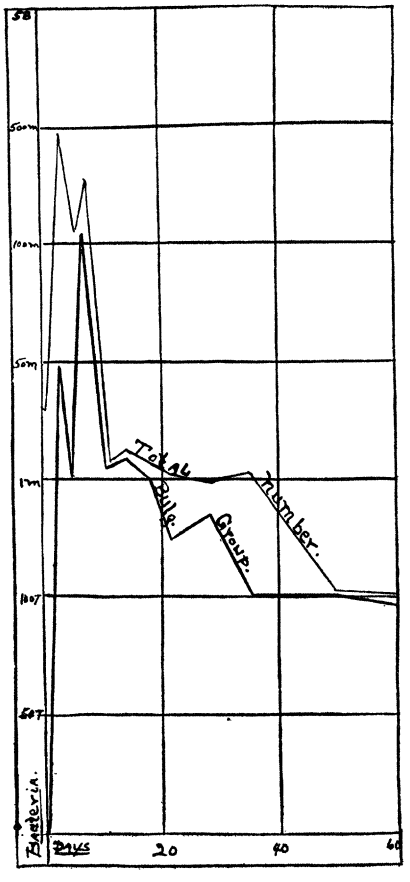
calculated as lactic acid, while 0.71 per cent. was volatile[3], figured as acetic acid. Plain agar was used to obtain the total microbial content. The relation of these two curves to each other compares very favorably with the corresponding curves made from other kinds of ensilage studied.

Fig. 1.

A Comparison of Total Numbers with the Bulgarian Type in Kaffir Ensilage



The presence of this group, in all normal ensilage, in large numbers, at a very important stage of fermentation, together with the fact that their characteristic fermentation is acid production, seem to offer sufficient evidence to support the view that a large part of the acid formed in normal ensilage is the result of their activities.

A more detailed report relating to silage fermentation will appear later.

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[3] The volatile acids were determined by the method proposed by Dox and Neidig, *Research Bulletin*, No. 7, Experiment Station, Iowa State College.

THE ANNUAL MEETING OF THE AMERICAN PHYSICAL SOCIETY

The eighty-first meeting of the American Physical Society was held at Columbus, Ohio, December 27–30, 1915. It was the annual meeting and a joint meeting with Section B of the American Association for the Advancement of Science. Six sessions were held for the reading of papers. President Merritt presided, except on Wednesday afternoon, which was devoted to a special program of invited addresses arranged by Section B. Vice-president E. P. Lewis was in charge of this session. At the other five sessions the following sixty-three papers were presented:

"A Mechanical Device for the Rapid Evaluation of Certain Variable Exponential Functions," by Irwin G. Priest.

"On the Value of $\gamma = Cp/Cv$ for Hydrogen," by Karl K. Darrow.

"Deviation of Natural Gas from Boyle's Law," by R. F. Earhart.

"Preliminary Report on the Diffusion of Solids," by C. E. Van Ostrand and F. P. Dewey. (By title.)

"On the Properties of Matter at Low Temperatures," by Jakob Kunz. (By title.)

"Pressures and Critical Lengths in the Collapse of Short Tubes," by A. P. Carman.

"A Photographic Study of the Relative Velocity of Sound Waves of Different Intensities," by Arthur L. Foley.

"A Preliminary Investigation of an Explosion Wave in a Gas," by J. B. Dutcher.

"An Attempt to Detect a Change in the Specific Heat of Selenium with a Change in the Illumination, and also with the Application of an Electric Field," by L. P. Sieg.

"Wind Velocity and Elevation," by W. J. Humphreys.

"A Proposed Physical Method for Reducing Radiant Power and its Luminous Value," by Irwin G. Priest and Chauncy G. Peters.

"The Coefficient of Total Radiation of a Uniformly Heated Enclosure," by W. W. Coblentz and W. B. Emerson.

"A Luminosity Curve Equation and its Application to the Black Body," by E. F. Kingsbury.

"Black Body Brightness and the Mechanical Equivalent of Light," by Herbert E. Ives and E. F. Kingsbury.

"The True Temperature Scale for Tungsten and its Emissive Powers at Incandescent Temperatures," by A. G. Worthing.

"'Color Temperature' Scales for Tungsten and Carbon," by Edward P. Hyde, F. E. Cady and W. E. Forsythe.

"The Infra-red Spectra of the Alkaline Earth Group," by H. M. Randall.

"The Pole Effect in a Calcium Arc," by Henry G. Gale and Walter T. Whitney.

"The Reflecting Power of Alkali Metals in Contact with Glass, as Determined by the Photoelectric Cell," by J. B. Nathansen.

"The Refractive Indices of Hydrogen and Helium on Bohr's Theory," by C. Davisson.

"A Photographic Study of the Diffraction Ring System in the Shadow of a Sphere," by Mason E. Hufford.

Wednesday, December 29, 10 A.M.

"The Ionization Produced by a β-particle," by Alois F. Kovarik and L. W. McKeehan.

"The Rôle Played by Gases in Photo-Electric Discharge," by R. A. Millikan and Wilmer H. Souder.

"The Relation between the Pressure Effect and the Light Effect in Selenium Crystals," by E. O. Dietrich.

"On the So-called Magnetic Rays of Righi," by James E. Ives.

"The Absorption Coefficients of various Metals for High Frequency X-Rays," by S. J. M. Allen.

"The Distribution of Energy in the X-Ray Spectrum of Tungsten and Molbydenum at Constant Potential," by A. W. Hull.

"The Emission Quanta of Characteristic X-Rays," by David L. Webster.

"The Tribo-luminescence of Manganese-Zinc Compounds." With demonstration. By C. W. Waggoner.

"A New Law relating Ionization Pressure and Current in the Corona of Constant Potentials," by Earle H. Warner.

"Arcs in Gases between Non-consuming Electrodes," by G. M. J. Mackay and C. V. Ferguson.

"The Hall Effect and Allied Phenomena in Rare Metals and Alloys," by Alpheus W. Smith.

"Mechanical and Acoustical Impedance, and the Theory of the Phonograph," by A. G. Webster.

"Further Experiments on the Impedance of Conical Horns," by A. G. Webster.

"The Effect of Surface Films on Contact E. M. F.'s," by R. A. Millikan and Wilmer H. Souder.

"A Resonance Method for Measuring the Phase Difference of Condensers," by H. L. Dodge.

"The Magnetic Susceptibility of Oxygen," by W. P. Roop. (Read by E. P. Lewis.)

"An Unrecognized Error in the Measurement of Magnetic Flux," by Arthur Whitmore Smith.

"Unipolar Induction and Absolute Rotation," by E. H. Kennard.

"The Electrical Resistance of Vertically Suspended Wires," by S. R. Williams.

"A Simplified Apparatus for Measuring the Conductivity of Electrolytes," by R. P. Hibbard.

"Measurements of an Electric Current from its Heating Effect," by S. Leroy Brown.

"A Study of the Law of Response of the Silicon Detector," by Louise S. McDowell and Frances G. Wick.

"On the Free Vibrations of a Lecher System IV.," by F. C. Blake and Charles Sheard.

"Constant High Potential for X-Ray Work," by Albert W. Hull.

"Carbon Compression Rheostats," by E. L. Clark.

"On the Theorem that all Action Requires Action at a Distance Somewheres," by E. H. Kennard.

"The Black Body at the Melting Point of Platinum as a Fixed Point in Photometry," by Herbert E. Ives.

"The Luminous Efficiency of the Carbon Incandescent Lamp and the Mechanical Equivalent of Light," by Herbert E. Ives and E. F. Kingsbury.

"The Mobility of Positive Ions," by Henry A. Erikson.

"The Hall Effect and Allied Phenomena in Tellurium," by P. I. Wold.

"A Wehnelt Cathode Ray Tube Magnetometer," by C. T. Knipp and L. A. Welo.

"An Investigation of the Acoustical Properties of the Armory at the University of Illinois," by F. R. Watson.

"New Electromagnetic Phenomena demonstrated by Floating Sand Pebbles and other Nonconductors in Acidulated Water," by J. C. Lincoln. (By title.)

"The Phonotrope, a New Instrument for find-

ing the direction of an Acoustical Ray," by A. G. Webster.

"The Propagation of Transverse Waves in a Bar," by Louis Thompson.

"The Exceptions to the Law of Dulong and Petit," by J. E. Siebel.

"Experiments with Slow Positive Rays," by A. G. Dempster.

"Theory of the Free Vibrations of a Lecher System," by F. C. Blake.

"Springs of Minimum Weight," by Henry C. Lord. (By title.)

"Spectra of Some Halogen Compounds and Phenomena Connected Therewith," by Charles Sheard and C. S. Morris.

"On a New Method of using the Reversible Pendulum for the Determination of g," by J. C. Shedd.

"The Effect of Absorbed Gases in Photoelectric Emission," by Robert J. Piersol. (Read by E. P. Lewis.)

At the special session in charge of Section B on Wednesday afternoon the following program was presented:

"The Dependence of Progress in Science upon the Development of Instruments" (Vice-presidential address before Section B), by Anthony Zeleny.

"A General Survey of the Field of High Pressure," by P. W. Bridgman. Discussion by A. G. Webster.

The Northrup Visible Molecules Apparatus was demonstrated at the close of the session.

At a short business session on Wednesday the result of the mail ballot for officers for 1916 was announced as follows: for president, R. A. Millikan, of Chicago; vice-president, H. A. Bumstead, of New Haven; secretary, A. D. Cole, of Columbus; treasurer, J. S. Ames, of Baltimore; members of council, Irving Langmuir, of Schenectady and G. B. Pegram, of New York; members of editorial board, A. Trowbridge, E. P. Lewis and W. C. Sabine. Several other items of business were transacted.

The registration for the meeting was 158. About one hundred were present at the Physicists' dinner on Wednesday evening. Whether judged by the number and character of the papers presented, by the attendance or by the amount and interest of the discussion following the papers, this meeting was one of the best that the American Physical Society has ever held.

A. D. COLE,
Secretary

THE BOTANICAL SOCIETY OF AMERICA. II

The Evolution of Reproductive Mechanisms in Seed Plants: E. C. JEFFREY AND R. E. TORREY.

Mechanisms strictly so called are not numerous in plants. Among them may be classed the annulus which causes the opening of the sporangium in ferns and fern allies, including the cycads. The annulus is obviously a structure of epidermal origin, sometimes showing the presence of stomata. In the seed plants from *Ginkgo* upwards the opening mechanism of sporangia is not primarily of this nature. In the lower Gymnosperms the cryptogamic wood of centripetal development persists strongly, clearly indicating their filiation with the fern series. In the higher Gymnosperms the centripetal or cryptogamic wood becomes merged in the so-called transfusion tissue. The purpose of the present communication is to make clear that the transfusion tissue of *Ginkgo* and the Abietineae obviously furnishes the mechanism for opening the microsporangium. In the higher Conifers as well as in the Gnetales and angiosperms the fiber layer or mechanical system of the anther wall is no longer related to the fibrovascular system. The considerations advanced make it clear that sporangial mechanisms are of diverse origins. In the Cycadales and their allies the fern-like plants, the epidermis supplies the mechanically active layer. From the Ginkgoales upwards the tissues of the fibrovascular system, particularly the vestiges of the cryptogamic centripetal wood known as transfusion tissue, take on the function of providing for the opening of the spore sacks. The sporangium of the lower forms may appropriately be designated ectokinetic since its action depends upon the mechanical action of an external tissue, the epidermis. The sporangium of the higher forms, in which the fibrovascular tissue is primitively related to the mechanically active layer, is appropriately designated endokinetic.

The Comparative Rapidity of Evolution in Various Plant Types: EDMUND W. SINNOTT.

Given an equal degree of heritable variability, the rapidity with which a plant undergoes evolutionary change depends on the growth-type to which it conforms. Herbs, with their very brief period from seed to seed, accumulate changes much more quickly than do trees and shrubs, with their much longer generations. Local specific and generic types therefore arise most readily among herbs. Herbs occur in a much smaller number of