 35, 47 and 59, were specially outstanding for resistance to both physiologic forms of the mildew. (Investigation started through the cooperation of the Purdue Agricultural Experiment Station and the Office of Cereal Investigations, Bureau of Plant Industry and continued at the University of Michigan.)

In vitro experiments on the metabolism of the pancreas: EUGENE U. STILL (introduced by A. J. Carlson). The metabolism of the resting and active pancreas of dogs under barbital anesthesia has been studied. The rate of blood flow through the pancreas was measured continuously, samples of arterial and venous blood (from the pancreas) were taken during the resting state for O_2 and CO_2 analyses. Samples were also collected during and after maximal secretion by the pancreas (Secretin stimulation). The data indicate: The R. Q. of the resting gland is between 0.70 and 0.80, and for the active gland about 1.00. The oxygen consumption of the pancreas increases rapidly with the onset of secretion and develops a large oxygen debt which is not dissipated until some time after the secretion has stopped. The carbon dioxide production of the gland (corrected for the CO_2 in the juice) increases rapidly during activity and gradually returns to the resting level somewhat before the oxygen consumption. The data indicate that during secretion the metabolic CO_2 of the gland is caused to pass into the juice instead of into the blood. In some experiments the juice contained 7 times as much bicarbonate as the blood. The mechanism of this phenomenon is under investigation.

On a laboratory method of testing the potency of liver extract: CHARLES W. EDMUNDS (introduced by F. G. Novy). The present research is concerned with an effort to find some method for the laboratory estimation of the potency of liver and stomach preparations which are used in the treatment of pernicious anemia. At the present time no method is known except to observe their effects when they are administered to patients with pernicious anemia. In the present research an effort was made to utilize the changes which are produced in

pigeons' blood by the administration of various liver preparations. The administration to pigeons of such preparations known to be clinically potent is followed in from eight to ten days by an increase in reticulocytes, this increase ranging from about 10 per cent. to even as high as 50 per cent. Preparations of liver which have been rendered clinically inert by means of prolonged heating were also tested as controls, and these proved to be inactive. When they were administered to pigeons no increase in reticulocytes was found. Ventriculin given in capsules had the same effect as had liver preparations. It is believed that this method can be used for the commercial testing of such preparations and also as an aid in the isolation of active fractions of both liver and stomach preparations.

Hemodynamic and respiratory changes following the manipulation and traction of the gastrohepatic ligament: ARNO B. LUCKHARDT, RUTH ALPERT and SIDNEY SMITH (introduced by A. J. Carlson). It is quite commonly known by surgeons that manipulation, including traction of the gastrohepatic ligament, may induce not only a spasmodic intermittent type of respiration but alarming drops in blood pressure. It is generally believed that these hemodynamic and respiratory phenomena are of reflex origin, resulting from stimulation of afferent sensory fibers present in the gastrohepatic ligament or more particularly about the biliary passages. The decrease in blood pressure is considered to be due to reflex vasodilation or reflex inhibition of the general vasoconstrictor tone. In some preliminary experiments it was found that this interpretation is for the most part incorrect. In dogs under ether anesthesia traction on the gastrohepatic ligament produces in most animals an irregular respiration or even complete cessation of respiration if a constant and steady traction is performed. There occurs simultaneously a drop in the blood pressure. However, similar downward traction on the liver, stomach and diaphragm effects the same result, even to a more marked degree. If the hand is simply placed between the liver and diaphragm so that the hepatic veins and inferior cava can be at any moment compressed between the index and third fingers a profound drop in the blood pressure occurs with no change in the respiration rhythm. Each of the maneuvers cited above interferes more or less with the normal return of the venous blood from the splanchnic region and lower extremities. Simultaneous temporary ligation of the portal veins and inferior vena cava within the abdominal cavity causes an identical drop in blood pressure. The abrupt elevation to the normal level on release of the venous obstruction or cessation of traction on the liver, gastrohepatic ligament, stomach and diaphragm indicates that the drop in pressure in each case was not due to the vasomotor reflex but was the result of partial or complete mechanical obstruction. With respect to the spasmodic type of respiration or actual inhibition, it can be shown that the reflex effects seen are due to stimulation of the vagus fibers in the lungs. Each of the aforesaid maneuvers leads to an enlargement of the thoracic cavity with filling and stretching of the lungs. A momentary or more or less prolonged vagal apnoea results; for the irregular, spasmodic respiration fails to occur, following traction on the structures mentioned, if both vagi nerves have been sectioned previously. Briefly, then, the respiratory irregularity on traction is due to stimulation of the vagal nerve endings, resulting from a filling and stretching of the lungs; the hemodynamic phenomena are the result of mechanical interference with the return of venous blood to the heart. These observations do not imply that reflexes from the gastrohepatic ligament are impossible.

The crystalline structure of insulin: GEORGE L. CLARK and KENNETH E. CORRIGAN (introduced by W. A. Noyes). It has been known for some time that insulin exhibited certain optical properties of a true crystal. Although numerous attempts have been made by Freudenberg and others, no x-ray diffraction pattern could be obtained beyond the usual ring due to the 3.5 A. U. spacing common to proteins. Work of this kind employing the usual wave-length of x-radiation, copper (K, 1.54 A. U.), has been carried on in this laboratory for more than two years. Insulin has now been investigated by means of long wave x-rays, using the K α radiation of magnesium (9.86 A. U.). The apparatus, consisting of an x-ray tube and camera built into one unit, will be described. A crystal diffraction pattern was obtained corresponding to unit cell dimensions of 130, 100 and 80 A. U. The crystal is monoclinic, and upon the basis of a molecular weight of thirty-five thousand, there are 24 molecules per unit cell. The extreme complexity of insulin is shown by the fact that the unit cell dimensions are the largest thus far recorded for any substance.

Regeneration in mutilated seedlings: CARL D. LARUE (introduced by F. G. Novy). (Read by title.)

A study of specialization in ring-neck snakes: FRANK N. BLANCHARD (introduced by F. G. Novy). (Read by title.)

Biological inductions from the mechanical evolution of the proboscidea: HENRY FAIRFIELD OSBORN. (Printed in SCIENCE, December 2, 1932.)

The relation of water regulation to habitat selection of reptiles: G. KINGSLEY NOBLE and E. R. MASON (introduced by Henry Fairfield Osborn). Lizards adsorb moisture through their skin, and forms such as Amphisbaena and Eumeces will die from desiccation if they are deprived of a damp substratum for several days. Lizards living in damp habitats lose and absorb greater amounts of water than do those frequenting arid regions. Burrowing lizards have a more permeable skin than surface species have. The arboreal Anolis and the nocturnal Hemidactylus also practice a rapid exchange of water. There is little correlation between water loss and skin structure, except that the most impervious skins are provided with the thickest horny layer. Unlike lizards, the snakes absorb very little water through their ventral

surfaces. With an increase in environmental temperature, the rectal temperature of lizards and snakes is depressed. All lizards, except certain gekkonids, depress more after water is taken in through the mouth or the skin. Species differ both in ability to depress and in temperature tolerance. Survival at high temperatures is dependent on both factors. The rectal temperature of the brooding lizards Eumeces and Ophisaurus follows closely that of the environment. Eumeces voluntarily leaves the eggs at intervals to raise the body temperature by exercise and by sunning. In the laboratory this increase averaged 1.3° C. On returning to the eggs the female aids their incubation by increasing their temperature.

Skull of a fossil bird from the Bad Lands of South Dakota: ALEXANDER WETMORE and ERMINE C. CASE (introduced by F. Leverett). This paper announces the discovery of the skull of a hawk of the genus *Buteo* in the Oreodon zone of the Oligocene beds in the Big Bad Lands of South Dakota. It is the first discovery of bird remains in the locality and carries the genus *Buteo* as far back as the Oligocene; it demonstrates the antiquity of origin of certain still living forms of birds. The excellent state of preservation of the fragile skull is remarkable among fossils of birds.

Miniature rock fans and pediments: DOUGLAS JOHNSON. The origin of erosion planes in arid regions presents a problem of much geomorphic importance, involving as it does divergent interpretations of arid processes and arid forms. Whether these planes are the product chiefly of weathering back of mountain fronts, of sheetflood erosion or of normal stream erosion, involving much lateral planation, is at least far from obvious. The author has suggested the latter explanation and has described rock surfaces of fan form which seem to him normal marginal features of desert rock planes and best explained as the product of stream corrasion. Examination last summer of small scale erosion forms in the Bad Lands of South Dakota revealed the extensive development of miniature rock fans coalescing to form rock pediments or planes. The distribution of these features in relation to drainage lines and their delicate adjustment to miniature stream profiles, seem to exclude the weathering hypothesis, to render the sheetflood interpretation of doubtful application and to favor the ascription of these forms to normal stream erosion. Examples of the miniature fans and pediments are reproduced by the aid of lantern slides and the significance of these small-scale forms to larger problems of the arid landscape is discussed.

Planktonic faunas of the Paleozoic seas of North America: RUDOLF RUEDEMANN. (Read by title.)

Further aerological studies near the margin of the Greenland Continental Glacier: WILLIAM HERBERT HOBBS (introduced by F. Leverett). The University of Michigan has now sent five expeditions to Greenland for the primary purpose of investigating by aerological methods the nature of the wind system over and about the Greenland continental glacier. These expeditions have been sent out in 1926, 1927, 1928, 1929–30 and 1932–33. The results have already revealed much concerning the structure of the glacial anticyclone, the northern wind pole of the earth. The paper outlined results of the work of the Fourth Expedition (1929–30) and the plans of the Fifth Expedition, which is now in Greenland.

Problem of motor fuel quality: GEORGE G. BROWN (introduced by M. Gomberg). (Read by title.)

Report on Senate Bill 2778: GEORGE O. SQUIER.

The surface configuration of a part of southeastern Brazil: PRESTON E. JAMES (introduced by F. Leverett).

A new interpretation of drainage shiftings in Ohio: FRANK LEVERETT. It has long been known that the preglacial drainage of much of the Ohio was northward into the Erie Basin along lines now followed by Grand, Cuyahoga and Sandusky rivers. The early Quaternary glaciation blocked this drainage, but did not initiate the present drainage. Instead, much of the Muskingum as well as the Scioto had discharge down the Scioto valley to Portsmouth, and from there down the Ohio. The Illinoian glaciation blocked the westward discharge of the Muskingum drainage, and diverted it from the Scioto Basin to its present southward course into the Ohio at Marietta. The new interpretation of the interglacial course down the Scioto is sustained by the slope of the rock floor as shown by deep borings. There is also a strong presumption that a considerable part of the old Monongahela system, which in preglacial time drained western Pennsylvania and adjacent parts of West Virginia and Ohio into the Erie Basin, returned to that basin when the ice of the early Quaternary glaciation had disappeared. There is some evidence from well borings of an interglacial gorge cut in the preglacial valley floor in northeastern Ohio, whose bed slopes toward Lake Erie. But more decisive evidence that the interglacial flow was not down the present Ohio is found in remnants of a small interglacial channel along the Ohio downstream from where this drainage system led away. The present large river may have been established no earlier than the Illinoian glacial stage.

Minnesota Pleistocene Homo: A. E. JENKS (introduced by Frank Leverett). On June 16, 1931, a road crew, working on highway No. 30 in Ottertail County, Minnesota, found and removed a human skeleton from 2.3 feet beneath the road surface and 9 feet, 9 inches beneath the ground surface as surveyed and plotted by the State Department of Highways before the cut for the new roadway was begun. On May 7, 1932, the site was redug for identification in the presence of Dr. Stauffer, Dr. Thiel, Dr. Butters and Dr. Jenks, of the University of Minnesota. Seven additional fragments were found. From August 2 to 7, 1932, the site was extensively dug out by Dr. Jenks and six students, when 355 additional fragments were obtained. The skeleton was rescued

from the silt of an extinct glacial lake, first noted by Dr. Frank Leverett and published by him in 1914. The date is placed by the same authority as about 20,000 years ago or before even the first stage of Glacial Lake Agassiz. The site has been carefully studied by Dr. Stauffer and Dr. Thiel, Minnesota geologists, who concur in Dr. Leverett's findings. The skull is of a nature to suggest an early dating, aside from the geological evidence. It is of a generalized type of *Homo sapiens*, showing distinct Mongoloid affinities. The teeth are unusually large and retain certain features of still earlier mankind. The rounding of the borders of the nasal opening is extraordinary and is strongly reminiscent of conditions seen in anthropoid apes. The extreme narrowness of the nasal opening, together with its lack of lower borders, and with its rudimentary spine, stamp this skull as a most unusual specimen.

(To be concluded)

SCIENTIFIC APPARATUS AND LABORATORY METHODS

AN ADJUSTABLE METAL MOULD FOR PARAFFIN EMBEDDING

THE mould described here is unlike any of the types more or less commonly used, such as folded paper boxes, glass dishes and the adjustable metal moulds consisting of L-shaped bars for sides and a flat plate for bottom. It (see Fig. 1) consists of two metal

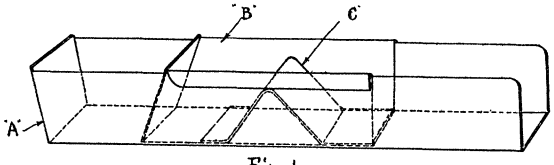

Fig. 1

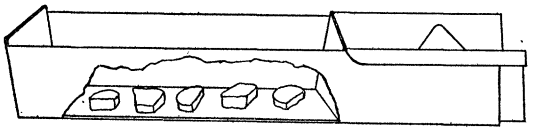

Fig. 2

troughs, A and B, both open at one end. Trough B fits snugly into trough A, closing its open end, and so forms a trough closed at both ends, easily adjustable in length by simply sliding B either to or from the closed end of A. The sides of both troughs slope outwardly, as also do the closed ends when the two troughs are fitted together to form the mould. The upper portions of the sides of trough B are folded over outwardly and, when B is in position as one end of the mould as shown in the figure, engage the upper portions of the sides of trough A, thus holding trough B securely in place anywhere within the working length of the mould. A folded metal strip C serves as a finger piece for conveniently adjusting the size of the mould. The dimensions of the mould from which the figures here shown were drawn are: Trough A, length 6 inches, inside width at bottom 1 inch, at top 1⅛ inch, depth 1 inch; trough B, length at bottom 2½ inches, other dimensions such as to fit snugly within trough A. Moulds of different dimension, of course, are simply matters of particular wants and individual preferences. As evident from the description and the figures, the sides and ends of castings from this mould will be plane surfaces sloping towards the bottom, or face, of the castings, a shape that will be appreciated when trimming them either before or after fastening them to the cutting platform of the microtome. From its constructional features, this mould has been found peculiarly well suited for specimens that are to be located in some particular plane or axis and, also, for such specimens as may be difficult to locate in castings when surrounded by considerable masses of paraffin, for instance, protozoa and scrapings of tissues. The mould can be narrowed in one axis and so adjusted that the specimens are enveloped on two sides by a minimum thickness of paraffin, while the sloping sides and ends afford a good view and easy access in arranging the specimens on the bottom of the mould, or face of the casting. In the case of very small bodies, such as Protozoa, the sloping sides of the mould focus them, so to speak, on the face of the casting. With small visible bodies the thin bar or edge of the semi-transparent paraffin permits them to be more or less clearly seen and properly located on the cutting platform of the microtome. As a permanent device, this mould saves both loss of time and minor inconveniences attendant on the making and using of paper box moulds; compared with the adjustable L-shaped metal moulds, because of its construction it is not subject to leakage of paraffin caused by dislocation of its parts by jars or other accidents, not infrequent occurrences with the L-shaped bars of such adjustable moulds.

Should the mould herein described appeal to other workers with paraffin, information regarding it may be had of The Arthur H. Thomas Company, Philadelphia, Pa.

W. F. R. PHILLIPS
MEDICAL COLLEGE OF THE STATE OF SOUTH CAROLINA

A VACUUM TUBE OSCILLATOR FOR CHLADNI PLATES

THE three-element vacuum tube used so extensively in radio telephony may be made to act as a detector,