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.*

CHESTER STOCK
PALEONTOLOGIC LABORATORY,
UNIVERSITY OF CALIFORNIA,
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.

	Asparag. Agar	Fischer's	Lipman's	Brown's	Soil-Extr. Gelatin
Water	1,000	—	1,000	1,000	900
Soil-extract	—	1,000	—	—	100
Agar	12	12	20	15	—
Gelatin	—	—	—	—	120
Peptone	—	—	.05	—	—
Albumin	—	—	—	.1	
Na. Asparag.	1	—	—	—	—
Dextrose	1	—	10	10	1
$MgSO_4$	.2	—	.2	.2	—
K_2HPO	—	2	.5	.5	—
$NH_4H_2PO_4$	1.5	—	—	—	—
KCl	.1	—	—	—	—
$CaCl_2$	.1	—	—	—	—
$FeCl_3$	Trace	—	—	—	—
$Fe_2(SO_4)_3$	—	—	—	Trace	—

In the asparaginate agar the reaction should be carefully adjusted to 0.8 per cent. normal acid to phenolphthalein. The dextrose and asparaginate should be added just before tubing.

Some thirty-five comparative tests of the gelatin with one or more of the other media have been made. Various soils have been used for inoculating. Incubation has been at 180° C. for seven days with gelatin and fourteen with agar, which allows a very high count (5–50 million in normal field soil). The following figures (referred to in terms of colonies on asparaginate agar as 100) represent instances that seem to be typical:

	Asparag. Agar.	Fischer's	Lipman's	Brown's	Soil-Extr. Gelatin
Case 1	100	170	68	57	113
Case 2	100	85	75	Irregular	93

About forty other tests have been made to determine the best proportions of the various constituents in the asparaginate agar. None have proved more satisfactory than the above formula.

As a result of this work the asparaginate agar is highly recommended. The only medium which seems better, either in respect to count or to the colony differentiation, is soil-extract gelatin; and because of the addition of soil extract this gelatin is not one that can be readily duplicated. The only one of the media investigated which gives a higher count than either of these is Fischer's soil-extract agar, which does not allow good colony differentiation. The detailed results of this work are to be published as a technical bulletin of the New York Agricultural Experiment Station.

Antagonism Between Salts as Affecting Soil Bacteria: CHAS. B. LIPMAN.

With Loeb's conception of physiologically balanced solutions as a basis, the author has carried on experiments dealing with a phase of the subject hitherto regarded as of little significance, namely, the antagonism between anions. The most striking results have been obtained with such antagonism between anions through the use of the so-called alkali salts which commonly include sodium chloride, sodium carbonate and sodium sulfate.

Results of antagonism between the anions of these salts show that both as regards ammonification and nitrification, it was possible to improve the soil as a medium after it had been made toxic for the bacteria in question, by means of any one of these salts, through the addition of any other of the three salts mentioned. Thus briefly, it was possible at times to triple and quadruple the total salt content of the soil and still make it a better medium for ammonification and nitrification than it was with one third or one fourth of the total salt content consisting, however, of but one salt. The author claims for this great significance in the direction of the management and control of alkali land.

Sulfofication in Soils: P. E. BROWN AND E. H. KELLOGG.

Recent work has shown that considerably larger amounts of the element sulfur are removed from soils by the growth of crops than has been supposed. The inaccuracy of the old method used in the determination of the sulfur in crops explains the discrepancy. Soils have been shown to contain in most cases only a limited supply of sulfur, usually a smaller amount than of phosphorus. The problem of the sulfur feeding of plants is therefore coming to be of considerably more importance than it has been in the past. The natural means of returning sulfur to the soil is by the use of farmyard manure or green manure and in these materials it is added in a complex organic form in the proteins. The sulfur in these must be transformed into sulfates to be of use to plants.

Here is where the sulfofying bacteria appear. They are the agents which bring about the change of organic sulfur into sulfates. Many questions immediately arise in a consideration of this point. Do soils have a sulfofying power? Can this be determined? How? What is the relation of the sulfofying power of soils to the sulfur feeding of plants? etc. This work deals with the first question and shows that soils do have a definite sulfo-

fying power which varies with the type of soil, soil treatment, etc.

The sulfofying power of soils may be determined in the laboratory in the following way:

100 grams of fresh soil obtained with all precautions that it shall be representative and uncontaminated are weighed out in tumblers and thoroughly stirred. Then 0.1 gm. of a sulfide (Na_2S) or sulfur is added. Moisture conditions are brought up to the optimum by additions of sterile water. The soils are incubated for 4–5 days at room temperature. At the end of that time the sulfates are leached out by shaking for six hours with water in a shaking machine. The sulfate content of the soil itself is determined and the purely chemical oxidation of the sulfide occurring upon shaking the sulfide for six hours with the soil is also ascertained.

The sum of these two is subtracted from the total sulfate content of the soil after incubation and the difference gives the sulfofying power of the soil, or the physiological efficiency of the sulfuroxidizing bacteria in the soil. Many difficulties have been met in the work and largely overcome. Details regarding these will appear in a future publication. The point to be emphasized by the results so far is that soils have a definite sulfofying power which is determinable in the laboratory and therefore the efficiency of fertilization of soils with organic sulfur compounds may be ascertained for any soil.

Further Studies with Some Azotobacter: DAN H. JONES.

Viability of Azotobacter in Stock Cultures.—Equal quantities of azotobacter growth were taken from cultures grown on Ashby's agar for varying periods of time and plated out in beef gelatin. The relative colony counts were as follows:

Culture 16 days old	9,000 colonies
Culture 2 months old	8,000 colonies
Culture 5 months old	5,000 colonies
Culture 7 months old	4,500 colonies
Culture 1 year and 4 months old...	2,200 colonies
Culture 2 years and 2 months old ..	60 colonies

This work was duplicated with the four varieties of azotobacter under observation with approximately same results.

Thermal Death Point of Azotobacter in Stock Cultures of Different Ages.—The cultures used for the viability test were tested for their thermal death point, by mixing one loopful of culture in 10 c.c. of Ashby's solution and then held in water bath for 10 minutes at the required temperature.

All cultures heated up to 55° C. gave good growth.

All cultures heated up to 65° C. and over gave no growth.

Involution Forms.—Involution forms of azotobacter varying very much in shape and size may appear in cultures grown in Ashby's solution and Ashby's agar at any temperature within growth limits. This tendency to produce involution forms is comparatively slight at 20°–25° C., but excessive at 37° C. Involution forms taken from an Ashby agar culture 2 months old were tested for their power to reproduce in Ashby's agar in moist chambers. Fifteen were held under observation for four days, but during that time only one reproduced. Normal cells present in the same fields produced colonies which overgrew the involution forms.

Azotobacter and Plant Growth.—It was decided to test the power of azotobacter to fix sufficient atmospheric nitrogen for plant growth. Special vessels were designed for the purpose. These were filled with well-washed quartz sand, sterilized, soaked with Ashby's solution and inoculated with azotobacter, controls being kept. After two weeks, grains of wheat were sown in the pots of sand. These all germinated and gave growth-producing plants 16 inches high in one month, but no difference was observed at this time between the culture plants and the controls.

A Possible Improvement in the Technique of Determination of the Ammonifying Power of Soils: T. D. BECKWITH AND A. F. VASS.

One of the difficulties met with in determining the ammonifying power of soils is that part of the ammonia was lost under the older methods. We have found it possible to determine the total amount of ammonia given off by soils by a very simple method of laboratory technique. The soil, generally 100 or 200 grams in content, is placed in a 1,000 c.c. Erlenmeyer flask. In the top of the flask is inserted a two-hole rubber stopper. The air is allowed to enter the flask through the inverted U-tube. The outer tube is made of a simple elbow placed in the other hole of the stopper. This flask thus prepared is connected with a water pressure filter pump. In the series between the soil flask and the pump is placed a wash bottle containing $N/10$ H_2So_4. For purposes of an indicator this acid solution is colored slightly with cochineal. When soil and the material to be ammonified is placed in the soil flask, air is drawn through the system by the filter pump. The ammonia is intercepted by the acid. The indicator in the wash bottle shows the point of neutralization.

When neutralized another wash bottle with an aliquot portion of acid is substituted. A final determination of the amount of ammonia in the soil flask plus that of the acid in the wash bottle shows the exact amount of ammonia given off. A large series of flasks and wash bottles may be served by the same filter pump, using appropriate connections of Y and T tubes with heavy-walled rubber tubing. It is necessary to use screw pinch cocks throughout the system in order to regulate the flow of air through the wash bottles and to see that none are cut off. Such a system should be used and adjusted for at least twenty-four hours before the soil and material to be ammonified are added in order to make sure that all is in perfect working condition.

A Bacterial Disease of the Larvæ of the June Beetle, Lachnosterna Spp.: Zae Northrup.

During the summer of 1912, the larvæ of the June beetle, *Lachnosterna* spp. committed serious depredations to crops. Specimens sent in to the entomological department by the farmers were found to be diseased and were turned over to the bacteriological laboratory for the determination of the etiology of the infection, and, if practicable, to use the living parasite as a remedial measure.

This disease which is characterized by a blackening of the affected parts, was found to be due to a micrococcus, which was found microscopically in smears and in sections from diseased tissue. This organism was isolated from the affected tissues of a living grub and liquid cultures were used for the inoculation of the soil in which healthy larvæ were then placed. Oftentimes infection occurred within a short time; the most marked infection occurred when an incision was made in the integument, a characteristic lesion developing within twenty-four hours. It was discovered that an excessive amount of water in such inoculated soil favored the rapid progress of the disease. This seems to be one of the most important factors in determining the fatality of the infection. This disease may be transmitted characteristically to larvæ of the southern United States June beetle, *Allorhina nitida* and to the American cockroach, *Periplaneta americana,* but is non-pathogenic to rabbits or guinea-pigs. The black pigment characterizing the disease is probably produced directly or indirectly by the activity of the bacterial cells within the larval tissues; the cocci and the integument cells in which they are imbedded do not take the ordinary or the Gram stain but remain dark brown in color. From the characteristic lesions produced by this organism it has been named "*Micrococcus nigrofaciens.*" No results have as yet been obtained in trying out this organism as a remedial measure for the destruction of the white grub. Cultures of the micrococcus have been sent to Porto Rico for this purpose.

WEDNESDAY, DECEMBER 31, 1913, TWO-THIRTY O'CLOCK

Sanitary Bacteriology

A Numerical Comparison of the Organisms Producing Gas in Lactose Bile Isolated from the Baltimore City Water Supplies: J. Bosley Thomas and Edgar A. Sandman.

The water supply of Baltimore city is derived from two streams which flow through a rather populous rural district. The larger stream, which has an average daily flow of about one hundred million gallons, drains a watershed supporting many large dairy farms, while the other, with a flow of twenty million gallons per day, is derived from a watershed supporting fewer dairy farms in proportion to its area, but known to be subject to a greater extent to possible sewage pollution. It, therefore, occurred to us that there might be shown in one of these supplies the presence of a different relative proportion of certain types of organisms than in the other supply; and a pollution derived largely from dairy-farms and creameries is obviously of a less serious character than a pollution caused principally by the introduction of sewage. For the classification of these organisms four sugars, in addition to the customary use of gelatin, were used, viz.: lactose, dulcite, saccharose and dextrose. Endo's agar was used for isolating the organisms in pure culture, and the results of a study of the character of colonies formed on this medium is given in the original paper. The average number per c.c. of the several types of organisms was estimated by considering the number of positive and negative tests in each dilution and following the method described by Phelps before the American Public Health Association in 1907. The results of this work, embracing 383 isolations from untreated water, show an average number of 2.79 organisms per c.c. giving cultural characteristics of *B. coli communis* and *B. coli communoir,* and 9.31 organisms per c.c. giving cultural characteristics of *B. (lactis) aerogenes* and *B. acidi lactici,* in the Gunpowder River, which is exposed to pollution from dairy-farms, in comparison with 5.12 organisms of the former types and 4.98 of the latter types in the Jones Fall supply, which is more exposed to sew-

age pollution. It is, therefore, seen that although the total number of these organisms is about the same in either supply, there are nearly twice as many *B. coli*-like organisms in the supply subject to greater sewage pollution than in the Gunpowder River.

Notes on the Bacteriology of Air and Its Sanitary Significance: C.-E. A. WINSLOW.

Both mouth spray and dust contain buccal bacteria and at times pathogenic forms, and might theoretically constitute sources of appreciable atmospheric pollution. Whether they actually do so or not can only be determined by quantitative studies of the bacteria actually present in air and particularly of the characteristic organisms of the mouth. Two sets of results bearing upon this point are here reported.

A series of 684 examinations of school room air in New York City made by Professor Chas. Baskerville and the writer gave an average of 96 microbes per cubic foot. This includes all organisms developing on litmus lactose agar in five days at room temperature. Two hundred and sixty-eight samples gave counts under 50, 178 between 51 and 100, 112 between 101 and 150, 39 between 151 and 200, 23 between 201 and 250, 12 between 251 and 300, and 17 over 300. Lactose fermenting streptococci (characteristic buccal forms) were found 52 times in 174 cubic feet of air giving an average of 30 per 100 cubic feet of air.

The second series of results includes 64 samples of outdoor air (mainly from New York City streets) examined in the course of a somewhat detailed study of air bacteriology now being carried on by the New York State Commission on Ventilation. The average 20° count of 64 samples was 59 microbes per cubic foot. Twenty-four samples showed less than 25, 18 between 26 and 50, 8 between 51 and 100 and 14 over 100. The maximum count was 395. At 37° in two days the average count was 48 microbes per cubic foot. Thirty-six samples were below 25, 9 between 26 and 50, 9 between 51 and 100 and 7 over 100. Acid forming streptococci were absent from 12 cubic feet of air examined for their presence.

The Usefulness of Dried Stained Smears of Milk as a Means of Determining the Sanitary Quality of Milk: ROBERT S. BREED AND JAMES D. BREW.

A number of tests of the method of making milk smears devised by Prescott and Breed[4] have been made at the Geneva Experiment Station with a view of determining the sanitary quality of milk. It has been found to be a very rapid and efficient method of determining the total germ content where milk contains 100,000 or more bacteria per c.c. The results secured probably represent the real conditions so far as total content is concerned better than those secured on agar or gelatin plates. By means of this test it is possible to separate milk as received at a milk station into two classes by a rapid examination of the prepared smears. The first grade of milk is that in which no bacteria are seen in 5 to 10 or more fields of the microscope. In all but eight of the sixty samples in which no bacteria were found the agar plate count was less than 100,000 per c.c. and seven of the eight which exceeded this figure were less than 200,000 per c.c. Such milk would sell in the New York City market as Grade A, selected pasteurized if properly pasteurized. Inasmuch as a large proportion of the milk received at the particular milk station where the tests were made was of this quality this test would have been used to great advantage because it would have enabled the dealer to raise this part of his milk from Grade B to the Grade A class at no expense to himself or to the farmers supplying the milk except the cost of making the tests, which is fortunately not great enough to be prohibitive.

The second class of milk would be that in which bacteria are readily found with the microscope. Such milk under present regulations would go on the market as Grade B milk if properly pasteurized. The great advantage of this test over plate methods of examinations or other bacterial methods that require an incubation period, is that results can be secured in a very few minutes and a large number of samples can be handled by a single person. Any person sufficiently skilled to handle a microscope can learn the technique and apply the method successfully. The chief weakness of the method at present is that it is so new and has been tried out so little in a practical way that no one knows as yet how the results secured should be interpreted. The bacterial counts obtained are much higher than those obtained from the ordinary plate counts and there is no constant relationship between such counts where single comparisons are made. When a long series of comparisons are made between plate counts and these microscopic counts, it is found that greater discrepancies occur when the total number of bacteria is low than when the total number of bacteria is high. A detailed report on this work will

[4] *Journal of Infectious Diseases*, 7, p. 632, 1910.

be published in a technical bulletin of the New York Experiment Station.

Field Organization and Laboratory Technique, Canadian Section—International Joint Commission Pollution Investigation, 1913: F. A. DALLYN.

Period of investigation—April 10 to October 10, 1913.

Field laboratory located at nine (9) bases, from Fort Frances, Ont., to Kingston, Ont.

Equipment at each base comprised:

2 incubators —18° C., —22° C. and 37° C., designed to hold maximum number of samples.
2 sterilizers, one for glassware and the No. 3 Bramhall Deane Autoclave.
400–500 petri dishes with copper cases, 4 copper 25 c.c. pipette cases containing 30 pipettes each, 3 copper 1 c.c. pipette cases containing 60 pipettes each, 300–400 6-oz. glass stoppered sample collection bottles.
Apparatus for obtaining deep samples.
Several hundred Dumas bulbs, necessary table apparatus and media-making equipment.

Twelve thousand eight hundred (12,800) samples were collected and examined. The determination of the total bacteria count on nutrient agar (+ 10) at 18° -22° C. (48 hours), the count at 37° C. (24 hours), and the quantitative estimation of *B. coli* as indicated by fermentation in lactose bile at 37° C. (48 hours), not less than four (4) dilutions used for the latter—usually 1, 5, 25, 50 c.c. were tubed (1/1000, 1/100, 1/10) only when required. Sample collection points were located on straight lines by a time interval method (checked by different landmarks, buoys and lighthouses). Stoppers and necks of sample bottles protected from contamination by a rubber dam held by a band. The dam was dipped in mercuric chloride solution before being re-used.

Each field laboratory examined on an average of 52 samples per day. *Max. amount* 103 samples per day for 3 days in succession. Ten (10) to twenty (20) daily samples taken at each sample collection point. Special paragraphs on tabulation, accounting system, plating and tubing technique, handling of media, media reaction and washing of glassware.

The Virulence of the Resistant Minority: FRANK SCHOFIELD.

The work described has been done in an endeavor to obtain facts which would give a satisfactory basis for answering the following questions: Considering bacteria of the same species, have those which exhibit the greatest resistance to germicidal action a corresponding increase of pathogenic power over their fellows which succumb? Or, are the few which survive exposure for long periods to detrimental conditions practically innocuous?

In the experiments done swabs were inoculated from pure culture of *B. Diphtheria* and placed in the sunlight and others in the dark. At the same time definite quantities of special broth were inoculated, incubated for two days and varying amounts injected into guinea-pigs of known weight. Cultures were made from the inoculated swabs at different periods such as 30 days and number of colonies developing noted, for instance 100, then again at 35 days when number of colonies might be 50. By careful manipulation the time when but two or three organisms capable of growing on the culture media were left could be estimated. Such colonies would represent the most resistant of the strain used. From such colonies broth was inoculated and incubated under similar conditions, as at the beginning of experiment. Guinea-pig inoculation was made and results compared with results recorded at commencement of experiment. A series of eleven experiments such as these were undertaken and the results warranted the following conclusion: That cultures made from the most resistant individuals of a strain usually exhibited pathogenic properties similar to the less resistant organisms of same strain, the virulence neither being increased nor decreased materially.

The Influence of the Hypochlorite Treatment of Water upon the Development of Algæ: CARRIE M. DERICK.

Professor Derick briefly reported some general observations incidentally made by a graduate student, Miss Clare Miller (Mrs. Wasteneys), in the course of a study of the Algal Flora of the Island of Montreal, in 1911 and 1912. Collections of algæ made in October and November, 1911, were maintained in sixty or more aquaria in the botanical laboratories of McGill University. In addition to series in various media, parallel cultures were grown in ordinary tap water. At that time, the city water was being regularly treated with hypochlorite of lime, less than one part to a million parts of water being used. The development of deleterious bacteria being thus prevented, the cultures of algæ in this water, which contained all the necessary mineral nutrients, were unusually vigorous and long-lived. At temperatures about 20° C., blue-green algæ, especially *Oscillatoria tenuis* Ag., *O. splendida* Grev. and *Rivularia hæmatites* Ag., flourished. *Anabæna,* on the contrary, usually died or passed into a resting condi-

tion within a few days. In March, however, it reappeared and grew well. Desmids, such as *Cosmarium, Closterium* and *Micrasterias,* as well as *Mougeotia, Ulothrix* and *Stigeolonium,* which were collected in the spore stage, germinated and grew readily at a temperature of 20° C. *Spirogyra, Vaucheria* and *Cladaphora* were most successfully grown at a temperature of 5° C. or less. The majority of the Chlorophyceæ collected grew vigorously in city water, provided that the temperature was between 5° C. and 20° C. *Vaucheria, Scenodesmus* and other Protococcaceæ flourished throughout the year. *Œdogonium* and *Chætophora* developed freely towards spring. Diatoms, such as *Navicula,* were plentiful at low temperatures. By periodically renewing the water to prevent the concentration of the mineral contents and by guarding against excessive exposure to strong light, many aquaria were kept in good condition during the following summer and supplied much material used for class-work throughout the winter of 1912–13. Towards spring, in 1913, *Scenodesmus* and a few other types crowded out less resistive groups, and the cultures were allowed to die during the summer of 1913.

Algæ similarly treated in the autumn of 1913 have not developed well. The summer was unfavorable to the majority and they were not in good condition when collected. *Spirogyra* and other Conjugatæ, several of the Protococcaceæ and *Œdogonium* began to grow after a few weeks. But in December, practically all of the aquaria contained species of *Bacillus, Spirillum* and *Vibrio,* as well as one or two water molds. Several factors probably contributed to this result. A less rigorous use of hypochlorite of lime in the treatment of the city water was suggested as a partial explanation by Dr. Adami during the discussion which followed the reading of the paper. It is obvious that when water-supplies are freed from bacteria by means of hypochlorite of lime, such a free development of algæ is permitted as to require treatment by copper sulphate or other measures to prevent pollution.

Toxic Products in Food and Their Detection: CHAS. H. HIGGINS.

Outline of necessity for the formulation of a method which could be used as a standard in routine examinations connected with the administration of the Meat and Canned Foods Act.

Three forms of poisoning in meat food products recorded by Edelmann. These are: (1) poisoning resulting from an infection by the *Bacillus enteritidis* (Gärtner); (2) poisoning resulting from the toxic products of the *Bacterium coli, proteus* species, etc., (3) poisoning resulting from the *Bacillus botulinus.* These food poisonings are the result of a direct bacterial infection or the poisoning from toxic products formed during their growth. Methods of detection are bacterial, such as Rosenau's, the *boiling test,* judgment depending upon the odor and the various feeding tests, principally with mice. None of these meet the requirements of routine examinations, as the individual element is an important factor and one that can not be standardized. The method employed is through the preparation of a solution of the material under consideration; in the case of commercial gelatines a ten per cent. solution, and following the method of Rosenau injecting this subcutaneously in amounts of 1 c.c. to 10 c.c., which contain from 0.1 to 1.0 of the original gelatine. For other meat food products the method is similar save that the food is leached with normal saline or distilled water, either proving equally satisfactory. In every case ten guinea-pigs are used, preferably of 250 grams weight, these having been shown to be most suitable for this purpose.

This method was used on upwards of two hundred samples. In one instance untoward effect occuring in sixteen persons, was directly traced to gelatine entering food product. In other cases untoward effect was found to be due to faulty methods of handling.

Proteid products have not interfered with the results and have not led to uncontrollable factors. Judgment depends upon the presence of illness or death among the inoculated animals. Period of observation, five days.

A. PARKER HITCHENS,
Secretary

(To be continued)

SOCIETIES AND ACADEMIES

THE AMERICAN MATHEMATICAL SOCIETY

THE one hundred and seventieth regular meeting of the society was held at Columbia University on Saturday, April 25. The attendance at the morning and afternoon sessions included forty-four members. Ex-president Bôcher occupied the chair, being relieved by Vice-president Eisenhart, Ex-president Fiske and Professor Tyler. The council announced the election of the following persons to membership in the society: Dr. T. H. Brown, Yale University; Dr. Josephine E. Burns, University of Illinois; Professor C. F. Gummer, Queen's University, Kingston, Ontario; Mr. G.