taxonomic importance are clearly elucidated. Brief directions are then given for the collection of material and the determination of species, and this is followed by the taxonomic section which includes quite detailed descriptions of 916 species of mosses, with dichotomous keys to the families, genera and species. The system of classification adopted agrees very closely with that of Limpricht in Rabenhorst's 'Kryptogamen Flora von Deutschland.'

The second part of the work deals with the liverworts and in general arrangement follows that for the mosses. Keys and descriptions are given for 228 species. The work is bound in 'halbfranz,' and is embellished with 68 full-page lithographed plates, distributed throughout the text, of which 26 are executed in natural colors. The work is on the whole an admirable one, and it is only to be regretted that the production of such works is apparently not possible in our own country. It will form a valuable addition to the library of any student of mosses.

F. D. HEALD.

THE UNIVERSITY OF NEBRASKA.

SCIENTIFIC JOURNALS AND ARTICLES.

THE contents of the March issue of *Terrestrial Magnetism and Atmospheric Electricity* is as follows:

Portrait of Svante August Arrhenius, Frontispiece.

S. A. ARRHENIUS: 'On the Electric Charge of the Sun.'

C. CHREE: 'Review of Maunder's Recent Investigations on the Cause of Magnetic Disturbances.'

W. VAN BEMMELEN: 'Magnetic Survey of the Dutch East Indies.' (Third communication.)

J. ELSTER und H. GEITEL: 'Vorschläge für die Ausführung electrischer Beobachtungen während der bevorstehenden Sonnenfinsterniss.'

L. A. BAUER: 'Proposed Magnetic and Electric Observations during the Total Solar Eclipse of August 30, 1905' (Preliminary Information).

J. E. BURBANK: 'Earth Currents: and a Proposed Method for their Investigation.'

Biographical Sketch of Svante August Arrhenius.

Letters to Editor: Nachtrag zur Abhandlung 'Ueber den Einfluss der Torsion bei den Ablenkungen eines hängenden Magneten,' F. Bidlingmaier; Tortosa Observatorio del Ebro (Illustrated), R. Cirera; Principal Magnetic Disturbances recorded at Cheltenham Magnetic Observatory, December 1, 1904, to March 1, 1905, W. F. Wallis; Present Russian Magnetic Observatories, M. Rykatscheff.

SOCIETIES AND ACADEMIES.

THE AMERICAN PHYSICAL SOCIETY.

THE regular spring meeting of the Physical Society was held at the Ryerson Physical Laboratory of the University of Chicago on Friday, April 21, and Saturday, April 22, 1905. President Barus presided. The meeting was well attended, nearly all the colleges and universities within several hundred miles of Chicago being well represented. An informal dinner on Friday evening at the Quadrangle Club was a pleasant feature of the meeting. The program, which was the largest in the history of the society, is given below:

H. N. MCCOY, University of Chicago: 'On the Relation between the Radioactivity and Composition of Uranium Compounds.'

G. G. BECKNELL, Northwestern University: 'The Residual e.m.f. of the Carbon Arc.'

C. W. CHAMBERLAIN, Denison University: 'The Radius of Molecular Attraction.'

G. M. HOBBS, University of Chicago: 'The Relation between p. d. and Spark Length for Small Values of the Latter.'

CARL KINSLEY, University of Chicago: 'Short Spark Discharges.'

J. E. ALMY, University of Nebraska: 'The Influence of Electrodes upon Spark Potentials.'

J. E. ALMY, University of Nebraska: 'Note on the Potential Difference Required to Produce very Short Sparks.'

A. B. PORTER, Chicago: 'Some Oddities in Lenses.'

A. H. TAYLOR, University of Wisconsin: 'On the Possible Variation of Inductance Standards with Temperature.'

E. M. TERRY, University of Wisconsin: 'On the Variation of Capacity with Temperature.'

A. H. TAYLOR, University of Wisconsin: 'On the Comparison of Mutual Inductances.'

R. T. HERDEGEN, University of Wisconsin: 'The Comparison of the Mutual Inductance of a Pair of Coils with the Self-induction of One of Them.'

O. M. STEWART, University of Missouri: 'The Use of the Quadrant Electrometer in Measuring Current.'

R. R. RAMSEY, University of Indiana: 'Polarization of Standard Cells.'

HENRY CREW and B. T. SPENCE, Northwestern University: 'Variation of Arc Spectra with the Phase of the Current Producing Them.'

A. A. MICHELSON, University of Chicago: 'Reciprocal Relations in Diffraction.'

A. A. MICHELSON, University of Chicago: 'Report of Progress in Ruling Diffraction Gratings.'

A. A. MICHELSON, University of Chicago: 'On the Use of the Concave Mirror with Diffraction Gratings.'

N. A. KENT, Wabash College: 'The Relative Positions of the Arc and Spark Lines in the Spectra of Titanium and Zinc.'

H. M. REESE, University of Missouri: 'The Resolving Power of Quartz Prisms.'

E. S. JOHONNOTT, Rose Polytechnic Institute: 'The Black Spot in Thin Liquid Films.'

F. L. BISHOP, Bradley Polytechnic Institute: 'Thermal Conductivities.'

A. P. CARMEN, University of Illinois: 'The Collapse of Tubes by External Pressure.'

A. B. PORTER, Chicago: 'Abbe's Diffraction Theory of Microscopic Vision.'

F. R. WATSON, University of Illinois: 'Surface Tension by the Method of Liquid Jets.'

A. L. FOLEY and J. H. HASEMAN, University of Indiana: 'Diffraction Fringes of Electric Discharges and the Fluid Streams.'

L. T. MORE, University of Cincinnati: 'On Dielectric Strain Along the Lines of Force.'

J. E. ALMY, University of Nebraska: 'On the Dielectric Strength of Crystals.'

PERCIVAL LEWIS, University of California: 'The Velocity of Ions in Gases from Colored Flames.' (By title.)

L. R. INGERSOLL, University of Wisconsin: 'The Kerr Effect in the Infra-Red Spectrum.'

E. L. NICHOLS and ERNEST MERRITT, Cornell University: 'The Phosphorescence of Sidot Blend.'

W. W. COBLENTZ, Cornell University: 'Infra-Red Emission Spectra of Gases in Vacuum Tubes.' (By title.)

D. B. BRACE, University of Nebraska: 'Æther Drift and the Rotary Polarization Test.'

D. B. BRACE, University of Nebraska: 'On a Test of Anomalous Dispersion by Means of Channeled Spectra.'

C. B. THWING, Syracuse University: 'Experiments on the Flow of Electricity in Metals under Changes of Pressure.'

H. A. CLARK, University of Nebraska: 'The Absorption and Refraction of Carbon.'

ERNEST MERRITT,
Secretary.

AMERICAN CHEMICAL SOCIETY.
NEW YORK SECTION.

THE sixth regular meeting of the New York Section was held Friday, March 10, at 8:30 P.M., in the American Museum of Natural History, 78th Street and Central Park West.

The program of the evening was as follows:

The Vapor Friction of Isomeric Ethers: MORRIS LOEB and F. S. M. PEDERSON.

The recorded experiments on the friction of vapors, by the transpiration method, having been made with cumbersome apparatus and at the temperature corresponding to the boiling points of the substances, it was thought important to devise a method whereby non-saturated vapors could be studied at identical temperatures, for the purpose of ascertaining whether the constitution as well as the composition of organic compounds influences the molecular volume, of which the vapor-friction is a function.

The apparatus used consists of a U-tube, one limb of which, about 60 cm. long, has a bore of less than one tenth of a millimeter, while the bend and the other limb is just wide enough to allow a column of mercury to descend unbroken. A stop-cock and funnel-end are placed on the wider tube, which also bears two marks about 50 cm. apart. The capacity of the tube between these marks is accurately determined. The whole apparatus can be heated uniformly, as it is surrounded by a vapor-jacket. Before heating, the liquid to be studied is poured into the tube and is vaporized as the temperature rises, in such a manner as to expel all air and foreign gases. A short column of mercury, of known length is introduced by means of the stop-cock, and in its descent forces the vapor through the capillary; the time in which the lower meniscus travels from the upper to the lower mark is ascertained by means of a stop-watch. The method is easy and rapid, and experiments with air gave results agreeing well among themselves and with the values obtained by the majority of previous observers. The calculations were made according to Poiseulle's formula, very few corrections being necessary.

From the study of isomeric ethers, as well as ethyl alcohol, it was found that the consti-

tution has a decided influence upon the internal friction of the vapor, as will be seen from the following table, representing in each case the average of a number of experiments. The last column gives the comparative volumes of the molecules according to the formula suggested by L. Meyer, in which 'Y' is the friction, 'M' the molecular mass,

$$V = .00003 \left(\frac{M(1+aT)}{Y^2}\right)^{\frac{3}{4}}.$$

Substance.	Y.	V.
Methyl ether, $(CH_3)_2O$	1,133.5	55.53
Ethyl alcohol, C_2H_6O	1,100	58.09
Methyl-ethyl ether	1,030	78.2
Ethyl ether	944.7	110.4
Methyl-propyl ether	951.8	100.74
Methyl-isopropyl ether	992.3	96.46
Ethyl-propyl ether	874.9	133.2
Di-propyl ether	797.6	170.7
Di-isopropyl ether	841.5	157.8

The Iodine Absorption of Rosin and Shellac: A. C. LANGMUIR.

The paper states the results of further investigations in the iodine absorption of rosin and shellac. The various grades of rosin A. to W. W., ranged between 190.1 and 264.5 in the percentage of iodine absorbed. A number of pure shellacs of the years 1890 to 1895 were tested in order to find if there was any variation in different crops. The figures obtained were between 14.3 and 17.4 and are the same as those shown by similar grades to-day.

Decomposition of Ammonia at High Temperatures: WILLIAM MELVILLE and ALFRED H. WHITE.

The paper embodies the results of a series of experiments carried on in the chemical laboratory at the University of Michigan, by Mr. A. H. White, instructor in chemical technology, and Mr. Wm. Melville. The object of the experiments was to determine if possible the influence of surface contact upon the decomposition of ammonia, also the effect upon the decomposition, of mixing the ammonia with gases, which are generally present in the manufacture of illuminating gas, with a view to increasing the yield of ammonia in the manufacture of coal gas.

The results have been tabulated, and also plotted in the form of curves, showing the effect of increased temperature, rate of flow of gas, and dilution with hydrogen, nitrogen, carbon monoxide and water vapor.

Mineral Waters at the St. Louis Exposition: A. A. BRENEMAN.

The paper gave the experience and observations of the author as chairman of the International Jury on mineral waters at the St. Louis Exposition. He also drew some comparisons between the exhibition of 1904 and that at Chicago in 1893, where he filled a similar position.

Mineral waters at St. Louis were shown mainly in the departments of mines and metallurgy, a few only being in the agricultural building. The collection numbered about 160 samples. Notable among these was the collective exhibit of the U. S. Geological Survey embracing 125 samples of United States waters which are offered for sale, all neatly bottled and arranged on shelves and in a separate enclosure. Most of these were accompanied by analyses and descriptive circulars. Another feature of this exhibit was the illustration of the analysis of each water by a series of small jars containing powders which represented the proportion of the dry ingredients extracted from the waters, a demonstration which gave a much more tangible interpretation to the average visitor than the printed analyses.

The foreign exhibit was represented by Mexico, Brazil, Argentine and Peru, the last with an alkaline table water of exceptional merit. Mexico sent very good samples with alkaline and sulphureted waters. Germany, Hungary and Portugal monopolized the list from abroad with 8, 19 and 11 samples, respectively, while Belgium and Italy with one each completed the European list. These foreign waters deserve particular consideration because of their long transport and time of keeping, both tending to accentuate any defects. It would be difficult to find a fault in some of these samples as presented. Germany having the largest trade and greatest experience, rightly leads the list among these.

As compared with the exhibition of mineral waters at Chicago in 1893, the St. Louis display was smaller and had fewer countries represented, but was, on the whole, of better

quality. Russia and Spain, which were largely represented in the earlier display, were both absent in 1904. American waters especially show a great improvement over the earlier period. The trade as a whole, in the United States, has grown from 21,569,608 gallons, worth $3,211,846 in 1894, to 51,242,719 gallons, worth $9,041,078 in 1903.

Radium Exhibits at the St. Louis Exposition: GEORGE F. KUNZ.

The radium exhibit of the U. S. Geological Survey at the St. Louis Exposition was gathered under the auspices of the author for two main purposes: (1) As this was an exposition year, such a collection shown at a great fair would mean the interesting of a great number of people in radio-activity—one of the newer problems of the hour; (2) by the exhibition of a collection of apparatus and of the minerals themselves, it would lead many people to look for these minerals in various sections of the country. Both these objects were accomplished to a greater or less extent; and it is believed that the coming year will bring more facts in this direction than we possess at present.

The radium exhibit of the U. S. Geological Survey was also exhibited by the American Museum of Natural History on March 10 in a large series of cases, for the New York Section of the American Chemical Society.

THE seventh regular meeting of the section was held at the Chemists' Club, Friday evening, April 7. The program of the evening was as follows:

Polarimetric Analysis: F. D. DODGE.

In a brief paper the author discusses some of the applications of the polariscope in chemical analysis, and shows that, for quantitative work, its use has so far been practically limited to sugar and similar substances.

The varying specific rotation of most optically active compounds under different conditions of solution and temperature, the interference of unknown substances, and difficulties with colored solutions, are among the principal causes which have prevented a more extended use of the instrument.

A method is also described by which some analyses, difficult or inconvenient by ordinary methods, can be carried out quickly and with reasonable accuracy by means of the polarimeter.

Quinazolines from 2-Amino 6-Nitrobenzoic Acid: VICTOR J. CHAMBERS and M. T. BOGERT.

The authors show that quinazolines may be readily obtained: (1) By heating 2-amino 6-nitrobenzoic acid in sealed tubes with nitriles and acid anhydrides, (2) by heating the ammonium salt of 2-acylamino 6-nitrobenzoic acid, (3) by fusing 2-amino 6-nitrobenzoic acid with amides, or (4) by treating 6-nitro acylanthranils with primary amines. 2-acetylamino 6-nitrobenzoic acid, 6-nitro acetylanthranil, the quinazoline, its 2-methyl, 2-phenyl and various other derivatives are described. Only three nitro-quinazolines are known besides those described in this paper.

Homo-anthranilic-nitril and some of its Derivatives, 7-Methylquinazolines: A. HOFFMAN and M. T. BOGERT.

Starting with homo-anthranilic nitril a series of the aliphatic and aromatic acyl derivatives were made. In the case of the aliphatic derivatives, molecular proportions of the fatty acid anhydrides and nitril were heated together. The aromatic derivatives were made by dissolving the acid chlorides and the nitril in separate portions of pyridine and the solutions mixed. The compounds prepared were the acetyl, propionyl, iso-butyryl, iso-valeryl, benzoyl, meta-nitro-benzoyl and para-nitro-benzoyl. The formyl derivative could not be obtained, as it immediately rearranges to the quinazoline.

By heating the acyl-homo-anthranitic nitril with alkaline hydrogen peroxide, 7-methyl-2-R-keto-dihydro-quinazolines were formed. This reaction works very smoothly and offers the advantage over the older methods that the homo-anthranitic nitril need not first be converted into the amide or the acid itself. The 7-methyl-keto-dihydro-quinazoline itself was made, and the following 2-R derivatives; methyl, ethyl, iso-propyl, iso-butyl, phenyl, meta-nitro-phenyl and para-nitro-phenyl.

Theories of Metabolism: GRAHAM LUSK.

A mass of living matter composing an individual produces in metabolism exactly the same quantity of energy (which may be measured as heat) as any other similar individual mass of the same size and shape in the same environment. The cause of the metabolism is not due to oxygen and oxidizing enzymes for these are present in excess. The cause is not due to the satisfaction of chemical equivalents (as in Ehrlich's side-chain theory of immunity) for the metabolism proceeds in accordance with the utilization of energy equivalents (isodynamic values). The swinging motions of the cell particles apparently act after the manner of catalysis, breaking up proteid, fat and the carbohydrates into simpler molecules, which may then unite with oxygen. The energy liberated through these chemical processes is in turn exactly sufficient to maintain those swinging motions of the cell particles whose aggregate we call life. After all is said, it is only possible to define metabolism as being due to unknown causes in the cells.

F. H. POUGH,
Secretary.

THE CORNELL SECTION OF THE AMERICAN CHEMICAL SOCIETY.

AT the March meeting of the Cornell Section of the American Chemical Society Mr. William W. Coblentz, Carnegie fellow, department of physics, Cornell University, read a paper on 'The Infra-red Emission and Absorption Spectra.' The speaker introduced his subject by showing several substances which emitted light, when heated slightly, while the iron plate containing the substance gave out no light. This shows the necessity of distinguishing between luminescence and a pure thermal radiation. After reviewing the ionic theory of emission and absorption spectra the speaker illustrated his researches on this subject by means of two series of lantern slides. The slides of emission spectra dealt with luminescent and pure thermal radiators, and comprised such radiators as the Nernst lamp, the acetylene and amylacetate flames, metals in the carbon arc, the spark discharge, the mercury arc and the vacuum tube radiation for different gases. The slides of absorption spectra dealt with compounds showing the following facts: isomeric compounds show that structure has a great influence upon the resulting absorption spectrum; that the maxima of absorption do not shift with increase in molecular weight; that the substitution of certain groups of atoms has a great influence upon the absorption spectrum; that the spectra of groups of compounds are similar and are characteristic of the grouping adopted by chemists; that carbohydrates have a characteristic spectrum; that several marked absorption bands are closely harmonic; that in compounds having water of crystallization certain absorption bands are coincident with those of ordinary water; that the CH_3 group has characteristic bands at 3.43 and 6.86, NH_3 at 2.96, OH at 3, NCS at 4.78, C_6H_6 at 3.25 and 6.75; and finally that in benzene derivations the original bands of benzene, C_6H_6, are found beside the new ones, e. g., those of CH_3, NH_2 or NCS, showing that the vibration of the benzene nucleus has not been destroyed.

AT the meeting on April 18, 1905, Dr. A. W. Browne read a paper on 'A New Synthesis of Hydronitric Acid.'

Previous methods for the formation of hydronitric acid (or its inorganic salts) from hydrazine or its inorganic derivatives have involved, respectively, the action of nitrous acid, potassium nitrite, silver nitrite, nitric acid or nitrogen trichloride; or of oxidizing agents (such as chromic acid or hydrogen peroxide) in presence of hydroxylamine chloride. In no case has the compound been formed by the action upon hydrazine alone of a substance containing no nitrogen.

The method now to be described consists in the action of hydrogen peroxide upon hydrazine sulphate in presence of strong sulphuric acid. In eleven experiments performed under varying conditions yields of from 11.4 to 28.4 per cent. of hydronitric acid were obtained. The reaction may be considered to proceed in accordance with the following equation:

$$3N_2H_4 + 5H_2O_2 = 2HN_3 + 10H_2O.$$

The identity of the hydronitric acid was

established by the following facts: (1) It possessed even in dilute solution the characteristic headache-producing odor; (2) when treated with ferric chloride solution it gave the usual blood-red color, destroyed by dilute hydrochloric acid and not destroyed by dilute mercuric chloride solution; (3) when treated with silver nitrate solution it gave a white precipitate completely soluble in dilute nitric acid. The dried precipitate exploded with violence when thrown upon a hot iron plate or when touched with a glowing platinum wire; (4) analyses of the silver salt showed it to be identical with silver trinitride.

Further experiments have shown that hydronitric acid may be obtained in small quantities by the action upon hydrazine sulphate of certain oxidizing agents other than hydrogen peroxide, some of which have been previously used by other investigators in the quantitative determination of hydrazine.

At a special meeting of the section held on May 2 at eight P.M., Dr. W. C. Geer, of the department of chemistry, Cornell University, read a very interesting paper entitled: 'The Chemistry of Indium.'

W. S. Lenk,
Secretary.

THE GEOLOGICAL SOCIETY OF WASHINGTON.

The 167th meeting was held at the Cosmos Club, April 12.

The following papers were given as the regular program:

Terraces of the High Sierra, California: G. K. Gilbert.

The Sierra Nevada has long been recognized as a broad, sloping plateau having a steep face toward the east and a gentle descent from its crest to the western base. The fact has also been recognized that the general plateau is made up of subsidiary plateaus. In the northern part of the range it has been shown by Diller and others that various subsidiary plateaus are separated from one another by faults, and their discrepancies in altitude were caused by differential uplift. At the extreme south, in the basin of Kern River, Lawson has ascribed certain subsidiary plateaus to erosion, the surface of the range having been partially graded during pauses between epochs of uplift. The present studies pertain to the higher portions of the range, from the Kern River basin northward to that of the Tuolumne, a distance of more than 100 miles. Within this belt are (1) *summit plateaus* characterizing interstream areas and recording a long period, or periods, of degradation soon after the commencement of the Sierra uplift. Many of the peaks overlooking the summit plateaus, especially in the neighborhood of the crest line, have (2) *remnant surfaces* of moderate slope, strongly contrasted with the surrounding cliffs, produced for the most part by glacial erosion. And many of the valleys are bordered by (3) *high terraces,* in some cases expanded so as to constitute important plateaus. It is believed that the remnants of old topography at high altitudes were in the main once continuous with the summit plateaus, but the correlation is difficult, because the connecting slopes have been destroyed by the excessive development of glacial cirques. It is probable also that some of the valley plateaus at high levels will eventually be correlated with summit plateaus farther to the west, and it is also to be anticipated that the plateaus and terraces of the higher parts of the range will eventually be correlated with similar features near the western base of the range; but the latter have not yet been studied. In the upper Tuolumne basin a discordance of plateau levels appears to have been produced by comparatively recent dislocation, and somewhat similar phenomena were observed in the basin of Kings River.

The plateaus constitute part of the evidence by means of which the history of the uplift is to be read, and they also serve as datum planes from which the amount of subsequent erosion, especially glacial erosion, can be measured.

The Snowy Range of New South Wales: W. Lindgren.

As is well known, the Australian Cordillera follows the eastern coast of the continent until, in Victoria, it bends westward and finally dies out.

The highest points of this cordillera are situated in the southern part of New South Wales, not far from the Victorian boundary line, and somewhat exceed 7,000 feet in elevation; the culminating point is Mt. Kosciusko, which attains 7,300 feet. The Snowy Range, which includes most of this elevated district, constitutes the watershed between the interior drainage of the Murrumbidgee and Murray Rivers and that of the Snowy River which empties into the ocean in Victoria near the boundary line between that state and New South Wales.

The plateau sustains a very scanty vegetation of dwarfed eucalyptus. The climate is very cold, the temperature sinking to — 20° F. in the winter, and the snowfall is extremely heavy.

The rocks consist chiefly of the rather closely folded Paleozoic sediments which occupy so much space in the Cordillera. Their age ranges from Ordovician to early Carboniferous, and tuffs and intrusive granitic rocks of various kinds are associated with the sediments.

The so-called Snowy Range is not really a range at all, but a plateau of comparatively gentle relief, a peneplain in fact, with elevation ranging from 5,000 to 7,000 feet, in which the Tumut, Murrumbidgee and Eucumbene Rivers have cut abrupt canyons, the depth of which in some cases amounts to 3,000 feet. That this uplift is of comparatively recent age is proved by the basaltic flows which, near Kiandra, cover the summit of the plateau. The basalt covers an old auriferous river channel which has been traced for 20 miles by means of mining operations, and which has a gentle northward grade. Sand, clay and lignite cover the thin stratum of auriferous gravel to a depth of 150 feet and capping this the basalt flow attains a thickness of about 100 feet.

GEO. OTIS SMITH,
Secretary.

DISCUSSION AND CORRESPONDENCE.

CONCERNING THE NATURAL MOUNDS.

WHAT has been said in SCIENCE recently (Nos. 530, 535 and 536, pp. 310, 514 and 551) by Mr. A. C. Veach and Professors Branner and Hilgard is of great interest to the writer, inasmuch as he has for some years been making observations on these mounds in Arkansas with the hope of reaching a satisfactory conclusion as to their origin. They have been observed along the western border of the Tertiary area, along the Arkansas valley, and in the northwestern part of the state. In outline, they are uniformly circular, and in size are rarely less than fifteen or more than thirty feet in diameter, and usually less than three feet in height.

The theories of surface erosion, wind origin and human origin have been applied to these with the conclusion that none of them will hold. The uniformity of size and circular outline could not result from surface erosion. For the same reason, as Mr. Veach points out, they could not be the product of wind deposition. Besides, they always occur on clay soil, out of which and upon which, according to the writer's observations, the wind does not form dunes. The fact that they frequently occur in the most undesirable places for human abode, being on ground where both the surface drainage and underdrainage is poor, is in itself sufficient argument against the theory of human origin. The spring and gas vent theory is not tenable in the Paleozoic region, for the reason that Mr. Veach has stated.

After being forced to abandon the above theories, one of origin by burrowing animals, such as the gopher or prairie-dog, was held for some time, but the examination of a large number of sections disclosed by grading along railroads, wagon roads and cutting ditches through farms furnished no evidence of the material having been worked over, as must have been the case if such were the origin. However, this theory is not yet entirely abandoned.

As to the ant-hill theory, there are at present in the Arkansas valley large numbers of ant-hills from three to four feet in diameter, and often as much as fifteen inches high. These are found on the very soil where the mounds occur. But if the ancestors or forerunners of the living ants were the builders of the mounds, they must have existed in