tiny. But we are ignoring a billion dollar commerce on the Atlantic side of the isthmus. We have the wide sea as a trade path to the markets of the West Indies, Central America and the eastern portion of South America. To reach these fields, we have no more need of a canal at Panama than of the Northwest Passage. By the time we complete the Panama Canal, Japan may be the dominant commercial power of the Pacific. Even if the Chinese Empire were to remain friendly to America and the awakening of the whole orient be postponed until we are ready to travel through our waterway, the canal itself would not secure us the commerce of the far east any more than the Atlantic and Caribbean have secured us the trade of the eastern seaboard of Latin America.

JOHN FRANKLIN CROWELL,
Secretary.

NEW YORK CITY.

THE NEBRASKA ACADEMY OF SCIENCES.

THE sixteenth annual meeting of the Nebraska Academy of Sciences was held in Mechanic Arts Hall, University of Nebraska, February 2–3, 1906, under the presidency of Dr. R. H. Wolcott.

Resolutions were passed approving and urging the passage by Congress of the Adams bill providing for an increase in the appropriation granted to the Agricultural Experiment Stations; that creating the Mesa Verde National Park, and the Lacey bill providing for the preservation of American Antiquities.

The following officers were elected for the ensuing year:

President—Dr. S. R. Towne, Omaha.
Vice-president—Professor G. R. Chatburn, Lincoln.
Secretary—Dr. F. D. Heald, Lincoln.
Treasurer—Dr. H. H. Waite, Lincoln.
Directors—Dr. C. E. Bessey, Lincoln; Mr. G. A. Loveland, Lincoln; Dr. J. B. Hungate, Weeping Water; Dr. H. B. Lowrey, Lincoln.

The following papers were presented:

President's Address—Biological Conditions in Nebraska: ROBERT H. WOLCOTT.

Nebraska, owing to its geographical position, topography, climate and vegetal conditions, may be divided into five faunal areas: (1) a wooded Missouri River bluff area, (2) a prairie area, (3) the sand hills, (4) the plains, (5) a pine-forest foothill region in the northwest. These correspond closely to the floral regions. In early days the two wooded regions were sharply limited, but the planting of groves, orchards and shrubbery, together with the extension of the natural growth of timber and thickets, have led to the extinction of prairie and plains forms and the spreading into these regions of woodland species. Further and more pronounced changes are to be expected in the future. Of these areas the first two named belong to the Carolinian life zone as defined by Merriam, the next two to the Upper Sonoran, the last to the Transition. Merriam shows a close correspondence between life zones and crop zones. With the changing biological conditions in the state, agricultural possibilities are becoming increased. Crops may now be confidently expected which under former conditions could not have been secured. A biological survey of the state would bring out these possibilities, supplementing the work done by the experiment station, and furnishing a scientific basis for that work. Such an enterprise would be for the academy most appropriate, and would render its labors of great practical value, and would furnish a powerful argument upon which to base an appeal for support from the people of the state.

The Drifting of Sunspots: G. D. SWEZEY.

Observations of the sun were made every clear day from October 26 to November 24, 1905, and the position of the principal sunspots on the sun's disk was measured.

Taking account of the changing position of the sun's axis during the period in which a sunspot was visible, the projection of the computed diurnal path was compared with the actual apparent path for ten well-defined spots, in order to determine the drift of the spot with reference to the solar surface. Some of them were found to maintain a very constant latitude; others drifted several degrees north or south; contrary to the usual rule, those within fifteen degrees of the equator drifted, if anything, away from the equator and those in high latitude, both north and south, drifted a little towards it.

The period of the sun's rotation as deduced from these ten spots varied from twenty-five to over twenty-eight days, those nearer the equator giving, as a rule, the shorter periods, but with some exceptions.

Ancient Picture-writing on Nebraska Rocks: A. E. Sheldon. (With lantern.)

Observations on Glacial Accumulations of Nebraska: G. E. Condra.

The glacial deposits in this state are thicker, better defined and more important than is generally known. Till composed of clay, sand, pebbles and boulders is about one hundred feet thick in the uplands near Lincoln. An oxidized clay, which is occasionally confused with loess, at places constitutes a large percentage of the till plain. Glacial clay and loess are usually distinguished quite readily by their structure and color. The brownish-colored subsoil in the uplands at Omaha, Nebraska City, Lincoln and Ponca is till, not loess. The till plain lies on Pennsylvanian, Permian, Cretaceous and Tertiary formations. Its western border is poorly defined, grading into a sand plain and concealed by loess. Just how the till and sand plains are related we do not know. Boulders are found in the latter farther west than Fairbury. Tertiary and glacial sands are confused at places. Boulders show in largest numbers where the loess and finer glacial materials have been removed by streams, as on valley slopes. By this means the coarser parts of the till have been concentrated locally as 'boulder areas,' the best known of which are near Endicott, Humboldt, Falls City, Lincoln and Hartington. Further investigation may force the conclusion that Nebraska has more than the one drift sheet which is known as the Kansan.

Bud Rot of Carnations: F. D. Heald.

The study of a troublesome bud-rot of carnations due to a species of *Fusarium* was described. The rotting buds always contained a mite in addition to the fungus. Pure cultures were made of the fungus, and successful inoculations were carried out. The fungus was again isolated and new inoculations made which indicated that the fungus alone was capable of producing the rotting. The experiment tried with inoculations of the mite into the buds did not produce the disease. It was suggested that the mites act only as carriers of the fungus and intensify its severity. The Lawson carnation was noticed as the most susceptible variety.

A New Distome of the Family Holostomeæ: F. D. Barker. (By title.)

The Strength of Nebraska Woods: G. R. Chatburn. (By title.)

The Bumble Bees of Nebraska: M. H. Swenk.

In arranging about six hundred specimens of Nebraska bumble bees and their inquilines contained in the collection of the University of Nebraska, an unusually rich fauna of these insects was found for the state. This collection includes records of seven species of *Bombias,* eight species of *Bombus* and three species of *Psithyrus,* making eighteen species in all, or more than have been recorded for the whole of the United States east of the Mississippi

River. The distribution of these species in the state and their relative abundance was noted, and in addition a brief outline of their general habits was given.

Seasonal Rhythms of Growth: W. W. HASTINGS. (By title.)

The Latest Enumeration of Nebraska Grasses: C. E. BESSEY.

In a recently published catalogue of the grasses of Nebraska in the Annual Report of the Nebraska State Board of Agriculture (1904), one hundred and fifty native and fifty introduced species are recorded. This is the largest number ever included in any authentic list of the grasses of the state. While recent reexaminations of certain specimens make a few changes of names necessary, the aggregates remain as already stated. It is not unlikely, however, that a still more critical study of the wild grasses will add a number of species to the present list. The popular impression that the number of species of grasses in the state is diminishing is erroneous. Of certain species there are fewer individuals, but there are few if any cases in which any grasses have completely disappeared from a region.

The Oil Region around Cleveland, Pawnee County, Oklahoma: E. G. WOODRUFF.

The most important oil field in Oklahoma to-day is the one surrounding the city of Cleveland in eastern Pawnee County. A brief history of this field was given, with notes on the number of wells, the amount and nature of the oil, and the enormous gas flow. One four-inch pipe line carries a stream of crude petroleum night and day; another line of six-inch diameter is almost completed. The city is heated by natural gas from the wells, and street lights burn night and day, while millions of cubic feet of gas are going to waste.

Oil and Gas Possibilities in Nebraska: G. E. CONDRA.

The possibility of oil and gas in paying quantities in Nebraska has led to a demand for a careful stratigraphic study, especially in the southeastern part of the state. The stratigraphic relations of the Carboniferous series of Nebraska to the oil regions to the south was studied during seven trips across Kansas, Oklahoma and the Indian Territory. Certain Pennsylvanian formations and at least two members of the Permian that outcrop in southeastern Nebraska were found to extend, with little change, to near the oil and gas fields. The study of the stratigraphy of southeastern Nebraska has shown that the Cherokee shales, the principal oil-bearing beds of Kansas, lie 2,000 feet below the Nemaha Valley. Only one well has been put down to this depth. Further west in Nebraska, in the region around Cambridge, the possible oil- and gas-bearing formations are the Grandose and the Dakota, but neither formation yields much oil in any region. There are a few favorable indications that oil and gas may occur in paying quantities in Nebraska, but many of the conditions are unfavorable.

Some Structural Peculiarities of the Rice Pistil: ELDA R. WALKER.

Rice pistils show several peculiarities which seem to indicate that they are tricarpellary. In the pistil there are three fibro-vascular bundles. Of these one goes to each of the two style branches and the other bears the ovule. This bundle typically stops a short distance above the ovary cavity near the level at which the style branches separate. However, in a few cases pistils are found with three style branches. It seems then that the style branches of the typical pistil represent two carpels and that the other carpel is reduced, only extending to the top of the ovary. The pistil is then apparently composed of two sterile carpels and the reduced fertile carpel.

The Use of Carbon Tetrachloride with the Soxhlet Apparatus: Roscoe H. Shaw.

Various chemicals have been advocated and used as extractants in the determination of fat in foods and agricultural products. Ether is most extensively used and its use has become official. Carbon bisulfide, petroleum ether and carbon tetrachloride are also used to some extent. The last named has many advantages over the others. It is cheap, it can be purchased pure and its vapor is non-explosive, non-inflammable and non-poisonous. Ether can not be obtained anhydrous and must be kept over sodium and redistilled just before using. It is expensive and its vapor is explosive. The unpleasant odor and poisonous property of the vapors of carbon bisulfide restrict its use. Petroleum ether is a mixture of the lighter oils of petroleum and consequently has no definite chemical composition or boiling-point.

Samples of corn and linseed meal were extracted with both ether and carbon tetrachloride. The heat for those with ether was supplied by a steam bath and for the carbon tetrachloride direct flame with an asbestos plate interposed. Soxhlet's extractors were used in each case. It was found that the tetrachloride made the complete extraction and gave identical results with the ether in about one third of the time required by the latter, and that a previous drying of the samples was unnecessary. Extractions on other grains will be made and reported at the next meeting.

Some Carboniferous Corals from Nebraska: E. H. Barbour.

Forest Planting in Eastern Nebraska: Frank G. Miller.

This paper dealt mainly with that part of the state east of the ninety-ninth meridian. It reviewed briefly the history of forest planting in Nebraska, in which it was noted that the state has about 300,000 acres of planted timber, approximately 250,000, or 83 per cent., of which are in the region east of the ninety-ninth meridian. The observation was also made that in the eastern portion of the state the planted area is decreasing. Owing to the rapid appreciation in the price of land, together with an increased timber supply, due to the efforts of the early settlers, the activity in forest planting so characteristic of pioneer days has gradually declined, till in the past few years the amount of planting done in most parts of the region under consideration has been very small, and this has been more than offset by the large amount of former planting that is being harvested. Tree planting declined very rapidly from about 1894. The outlook for future planting is more hopeful, as there is a distinct revival of interest in forest planting at the present time. In mentioning the purposes for which forest plantings should be made, their protective value was especially emphasized. The ability of wind-breaks and shelter belts to protect planted fields and orchards from the aridity of the wind and thus increase crop production is not only attested by common observation, but has been demonstrated by experimentation. This is one of the most vital questions connected with tree planting on the plains, since the importance of any agency that will retard the velocity of the wind and thus check evaporation becomes at once apparent. For commercial purposes, common cottonwood and willow were recommended for fuel. For fence posts, hardy catalpa, honey locust, green ash, Osage orange, European larch and red cedar were named; while for lumber production, common cottonwood and black walnut are the most available trees.

Cantor's Transfinite Numbers: E. W. Davis.

The Skulls of Syndyoceras and Protoceras: ERWIN H. BARBOUR.

The skull of the Oligocene *Protoceras* with its many horns or protuberances was compared with that of the four-horned Miocene artiodactyl *Syndyoceras*. Though representing widely divergent types, *Syndyoceras* seems to be more closely related to *Protoceras* than to any known form. The main horn-cores or protuberances in *Protoceras* seem to become true horn-cores in *Syndyoceras*. The more prominent distinguishing characteristics of *Syndyoceras* are the four grooved horn-cores; the 'midnares' or 'blow-hole' (of doubtful function); the tube eyes; the incisiform canines and the caniniform premolars of the mandible.

Additional Notes on the Cladocera of Nebraska: CHARLES FORDYCE.

Since the appearance of the two former papers on the Cladocera of Nebraska (Fordyce, 1901 and 1904), the author has found five additional species, which, added to the forty-five previously reported makes a total of fifty species thus far reported from Nebraska. The species described in this paper are embraced in the following three families: Daphnidæ one, Bosminidæ one, Lynceidæ two. The additional species are as follows: *Simocephalus serrulatus* n. var., *Bosnima* n. sp., *Alona quadrangularis* O. F. Müller, *Pleuroxus hamatus* Birge, *Pleuroxus trigonellus* O. F. Müller. These forms are all new to Nebraska; the first two are new to science, and the last three are rare in this country.

The Accuracy of Acquired Habitual Movements: H. L. HOLLINGSWORTH.

Contemporary psychology is paying increased attention to the general subject of movement. While the psychophysics of inactive perception has become fairly well organized, the more active modes have disclosed less regularity and the need is felt for a more careful study in this field. The comparison of series of naïve and practise tests of the accuracy of the standing, walking and sitting reflexes affords the following suggestions:

(1) The lack of uniformity displayed by modes of perception in which movement is involved is due to the complex conditions under which the movements are made, the general activity of the reflex, its functional correlation with static and orientation sense, etc. (2) The extremely delicate discrimination possible to even the most massive reflex is worthy of remark. (3) There is a practical minimum below which the threshold can not be reduced, and this threshold is about the same for all individuals. (4) Practise results may be manifested either in the reduction of the threshold, or, if the threshold remain constant, in the gradual definition and increased certainty of the criteria of judgment. (5) The more activity involved in a movement, and the more closely connected it is with static perception, the more susceptible is the movement to the reduction of the observable difference threshold by practise. The less activity involved the more likely is practise to result in the definition of the criteria. (6) The correlation of sensory and motor factors in the process of learning is seen to be advantageous. The more activity involved in an act of learning, the more quickly will the process be mastered. Since motor correlations are in general more persistent than sensory, it is also probable that the acquirement will be longer retained.

The Composition of Some Unique Feeding Stuffs Used in Nebraska: S. AVERY.

The following unique feeding stuffs were analyzed: burned alfalfa, the soapweed of the sand-hills, a water plant known as hornwort, and the much-abused Russian thistle. Burned alfalfa loses about 700 pounds,

weight per ton, which loss falls mainly on the crude fiber and the carbohydrates. The protein content is high, 24.75 per cent., but experiments indicate that it is much less digestible than the protein of prime alfalfa. Soapweed contains 9.09 per cent. protein and the hornwort 17.68 per cent. The high protein content of the Russian thistle, 17.95 per cent., indicates that the former pest has a feeding value that makes it a source of profit to the western rancher.

New and Little-known Plant Diseases in Nebraska: F. D. Heald.

Notes were given upon the following diseases:

(1) Twig-girdle of the apple due to a *Phoma*-like fungus. (2) Trunk rot of the cherry due to *Schizophyllum commune.* A small orchard of trees five to six years old was completely destroyed by this fungus. (3) Wheat leaf-fungus, *Leptosphæria tritici.* Among other things, its distribution over the same area as the Hessian fly was noted. (4) Bacterial leaf blight of wheat. A bacterial blight of the leaves was common on the leaves of wheat in the breeding-plot at the experiment station and was also observed elsewhere. (5) Bacterial blight of soy bean. This disease was quite serious on soy bean used as an orchard cover crop at the experiment station. (6) Moldy corn due to a fungus provisionally referred to *Diplodia Maydis,* but differing in several points in habit and structure.

A New Limestone in the Indian Territory: G. E. Condra.

This new stone represents an abnormal development of calcareous oolite in the Hunton formation and is underlaid by seventy-five feet or more of Sylvan shale. This stone forms a single massive ledge without distinct jointing and bedding, the thickness averaging ten feet. The formation where exposed is a hogback of the Arbuckle Mountains dipping three to five degrees northeast. The stone is very plainly oolitic, much more so than the Bedford, and approaching the famous English oolite. The spherules range from .5 to 2 mm. in diameter, the largest being in the lower part of the ledge. The spherules are held together by a matrix of clear olive-green crystallized calcite, giving the stone a beautiful surface when polished. The oolite is a very pure limestone, in fact a marble, running as high as 98 per cent. $CaCO_3$.

The stone and the underlying shale are to become the basis of several industries which will furnish building stone, ornamental stone, carbonate, lime, cement, brick, tile and ballast, all of which are in great demand in that section of the country.

The Causes of the Dwarfing of Alpine Plants: Frederic E. Clements.

Preliminary work upon the mountain vegetation of Colorado from 1896 to 1899 seemed to show clearly that the prevailing opinion that light was the primary factor in alpine dwarfing was erroneous. A large number of species was found to exhibit dwarf and normal forms at the same altitude, and often in close proximity. In every case the dwarf form grew in dry soil, and the normal one in wet soil, indicating that the difference was one of water content. Owing to lack of instruments, satisfactory determinations of light intensity were not obtained until 1904. The latter naturally showed no differences in dry and wet habitats at the same altitude. Readings taken at Manitou (1,900 m.), Minnehaha (2,600 m.) and on Mount Garfield at 3,600 m. gave practically the same light intensity for the three altitudes. The greatest intensity on Mount Garfield was 1.2, the intensity at Manitou being 1. This difference is altogether too slight to account for the dwarf habit of alpine vegetation as compared with that of the plains. Accordingly, in 1905, recording psychrometers

were located at the same stations to obtain complete records of humidity. Light readings were again made as for the year preceding with the same results. It was found that the humidity was much less upon the alpine summits than upon the plains. This leads necessarily to the conclusion that alpine plants, compared with those of the plains, are dwarfed because of excessive transpiration, while, among alpine forms, those that grow in dry habitats are dwarfed by virtue of a low water supply.

University Extension and the Prevention of Disease: H. H. WAITE.

Attention was called to the growth of the university-extension movement in the United States during the last decade. The general government and many states appropriate annually large sums of money to defray the expenses of investigating diseases of animals and plants. At the present time only a limited number of individual states have appropriated money and established laboratories for the investigation of disease in man. The importance of educating the people in regard to the origin, means of dissemination and measures to be taken to prevent the spread of infectious diseases, were briefly discussed. The infectious diseases especially considered were tuberculosis, typhoid fever and diphtheria. The excellent chances of recovery from or arrest of tuberculosis in its early stages, provided the patient is given accurate instruction as to the regulation of his daily life, was strongly emphasized. Statistics from all parts of the world prove that diphtheria antitoxin since its introduction has reduced the death rate by more than fifty per cent. Since its administration is attended with little or no danger to the individual, the public should so clearly understand this as to demand its introduction as both a curative and a prophylactic measure.

Tillering in the Corn Plant: E. G. MONTGOMERY.

The 'tiller' in a corn plant is a lateral branch, usually arising at or below the surface of the soil. In dent corn the number of tillers varies from none to three or four, depending largely on conditions. The number developing is directly affected by rate of planting, fertility of the soil, rainfall, or their development seems to be correlated directly with the favorableness of the environment. The following data show the effect of rate of planting when the hills were 44 inches apart each way:

	No. of Plants in a Hill.	No. Tillers Developed.
For every 100 plants,	4	8
For every 100 plants,	3	25
For every 100 plants,	2	76
For every 100 plants,	1	198

In the same way the number of tillers increased on fertile land and in seasons of good rainfall. The tendency to tiller was found to be more or less hereditary, but this tendency was more than overcome in most cases by the environment. Tillers also have an important economic value. On good soil where the stand happens to be below maximum, they are capable of producing good ears. When suckers were removed from a portion of a field for two seasons, the yield was decreased an average of 17 bushels per acre, but the yield where suckers were left on was 81 bushels per acre while it only averaged 64 bushels where they were removed.

Aboriginal Pottery of Nebraska: E. E. BLACKMAN.

The Nebraska aborigine made pottery very much as his European brother did. He used it for burial vessels as the ancients of the old world used the first pottery made by them. He also used it as household utensils. He ornamented it as much as they did, and all the pottery of northern

tribes, both in this country and Europe, has a recognizable similarity, while the same is true of tribes of warmer countries. There is little similarity between the pottery of the Nebraska aborigine and the pottery of the Mexican aborigine. There is much similarity between the pottery of the Nebraska aborigine and the aborigines of England, Ireland and Scandinavia. The pottery which we know to be the oldest in Nebraska shows a greater degree of art than the specimens we know were made just prior to contact with the whites.

Preliminary Work in Experimental Evolution: Frederic E. Clements.

The work done at the Alpine Laboratory at Minnehaha near Pikes Peak during the past six years concerns itself chiefly with measuring the physical factors of the many habitats, and the study of plant and vegetation differences arising from them. In 1905 a beginning was made in the matter of tracing the evolution of new forms. The problem was attacked simultaneously from the three standpoints of variation, mutation and adaptation. Careful observations were made upon variable and mutable species, and a number of plastic and stable species were moved from their original homes to new and widely different habitats. The seeds of a number of species which had already produced new forms by adaptation to two or more habitats were planted in the greenhouse in order to determine to what degree the new characters had become fixed.

Species of Filaria found in Human Blood: H. B. Ward. (With lantern slides.)

Circulating in the human blood at times are found minute round worms which are denominated collectively microfilariæ. They are embryonic forms, and though exceedingly uniform in general appearance, represent at least ten or twelve species of filariæ. Their structure is simple and only imperfectly known in detail, while the general size constitutes the common means of distinction. Certain of these forms manifest a periodicity in their appearance in the peripheral circulation which causes them to be classed as nocturnal or diurnal. In some forms the greatly attenuated vitelline membrane persists as a delicate sheath surrounding the circulating embryo and offers another mark of distinction. It has been shown that some species pass the next stage of their life history in a mosquito, from which they are enabled to pass to a new host when the insect is biting. They reach maturity in the subdermal connective tissue, or in lymph glands, whence the myriads of embryos produced by the female enter the blood to begin anew the life cycle. The life history of other forms is entirely conjectural. A synopsis of known forms was presented.

F. D. Heald,
Secretary.

Lincoln, Nebraska.

SCIENTIFIC BOOKS.

A Bibliography of Physical Training. By J. H. McCurdy, M.D. New York, G. E. Stechert & Co. Published by the Physical Directors' Society of the Y. M. C. A. of North America. Springfield, Mass. 1905. 8vo, pp. 369. Price $3.00.

One of the greatest obstacles that workers and students in the field of physical education have encountered has been the lack of a bibliography on the subject. The literature of physical training embraces such a wide range of topics that several individuals and committees who attempted to compile it, very soon gave up the task. That Dr. McCurdy had the patience and perseverance to keep on with the work for nearly fourteen years is evidence of his ability and his devotion to the cause of physical training.

The author had exceptional opportunities for doing the work thoroughly, for the library of the International Training School, with which Dr. McCurdy is connected, contains