Irwin; Meyer's Theorie benachbarter Geraden und ein verallgemeinerter Krümmungsbegriff, by E. B. Cowley; Hilbert's Grundlagen der Geometrie and Grundzüge einer allgemeinen Theorie der linearen Integralgleichungen, by T. H. Gronwall; Lebon's Gabriel Lippmann, Moritz's College Mathematics Notebook and College Engineering Notebook, and Harris's Gravitation, by E. B. Wilson; "Notes"; and "New Publications."

THE April number of the *Bulletin* contains: "An unpublished theorem of Kronecker respecting numerical equations," presidential address, by H. B. Fine; "Two convergency proofs," by Arnold Emch; "Some properties of the group of isomorphisms of an abelian group," by G. A. Miller; Review of Landau's Handbuch der Lehre von der Verteilung der Primzahlen, by T. H. Gronwall; Review of Fisher's Purchasing Power of Money, by E. B. Wilson; "Shorter Notices"; Clebsch-Lindemann's Geometrie, by Joseph Lipka; Weyl's Die Idee der Riemannschen Fläche, by F. R. Moulton; "Notes"; and "New Publications."

THE May number of the *Bulletin* contains: Report of the February meeting of the society, by F. N. Cole; "A non-enumerable well-ordered set," by A. B. Frizell; "Note on the Fredholm determinant," by W. A. Hurwitz; "Time as a fourth dimension," by R. C. Archibald; Review of Bützberger's Bizentrische Polygone, Steinersche Kreis- und Kugelreihen und die Erfindung der Inversion, by Arnold Emch; "Shorter Notices"; Loria's Poliedri, Curve e Superficie secondo i Metodi della Geometria descrittiva and Darstellende Geometrie, zweiter Teil, by Virgil Snyder; Czuber's Differential- und Integralrechnung, by L. W. Dowling; Ciani's Lezioni di Geometria proiettiva ed analitica, by E. B. Cowley; Hessenberg's Transcendenz von e und π and Bolza's Variationsrechnung, by T. H. Gronwall; Picard's Das Wissen der Gegenwart in Mathematik und Naturwissenschaft, by J. B. Shaw; Sturm's Maxima und Minima in der elementaren Geometrie, by J. V. McKelvey; Norris and Craigo's Advanced Shop Mathematics, by P. F. Smith; Czuber's Wahrscheinlichkeitsrechnung, by H. B. Phillips; Lord Kelvin's Mathematical and Physical Papers, volumes IV., V. and VI., and Love's Problems of Geodynamics, by E. B. Wilson; Annuaire pour l'An 1914 publié par le Bureau des Longitudes, Combebiac's Les Actions à Distance and Abbe's Mechanics of the Earth's Atmosphere, by E. W. Brown; "Notes"; and "New Publications."

SPECIAL ARTICLES

THE SYSTEMATIC POSITION OF THE MYLODONT SLOTHS FROM RANCHO LA BREA[1]

IN the excavation work carried on by the University of California in the Pleistocene of Rancho La Brea, a considerable percentage of the material obtained represents ground-sloths of the mylodont group. Twenty-seven skulls, representing the family Mylodontidæ, are now in the collection of the department of paleontology. Of these, nineteen are well preserved and show the dental series on both sides. Many lower jaws are also available, several of which are associated with the skulls. In a preliminary consideration of this extensive series of specimens, certain suggestions as to the relationship of some of the mylodont genera have presented themselves. It seems desirable, therefore, to make this information available for other students of the group.

The writer is indebted to Professor John C. Merriam for kind assistance during this study.

The genera *Mylodon* and *Paramylodon*, to which the Rancho La Brea material has previously been referred, are the members of the family Mylodontidæ definitely recognized in the North American Pleistocene. A fragmentary lower jaw, originally described by Harlan from Big Bone Lick, Kentucky, was referred to *Mylodon* by Owen in 1840. In 1903 Brown[2] established the genus *Paramylodon* on a skull and lower jaw with associated skeletal material obtained from Pleistocene deposits near Hay Springs, Nebraska.

[1] Read at the fifth annual meeting of the Paleontological Society, Princeton, N. J., January 1, 1914.

[2] Brown, B., *Bull. Amer. Mus. Nat. Hist.*, Vol. XIX., Art. XXII., pp. 569–583, 1903.

In 1909 Cockerell[3] briefly described a skull from Walsenburg, Colorado. Brown believed it to be distinct from *Paramylodon* and assigned it to the genus *Mylodon*. Some doubt as to the validity of the genus *Paramylodon* was subsequently expressed by Osborn,[4] though Allen,[5] in a recent paper, accepts the determination of Brown.

The diagnostic characters of the genus *Paramylodon* were stated by Brown as follows:

> Skull elongate; muzzle inflated; dentition $\frac{4}{4}$; first upper molar the largest of the series; last lower molar trilobate; first lower molar without opposing tooth.

The nineteen skulls from Rancho La Brea are similar to the Nebraska and Colorado specimens in the elongation of the head and the inflation of the muzzle. In several of the California specimens the teeth have fallen from the sockets, the study in such cases being restricted to the alveolar outlines. The series arranges itself as follows:

1. Four skulls with four teeth on both sides.
2. Six skulls with four teeth on one side and five teeth on the opposite side.
3. Nine skulls with five teeth on both sides.

The superior dentition varies, therefore, from four to five teeth on each side; and this variation appears to be independent of the age of the individual. It follows from the variable presence of the first tooth, that it is the second superior tooth which is the largest of the series. Upon the presence of the first superior tooth depends, also, the nature of occlusion with the first inferior tooth.

The fourth inferior tooth, in a series of five lower jaws, is most distinctly trilobed in an individual of the first group. The tooth appears slightly less trilobed in individuals of the second and third groups, and may be two-lobed in the last group.

Judging from the variation in the large series from Rancho La Brea, the form described by Brown, as well as the remains from the asphalt deposits, should apparently be placed in the genus *Mylodon*. The earlier authors would probably have arrived at a similar conclusion, had this extensive collection been available. Allen considers the Colorado skull as belonging to *Mylodon harlani* Owen. Possibly the specimens from Nebraska and Colorado are closely related specifically to the Rancho La Brea remains. At present the writer will only state that the inferior dental series of several mandibles from Rancho La Brea bear a close resemblance to the type specimen of *M. harlani*.

A third type of ground-sloth from North America, which has been considered with the Mylodontidæ, is the genus *Morotherium* described by Marsh[6] in 1874 from remains found in Alameda county, California. Marsh considered *Morotherium* closely related to *Mylodon* and *Megalonyx*. It was distinguished from *Mylodon* by the absence of the depression in the head of the femur for the ligamentum teres. The humerus of *Morotherium* differed from *Megalonyx* in the absence of the supracondylar foramen. In 1899 Merriam[7] described a humerus from Pleistocene strata near Tomales Bay, California. It resembled closely the known portion of Marsh's specimen and was referred to *Morotherium*, although the validity of the genus was questioned by the writer.

A comparison of the Tomales Bay humerus with several specimens from Rancho La Brea indicates that the former specimen undoubtedly belongs to *Mylodon*. The writer has not seen the type (femur) of *Morotherium*. As stated by Marsh, it resembles *Megalonyx* in general shape. The specimen, as figured, appears to be quite different in shape from the *Mylodon* femurs of the asphalt deposits. The absence of the notch for the ligamentum teres can hardly be considered as generically distinctive of *Morotherium*, as it may be absent

[3] Cockerell, T. D. A., Univ. Colo. Studies, Vol. VI., No. 4, pp. 309–312, 1909.

[4] Osborn, H. F., "The Age of Mammals in Europe, Asia and North America," Macmillan Co., p. 457, 1910.

[5] Allen, G. M., *Mem. Mus. Comp. Zool. Harv. Coll.*, Vol. XL., No. 7, pp. 319–346, 1913.

[6] Marsh, O. C., *Amer. Jour. Sci.*, Vol. 7 (3), Art. XLIX., pp. 531–534, 1874.

[7] Merriam, J. C., *Bull. Geol. Soc. Amer.*, Vol. 11, pp. 612–614, 1899.

on *Mylodon* femurs from Rancho La Brea. The femur of *Megalonyx,* as figured by Leidy, appears, also, to be without this notch. Possibly Marsh's type should be referred to *Megalonyx.*

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December 9, 1913

THE SOCIETY OF AMERICAN BACTERIOLOGISTS[1]

WEDNESDAY, DECEMBER 31, 1913, TEN O'CLOCK

Soil Bacteriology

Bacterial Activities and Crop Production: P. E. BROWN.

The importance of correlating the results of bacteriological tests with known facts regarding soil fertility is emphasized. The improvements in methods for the bacterial examination of soils has made possible the study of the relation between bacterial activities and crops produced. Thus the determination of the ammonifying power, the nitrifying power or the azofying power of soils may be an indication of their fertility or crop-producing power, or at least of the relative fertility of several soils.

Soils under varying rotations and under different treatment have been studied during the past three years, and the results secured show in practically every case a similar, definite relation between the crops produced on the various plots and the ammonifying power and the nitrifying power of the soils determined by the fresh soil-casein method for the one and the fresh soil-ammonium sulfate method for the other.

It is evident that the bacterial activities in soils determine very largely the crop-producing power of the soils. If the bacterial mechanism which brings about the solution of insoluble plant food is inadequate, crops will suffer for lack of food. In soils where improper rotations and poor treatment is practised the conditions very quickly become unsatisfactory for optimum bacterial growth and crops immediately feel the effect of this diminished growth in a reduced supply of food. The work, as a whole, therefore, points toward the value of bacterial tests as a measure of the crop-producing power of soils.

The Environment of Soil Organisms: F. H. HESSELINK VAN SUCHTELEN.

Growing out of the importance of the action of media on organisms a study of soil as a cultural medium was undertaken. So far as our present knowledge concerning soils extends, the only means at our disposal for judging the cultural medium of soil organisms is drainage water. It may be expected, however, that the soil solution as it exists in the soil differs quantitatively from the drainage water.

A method was devised for obtaining this soil solution based on its displacement by inactive substances (paraffine oil, vaseline, etc.). Work by means of the determination of osmotic pressure and electrical conductivity was undertaken, which demonstrated the value of such a displacement.

The absolute amount of soil solution obtained by the above-mentioned method varied from 100–435 c.c. solution. As an example of the successful extraction the following data may be quoted. From 7.949 kilograms of sandy loam with a total water capacity of 24.6 per cent. containing 14.3 per cent. water (all figured on the basis of dry soil), there was obtained 330 c.c. of soil solution. The concentration of the soil solution bears a resemblance to the very first portion of drainage water obtained by careful percolation through a large quantity of soil.

Besides an extensive study of the soils employed in our experiments, there were made physico-chemical and chemical examinations of the liquid obtained by the foregoing displacement process, together with a determination of the number of microorganisms found by the plate method. It was ascertained that different soils, soils closely adjacent and the soils of different layers, contained soil solutions of different compositions. Detailed results will appear in a future publication.

A New Medium for the Quantitative Determination of Bacteria in Soil: H. JOEL CONN.

Three special media for soil work have been proposed during the last few years: by Hugo Fischer,[2] by J. G. Lipman[3] and by P. E. Brown.[4] Recently an asparaginate agar containing wholly chemicals of known composition has been prepared at the New York Experiment Station. A fifth medium, a soil-extract gelatin, has been compared with them, because it has been found to give a very high and regular count. The composition of these media are as follows:

[1] Abstract of papers presented.

[2] *Centbl. f. Bakt.,* II., Ab. 25, p. 457.

[3] *Id.,* 25, p. 447.

[4] *Id.,* 38, p. 497.