SCIENCE

A WEEKLY JOURNAL DEVOTED TO THE ADVANCEMENT OF SCIENCE, PUBLISHING THE OFFICIAL NOTICES AND PROCEEDINGS OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

FRIDAY, MARCH 31, 1905.

CONTENTS:

MSS. intended for publication and books, etc., intended for review should be sent to the Editor of SCIENCE, Garrison-on-Hudson, N. Y.

THE SIXTH ANNUAL MEETING OF THE SOCIETY OF AMERICAN BACTERIOLOGISTS.

THE sixth annual meeting of the Society of American Bacteriologists was held at the Laboratory of Hygiene, University of Pennsylvania, Philadelphia, Pa., on December 27 and 28, 1904.

The opening address was by President F. G. Novy, of the University of Michigan, on 'The Hematozoa of Birds.'

On the Hematozoa of Birds: F. G. NOVY, University of Michigan.

An abstract or partial summary of the results obtained in this study appeared in *American Medicine,* November 26, 1904. The work in full will come out in two papers, the first of which, dealing with the Trypanosomes in birds, will appear in the second number (1905) of the *Journal of Infectious Diseases;* the second paper, dealing with the Cytozoa, may be expected in the third number of that journal.

The Effect of Freezing on Bacteria: ERWIN F. SMITH and DEANE B. SWINGLE, U. S. Department of Agriculture.

More than 100 freezings were made using about a dozen different bacteria—saprophytes and plant and animal pathogenic forms. Quantitative determinations were made in all cases. With the exception of *Bacillus radicicola,* all of the exposures were made in +15 peptonized beef bouillon, using cultures 24 to 48 hours old. Part of the freezings were made in liquid air, the time of exposure varying from 10 minutes to 24 hours, but usually one half hour. The rest were made in salt

and pounded ice, the time of exposure being 2 hours. The freezings were made in 5 c.c. portions of bouillon in test-tubes of resistant glass. The thawings were made in tap water at 16° to 18° C. The inoculations for each set of plates were made in the same way, *i. e.*, usually with the thinnest meniscus it was possible to obtain across a 1-mm. platinum oese. The petri dishes were carefully selected, those taken being approximately 9 cm. in diameter, with flat bottoms. The regular method of work was to make three poured plates (checks) from the inoculated tubes after insuring thorough diffusion, which was obtained by stirring with the platinum rod, shaking and allowing to stand one half hour. The tube was then immediately lowered into the liquid air and frozen slowly from the bottom up to avoid cracking. (This usually required four minutes.) As soon as the one half hour or other predetermined time of exposure had elapsed, the tube was removed, warmed for about 3 minutes in the laboratory air and then thawed in water (which usually required another 5 minutes). As soon as the thawing was completed, three more poured plates were made, and these together with the three check plates were then incubated in the dark at 30° C., until the colonies were in good condition for counting—a period varying, according to the species, from one to several days. The plates were all put on a leveling apparatus as soon as poured, and in general the distribution of the colonies in the nutrient agar was very uniform. When the plates were sown thin enough, the entire surface was counted (60 sq. cm.); for the thicker sowings the average of 10 or 12 sq. cm. was used, or of one half the plate. The following samples from two of the thirty or more slides exhibited will give a general idea of the method and results:

BACILLUS TYPHOSUS. (SIX POURED PLATES.)

Colonies per Square Centimeter:

	Before Freezing.	After Freezing (2 hrs. in Salt and Ice).
Plate I	46	2/60
Plate II	39	0
Plate III	42	2/60
Average	42	1/45

Per cent. killed, 99.5.

Frozen, Dec. 15. Incubated at 30° C. Counted, Dec. 19.

BACILLUS TYPHOSUS. (SIX POURED PLATES.)

Check on Salt and Ice, *i. e.*, 1/2 of Same Culture.

Colonies per Square Centimeter:

	Before Freezing.	After Freezing (2 hrs. in Liquid Air).
Plate I	50	1/60
Plate II	51	3/60
Plate III	43	2/60
Average	48	2/60

Per cent. killed, 99.3.

Frozen, Dec. 15. Incubated at 30° C. Counted, Dec. 19.

The following conclusions may be drawn: (1) The effect of very low temperatures has been greatly overestimated. As destructive results were obtained with salt and pounded ice (—17°.8 C., or less) as with liquid air. (2) The critical point appears to be somewhere around 0° C. If an organism can pass this point in safety, it is believed that even absolute zero (—273° C.) would not harm it. (3) Some individuals of each culture were able to endure unharmed the temperature of liquid air (—190° C.), although this was often only a small proportion of the whole number. (4) Repeated freezings and thawings reduced this number very gradually to nothing, but ten freezings and thawing (in course of eight hours) did not kill all of the individuals of *P. campestris*, although it reduced the number in the bouillon to such an extent that three one-millimeter loops gave three sterile plates. (5) This resistance to freezing is believed to be due

to absence of water in the resistant cells, these cells behaving like endospores, although not known to be endospores (*i. e.*, from species not known to produce endospores). Possibly these resistant cells are to be considered as arthrospores. (6) Endospores freed from non-sporiferous vegetative cells by heating in the water-bath for fifteen minutes at 70° C. were not in any way injured by freezing (two species), and this would seem to be an added proof that the protoplasm of such spores is destitute of water, a conclusion already reached by various observers on account of their behavior in boiling water and streaming steam.

So far as any general inference can be drawn from experiments made only in bouillon, we may conclude that bacteria are injured by freezing to very different degrees, behaving in this respect like the higher plants and animals. Many kinds, like *Bacillus typhosus,* are destroyed in great numbers even by short freezings, while other forms, like *Bacillus sorghi,* are rather resistant. The former idea that bacteria in general are not harmed by freezing is untenable. It was based on qualitative tests which are incapable of showing the true state of affairs in the exposed culture. Probably an enormous number of bacteria are destroyed by every winter, and those which survive come through in the form of endospores or some other resistant shape. These experiments confirm and extend those of Prudden, Park and Sedgwick and Winslow. They will be repeated, freezing in water, and will be extended to include some additional species, and will probably be published by the U. S. Department of Agriculture.

The Viability of B. Dysenteriæ Shiga: W. D. FROST and R. WHITMAN, University of Wisconsin.

Four strains of this organism were tested. One was the Shiga type. The others belonged to the Flexner-Harris type. Of these one was the Harris culture and the others were from Duval and Bassett's series of summer diarrhœa cases. The viability was tested by drying the organisms on articles of merchandise, dried food substances and in sterile distilled water and milk, under various conditions. A summary of the conclusions reached follows: the *B. dysenteriæ* when dried on articles of merchandise, as paper, cloth and wood, dies rapidly in from four to nine days at the temperature of 17–20° C. On dried food substances, as bread, rice and albumin balls, this germ may live for days. In some cases it is able to live over a month. In sterile distilled water the life of the germ is very short, rarely maintaining itself more than a week. In sterile milk the germ can live until the medium is dried up. The different strains vary in their viability under given conditions, the Shiga type culture being distinctly more frail than cultures of the Flexner-Harris type, the effect of temperature in modifying the viability of the germ being important. At a temperature of 38° C. it will live from only one half to one fourth of the time that it will live at a temperature of 17–20° C.

Pseudomonas Campestris (Pam.) Smith: H. A. HARDING and M. J. PRUCHA, Experiment Station, Geneva, N. Y.

Pseudomonas campestris (Pam.) Smith is a yellow non-spore-forming plant parasite. It attacks cabbage, cauliflower and allied plants by way of their fibrovascular system.

A study of its resistance to desiccation showed that while it died when exposed on sterile cover-slips for a few days (in our experiments not surviving a ten-day exposure), it retained its vitality on cabbage seed for more than a year. Apparently

no loss of pathogenicity resulted from this long exposure to unfavorable conditions. Cabbage plants inoculated with pure cultures, obtained from seed thirteen months after infection, showed a blackening of the veinlets in the leaf and other evidences of disease at the end of sixteen days.

At a time when so much stress is being laid upon the quickness with which pathogenic organisms are destroyed in nature these observations should tend to check hasty generalizations. (To be published in full in *Centralbl. f. Bakteriol.*, etc., II. Abt.)

The Demonstration of the Flagella of Motile Bacteria and a Simple Method of Making Photomicrographs: Edward W. Duckwall, Aspinwall, Pa.

I found that the methods for flagella staining described by the old authors had to be modified. I divided the motile bacteria into six classes for staining purposes:

1. Bacilli which grow like typhoid, such as typhoid and colon. Bacteria resembling typhoid are actively motile bacteria. The material is transferred to a large drop or two of distilled water, previously boiled. A fine platinum loop, about half the usual size, should be used. The finest specimens of bacteria will swim to the outer edges of the water.

2. Bacilli which produce wrinkled or folded growths, such as *Mesentericus fuscus*. In order to get a good preparation from the bacteria which produce wrinkled or folded growths the agar should be streaked in the morning and carefully watched for the first appearance of growth.

3. Bacilli which send out a thin, almost transparent growth over the surface of the agar, such as *Bacillus subtilis* and *Bacillus megatherium*. In order to get a good preparation from the thin, transparent, spreading growth a curved platinum wire is used to collect the bacteria *en masse* and transfers are made to the distilled water with the small loop.

4. Bacilli which produce slime, such as *Bacillus vulgatus* and *Bacillus viscosus*. The slime which collects between the flagella of the slime-producing bacteria can be precipitated by shaking a water suspension with chloroform. A very young growth is used and transfers are made to about 1 c.c. of water until it is made very cloudy. This suspension is then shaken with chloroform and the cover-glass preparation is made from the water above the chloroform.

5. Bacilli which produce pigments, such as *Bacillus prodigiosus* and *Bacillus cyanogenes*. Bacteria which produce pigments soluble in chloroform are treated in the same manner. Those whose pigments are soluble in water and not in chloroform I prepare by holding the cover-glass under the tap after fixing the preparation in the flame previous to adding the mordant.

6. Anaerobic bacteria, such as *Bacillus tetanus*, œdema and symptomatic anthrax, etc. The best results with anaerobic bacteria are obtained as follows: The medium is two per cent. glucose agar in slants and the inoculation is made back of the slant between the agar and the wall of the tube. I slide the needle back of the slant and let it fall forward, I introduce two or three drops of a young bouillon culture and replace the agar. By excluding oxygen and maintaining a blood temperature for thirty-six hours a fine growth is usually obtained.

I prefer the No. 1 round cover-glasses. For removing the grease they are covered with sulphuric acid, which is poured off after they have stood one day, and they are then covered with bichromate of potassium. After several hours this is poured off and they are washed with distilled water and transferred to a jar containing absolute alcohol, where they remain until

ready for use. A single cover-glass is removed with clean forceps from the alcohol and dried with clean linen without touching it with the fingers. It is then taken in the forceps and passed several times through the Bunsen flame.

The fixing agent is a mordant and the stain is carbol gentian violet or preferably carbol fuchsine.

Mordant.—2 grams tannic acid; 5 grams cold saturated solution ferrous sulphate (aqueous); 15 c.c. distilled water; 1 c.c. saturated alcoholic solution of fuchsine.

To these ingredients I add a one per cent. solution of sodium hydroxid, from .5 to 1 c.c. After filtering, the mordant should be of a reddish-brown hue, and it must be used within five hours after it is made.

Carbol Fuchsine.—Put about one gram of granulated fuchsine in a bottle and pour over it 25 c.c. of warm alcohol; shake, let stand for several hours, and dilute four or five times with a five per cent. solution of carbolic acid.

A small loop full of the clouded water is transferred to the cover-glass. A spread consisting of several parallel streaks is best. The glass, held by the forceps, preparation side up, is passed down on to the Bunsen flame and instantly removed. The mordant is then poured on, just enough to cover the surface without flowing over the edges. After one half to one minute the mordant is completely washed off under the tap; a small quantity of alcohol is then poured on to the surface and instantly washed off. Then cover the surface with carbol fuchsine or carbol gentian violet, which is allowed to stand on the cover-glass for about one half minute. We then heat it so that steam is given off and, after drying thoroughly, treat with xylol, immediately draw off the xylol with filter paper, drive off what remains with heat and mount in xylol balsam.

A Simple Method of Making Photomicrographs.—The camera is about twice as long as the ordinary 4 x 5 camera, and the photomicrographs are taken with the camera in a horizontal position. It must be steady and the microscope stand should be substantial, with the fine cone adjustment. Much depends upon the objective. I have found none equal to the one-twelfth oil immersion objective and No. 6 compensating eye-piece made by the Spencer Lens Co. The best plates are the isochromatic or orthrochromatic swift plates which are corrected for colors. I have found the acetylene radiant preferable to gas, oil or electric light. The only screen I ever use is green glass. Printing from the negatives on glossy Velox brings out the best detail. The glossy Velox is then ferro-plated, which makes a beautiful photograph.

(Complete paper will be published in the *New York Medical Journal;* also in the *Canner and Dried Fruit Packer,* 1905, XX., No. 5, p. 23, with many illustrations.)

Principles of Classification of Bacteria: F. D. CHESTER, Delaware Agricultural College.

As far as possible morphologic characters should be the primary basis of classification. The generic system of *Migula* is proposed, based upon character of flagellation.

With sporogenous bacteria, character of spores, mode of germination, form of sporangia, and orientation of the cellular elements are useful toxonomically. With the asporogeneous bacteria grouping must be based largely upon physiological characters.

The proposed division of genera into groups is based upon leading characters in the order named: (1) Spore formation, (2) relation to oxygen, (3) liquefaction of gelatin, (4) fermentation of lactose, (5) fermentation of dextrose, (6) fermentation

of saccharose, (7) reduction of nitrates, and (8) chromogenesis.

Any combination of the above-named characters gives a character complex which can be best represented by a series of digits. Each digit represents a character in order of value. When the character covered by a digit is either positive or negative two numbers only are necessary, *i. e.*, 1 and 2, 1 signifying positive and 2 negative. Thus spore formation and non-spore formation by 1 and 2 in the hundreds place; aerobic-facultative anaerobic and anaerobic by 1 and 2 in the tens place, and liquefaction and non-liquefaction of gelatin in the units place represented by 1 and 2. In the tenths, hundredths and thousandths place of decimals three numbers are used, in which 1 represents acid with gas and 2 acid without gas, while 3 no acid from dextrose, lactose and saccharose respectively, 1 and 2 in the next place indicate reduction and non-reduction of nitrates, and in the next place numbers from 0 to 8 indicate the absence or the presence of chromogenesis in the order of the occurrence of the colors in the spectrum, namely, 0, non-chromogenic; 1, fluorescence; 2, violet; 3, blue; 4, green; 5, yellow; 6, orange; 7, red; 8, brown; on this basis the number for *B. coli* is 212.11110, for *B. enteritidis* 212.13310.

A Revision of the Coccaceæ: C.-E. A. Winslow and Anne F. Rogers, Massachusetts Institute of Technology.

Since the swamping of minor differences by sexual reproduction is absent among bacteria, every inheritable variation is maintained, and instead of true species we find an infinite series of minutely differing but constant races. The only practical method of handling and systematizing these is to establish certain fairly distinct groups or types about which the lesser individual variations may be grouped. The larger number of published descriptions of species among the cocci are based either on variable or on isolated and unimportant characters. The authors find that 445 described species may be condensed to 31. These are grouped under two subfamilies and five genera which mark transition stages between strictly parasitic pairs of cells like *D. Weichselbaumii* and strictly saprophytic organisms in large vegetative masses like *Ascococcus mesenteroides*. The principal groups are defined as follows:

FAMILY COCCACEÆ.

Vegetative cells spherical.

Subfamily I. Paracoccaceæ (new subfamily).

Parasites (thriving only or best on or in the animal body). Thrive well under anaerobic conditions. Many forms fail to grow on artificial media, none produces abundant surface growth. Planes of fission generally parallel producing pairs or short or long chains.

Genus 1. *Diplococcus* (Weichselbaum).

Strict parasites. Not growing or growing very poorly, on artificial media. Cells normally in pairs, surrounded by a capsule.

Genus 2. *Streptococcus* (Billroth).

Parasites. Cells normally in short or long chains (under unfavorable cultural conditions, sometimes in pairs and small groups, never in large groups or packets). On agar streak, effused translucent growth often with isolated colonies. In stab culture, little surface growth. Ferment sugars with formation of acid.

Subfamily II. Metacoccaceæ (new subfamily).

Facultative parasites or saprophytes. Thrive best under aerobic conditions. Grow well on artificial media, producing abundant surface growths. Planes of fission often at right angles; cells aggregated in groups, packets or zooglea masses.

Genus 3. *Micrococcus* (Hallier) Cohn.

Facultative parasites or saprophytes. Cells in plates or irregular masses (never in long chains or packets). Acid production variable.

Genus 4. *Sarcina* (Goodsir).

Saphrophytes or facultative parasites. Division under favorable conditions, in three planes, producing regular packets. Generally fail to produce acid by fermentation of sugars.

Genus 5. *Ascococcus* (Cohn).

Generally saphrophytic cells imbedded in large irregularly lobed masses of zooglea. In presence of carbohydrates usually form acid.

Full paper (preliminary) to be published in SCIENCE.

Diagnostic Value of the Red Color which Develops on the Addition of Caustic Soda to Solutions of Glucose after Fermentation: WM. R. COPELAND and PERKINS BOYNTON, Columbus, Ohio.

Certain members of the colon group of bacteria produce a substance in glucose solutions which, on the addition of caustic soda (NaOH), forms a brick-red color if the alkali is kept in contact with the fermented bouillon for twenty-four hours.

The glucose solution used in making this test contains:

Meat extract from fresh round beef steak	1,000 c.c.
Peptone—Witte's best white, dry.....	10 gms.
Table salt	5 gms.
Anhydrous glucose	10 gms.
Reaction (referred to phenol-phthalein) .	1% acid.

The caustic soda used contains 20 grams of the best grade of NaOH in sticks dissolved in 1,000 c.c. water.

The fermentation is carried on by the bacteria for a period of 48 hours at a temperature of 37° C. +. The bacillus which brings about the formation of the red color resembles the *Bacillus cloaceæ* of Jordan and the *Bacillus Zeæ* of Moore.

The bacterium described by Dr. Theobald Smith as the typical *'Bacillus coli communis'* forms reactions which differ markedly in every instance from the reactions produced by *B. cloaceæ*. Therefore, as the colon bacillus never produces the red color in glucose solutions and as *B. cloaceæ* does, the appearance of a strong brick red color in a glucose fermentation tube, to which a two per cent. NaOH solution has been added and allowed to digest for 24 hours, may be taken as evidence that the bacteria in the Smith tube are *B. cloaceæ* and are not *B. coli communis.*

I., *The Value of the Widal Reaction for the Diagnosis of Hog Cholera.* II., *The Production of Agglutinins for Hog Cholera Bacilli in Swine:* CHAS T. MCCLINTOCK, CHAS. M. BOXMEYER and J. J. SIFFER, Detroit, Mich.

1. The serum of normal hogs agglutinates strains of ordinary hog cholera bacilli in dilutions occasionally as high as 1–250. For this reason we consider a reaction in a dilution of less than 1–300 without diagnostic value.

2. The bacillus of swine dysentery is not agglutinated by normal blood in such high dilutions.

3. The Widal reaction is of no value for the diagnosis of hog cholera, as the disease is at present defined.

4. The presence of a positive reaction does, however, indicate an infection with cholera bacilli.

5. There are occasional instances of both natural and artificial infection in which no increase of the agglutinins for hog cholera over those normally present can be demonstrated.

6. The maximum amount of agglutinin develops in a hog's blood within six or seven days after a single inoculation with hog cholera vaccine.

7. Hogs react to intraperitoneal injec-

tions of hog cholera vaccines, usually with the production of large quantities of agglutinins, the amount of the vaccine bearing no relation to the amount of agglutinin produced.

(Complete paper will be published in the *Journal of Infectious Diseases.*)

A Method for Inoculating Animals with Precise Amounts: M. J. Rosenau, Hygienic Laboratory, U. S. Public Health and Marine Hospital Service.

The author gives an original method for inoculating animals with precise amounts. With the ordinary methods used in most laboratories there is an unavoidable loss resulting in an error of from one to eight per cent. If the solution is measured into a graduate and then drawn up into a syringe a certain quantity remains in the graduate, and the entire contents can not be expelled from the ordinary piston syringe. In a number of weighings this loss was determined to average about .04 c.c. in using 4 c.c. of fluid, that is, about one per cent. of the amount used.

The new method consists of a battery of syringe barrels, one for each animal. The amount of fluid is measured into the syringe barrel directly, thereby totally eliminating the loss in the graduate. The entire contents of the syringe is expelled by means of a rubber bulb and any fluid remaining behind is washed out with a neutral and sterile solution. The syringe itself is a modification of the Koch syringe.

In working with different weights of solids, the solution may be made in the barrel of the syringe, so that the method is applicable to any sort of work where it is important to inoculate animals with precise amounts.

The method is especially useful in standardizing diphtheria antitoxin, in determining the strength of toxins and in certain lines of physiological chemistry where the greatest precision is essential. The battery of syringes is held in a specially designed rack which has many useful points.

(Complete description in U. S. Public Health and Marine Hospital Service, Hygienic Laboratory Bulletin, No. 19.)

A Method for Using Capacity Pipettes: M. J. Rosenau, Hygienic Laboratory, U. S. Public Health and Marine Hospital Service.

The pipette is held in a retort stand and has a rubber bulb attached to its upper or suction end. By means of a thumb-screw the fluid may be drawn up into the pipette to a point slightly above the mark. The outside of the pipette is then wiped with a piece of sterile gauze, and by applying a similar piece of gauze to the tip of the pipette the fluid may be drawn down so that the meniscus rests exactly on the line. The contents of the pipette may then be washed in and out by means of the rubber bulb into the syringe or vessel that is to contain it.

A Method for Using Delivery Pipettes. M. J. Rosenau, Hygienic Laboratory, U. S. Public Health and Marine Hospital Service.

This is similar to the method described for using capacity pipettes and has a similar rubber bulb attached to the upper end of the pipette; but in addition, attached to a glass *T*, is a valve consisting of a piece of rubber tubing controlled by a Mohr's pinchcock. The fluid is drawn up above the mark, and is nursed down by means of a piece of sterile gauze, as related above in using capacity pipettes. By opening the pinchcock the contents of the pipette may be delivered into any vessel desired. The method is both quick and accurate.

Exhibition of Cultures on Starch Jelly and on Silicate Jelly: Erwin F. Smith, U. S. Department of Agriculture.

These media were recommended for dif-

ferential purposes. The preparation of the first is given in Proceedings Boston (1898) Meeting of the American Association for the Advancement of Science; that of the second will be given in the first volume of the writer's monograph on 'Bacterial Diseases of Plants' (Carnegie Institution). It is easy by this method to prepare a silicate jelly free from glycerine and at the same time having a moist, smooth (untorn) surface, well adapted to the growth of many bacteria and not at all to that of others. The nutrient salts used were those of Fermi's solution.

Introductory Remarks on Morphology of Bacteria: H. W. HILL, Boston Board of Health Laboratory.

The writer points out the chaotic state of the evidence relating to morphology, and the difficulty of determining what is the normal morphology of bacteria, supports the acceptance of artificial standards for temporary purposes and urges very much more detailed attention to every phase of morphology than has as yet generally been given to it, as a basis for a more exact abstract science of morphology. He recommends also more attention to the direct continuous microscopic examination of bacteria during the processes of fission, spore formation, spore germination, etc.

A Peculiar Spirillum Showing Rosette Formation: MABEL JONES, University of Chicago.

The organism in question was isolated in October, 1904, from the Chicago water supply and also from Chicago sewage.

The organism is a short, rather plump 'comma,' with pointed ends, frequently growing out into straight or spiral filaments or forming 's'-shaped figures and semicircles.

There is a singular tendency towards definite rosette formation. This grouping is shown in cover-slip films and is apparently effected by a uniform grouping of the descendants of a single organism, and is in no sense an agglutinative phenomenon. The flagella, pointing towards the center of the rosette, stain by ordinary stains and add to the singularity of the picture presented by these chrysanthemum-like clusters.

Glucose-agar under anaerobic conditions seems to favor the formation of rosettes.

(Will probably be published in the *Centralbl. f. Bakteriol.*, etc.)

Notes on the Chemical Constitution of Bacillus Tuberculosis: M. DORSET and J. A. EMERY, U. S. Bureau of Animal Industry.

The authors report having found in the bodies of tubercle bacilli two classes of substances soluble in water. One portion of the ether extract is not saponifiable by the usual methods and possesses many of the characteristics belonging to the higher alcohols of the aliphatic series. This alcohol is completely acid-fast and it seems probable that the characteristic staining properties of tubercle bacilli are due to its presence in them. The second portion of the ether extract is easily saponifiable and consists of several different substances the nature of which has not yet been determined.

(To be published in Annual Report, Bureau of Animal Industry, 1904.)

The Metabolism of Chromogenic Bacteria: M. X. SULLIVAN, Brown University.

I. The biochemical study of bacteria is carried on best in simple, synthetic culture media.

II. Some bacteria show little power to grow upon synthetic media; it is probable that the power to grow upon such media can be developed; thus we may accommodate the medium to the organism or adapt the organism to the medium.

III. Many bacteria may be grown readily upon synthetic culture media.

IV. From those readily growing on such media I have chosen for study *B. pyocyaneus, B. prodigiosus, B. ruber balticus, B. rosaceus, B. metalloides, B. violaceus, B. janthinus.*

V. These bacteria may be grown with or without pigment formation.

VI. Whether producing pigment or not, these chromogenic bacteria give the same metabolic products, as far as these have been analyzed, *e. g.*, acids, ammonia, alcohol, benzol derivatives and albuminous bodies.

VII. The metabolic products are as follows: *B. prodigiosus,* aldehydes, formic, acetic and citric acids; albumin. *B. rosaceus, B. metalloides,* formic and acetic acids; albumin. *B. ruber balticus,* formic acid; albumin. *B. violaceus,* aldehydes, formic acid; albumin. *B. janthinus,* formic acid; albumin. *B. pyocyaneus,* aldehydes, formic acid, mercaptan, H_2S; albumin.

The Intracellular Toxins: V. C. Vaughan, University of Michigan.

Bacterial cellular substance is obtained in large amount by growth on the large tanks which have been used for some years in the author's laboratory. After fourteen days of growth, the cell substance is removed, washed with water and absolute alcohol, then thoroughly extracted with ether, dried, pulverized, weighed and heated in a reflux condenser with sodium alcoholate. This splits the cell substance into a toxic and a non-toxic portion. The toxic part is soluble in absolute alcohol, while the non-toxic is insoluble in this reagent. The alcoholic solution is neutralized with hydrochloric acid and the sodium chloride, which forms, is removed by filtration. The filtrate is precipitated with an alcoholic solution of platinum chloride which precipitates the toxin. The platinum precipitate is suspended in absolute alcohol and decomposed with hydrogen sulphide, after which the alcoholic solution of the toxin is evaporated in vacuo. Animals have been immunized with this toxin both to the living germ and to the toxin itself. Animals treated with non-fatal and gradually increased doses of the toxin acquire immunity and furnish a blood serum which is both antitoxic and bacteriolytic. The toxin gives all the proteid color reactions. It is apparently an acid and combines with organic bases.

The non-toxic portion of the germ substance, or that which is insoluble in alcohol, is soluble in water, and with aqueous solutions of this substance bacteriolytic immunity is easily induced. Toxins have been obtained from colon, typhoid, and anthrax bacilli and animals have been immunized to the first two.

(To be published in the *Journal of the American Medical Association.*)

Relation of the Index of Alkalinity to the Production of Diphtheria Toxin: A. P. Hitchens, Glenolden, Pa.

A study of the reaction of bouillon before and after sterilization shows that in media containing carbohydrate the rise in acidity after sterilization varies according to the temperature of the sterilizer. This is most important in the production of diphtheria toxin. Bouillon prepared according to the method of Smith, and sterilized in the autoclave, showed after sterilization varying indices of alkalinity. The reaction after sterilization of sugar-free bouillon is very uniform. And as the reaction of bouillon for the production of diphtheria toxin must be very exact, it is advantageous to add the dextrose after sterilization. The meat juice is neutralized to litmus, planted with the colon bacillus and incubated over night to destroy the muscle sugar. The bouillon is made from

this in the ordinary way, two per cent. of Witte's peptone being added. It is dispensed into Fernbach flasks, one liter in each, and sterilized in the autoclave. Little attention need be paid to the temperature, it may vary anywhere from 115° to 120°, 0.2 per cent. of dextrose is added after sterilization. The cultures are incubated six days at 35°–36° C. The reaction of the bouillon before sterilization is made +.45, so that after sterilization it may be +.75. Toxin made by this method has been very uniform, rarely being below .005 c.c. for a 250-gram guinea-pig.

(To be published in the *Journal of Medical Research.*)

On the Antagonism of Bacteria and their Products towards Other Bacteria: L. F. RETTGER, Sheffield Scientific School, Yale University.

Considerable attention has been given in recent years to the influence that one microorganism is capable of exerting on the life and growth of another. We learn, on the one hand, that certain bacteria profit by association. Again, there are numerous instances in which the presence of one organism, or its products, is inimical to the development of another. For example, the *pyocyaneus* bacillus has been found to act in a very antagonistic manner toward the anthrax bacillus. And not only is this true of the living bacilli themselves, but also of certain of their products. Emmerich and Loew claim to have succeeded in immunizing rabbits against anthrax by the use of their so-called 'pyocyanase,' which they prepared from old bouillon cultures of *B. pyocyaneus.*

In a study of the chemical and physiological properties of *B. prodigiosus* and its products, I observed, among other things, that sterile cultures or preparations of the *prodigiosus* bacillus exerted a strong protective action against experimental anthrax when injected in small quantities under the skin or into the peritoneal cavity of guinea-pigs. Of nine experiments that were carried out in full, seven yielded very positive results. In the eighth the animal died as a result of over-dosing with the *prodigiosus* material; and in the ninth, both the *prodigiosus* and control animal lived, owing to the small number of anthrax bacilli injected (47). In six of the seven experiments that gave positive results, the life of the guinea-pig was prolonged 14, 24, 25, 26 and 72 hours, respectively; while in the seventh the animal entirely recovered.

The *prodigiosus* material used for injection was prepared from potato cultures of the *prodigiosus* bacillus. The cultures were scraped and allowed to stand under chloroform for twenty-four hours. After drying in an exhaust desiccator, the mass was ground into a fine powder. Definite quantities of this '*prodigiosus* powder' (0.05 to 0.1 gram) were mixed with ten cubic centimeters of sterile physiological salt solution, and after filtration through loose absorbent cotton definite amounts of the suspension were injected, usually under the skin of the abdomen and in rather close proximity to the site of the anthrax injection.

For inoculation with anthrax, young agar cultures were employed. The bacilli were suspended in physiological salt solution, and their number was approximately determined by the use of agar plates. The inoculation with anthrax was made under the skin of the abdomen. In all the experiments control animals were employed.

Although sterile *prodigiosus* powder exerts such a pronounced protective action against anthrax, there remains at present one serious objection to its employment in practical immunization work. It exerts such a degree of toxic action, when injected, that only very small quantities can be used without serious consequence to the animals. Attempts thus far made to destroy the toxic

properties of the *prodigiosus* products without lessening their protective action have not given the desired results.

Associative Action of Bacteria on the Souring of Milk: C. E. Marshall, Michigan Agricultural College.

The author, working with cultures of associated bacteria, consisting of *B. acidi lactici,* and a bacillus obtained from milk and not yet described, possessing marked proteolytic action in its growth upon milk, and producing alkaline reaction, decidedly marked in old cultures, has been able to demonstrate that loppering is hastened by the presence of this proteolytic germ over that of the lactic acid germ, by as many as ninety-six hours at times, temperature 20° C.; that the acidity rises high above that of the lactic germ; that these changes may be noted by the naked eye appearances of the cultures; and, further, that the lactic acid germ develops much more rapidly when associated with these proteolytic germs than when existing in pure cultures. He has also found that the products produced by the proteolytic germ are stable and that they may exert the same influence as the presence of the living germ. Analyses of cultures at various ages indicate that the products influencing the growth of the lactic acid germ are either amido or ammonia compounds. Synthetic cultural media have been attempted, but without satisfactory results thus far.

It may also be said that peculiar curdling effects have been obtained with fresh milk from the cow and of various ages thereafter. This may account for certain peculiar cultural results secured in cultivating germs in various samples of milk.

The description of the proteolytic germ and the detailed work will be published in *Centralbl. f. Bakteriol,* etc. (Zweite Abteilung), at no distant date.

Bacterium truttæ: A Pathogen to Trout: M. C. Marsh, U. S. Bureau of Fisheries.

An organism which causes serious epidemics among domesticated brook trout and is not pathogenic to warm-blooded animals. The characters of chief interest are its pleomorphism, color production, apparent acquirement of motility on media, and low death point.

(Complete paper in Bulletin of U. S. Fish Commission, 1902, p. 411.)

A Germ-proof Filter: F. P. Gorham, Brown University.

The filter consists of a porcelain tube upon which a layer of aluminum hydroxide, bound together by mineral wool, is deposited. The effluent is of excellent quality chemically, all algal odor is removed, is germ free after running continuously for over a year, and the rapidity of flow is some seven times that of the uncoated tube at the start, and double the speed of flow of an uncoated tube after a continuous run of fourteen days.

The filter is the invention of Mr. James G. Woolworth, Providence, R. I.

The Bacteria Encountered in Suppurations: D. H. Bergey, University of Pennsylvania.

In the examination of pus by the students in the laboratory it has been my experience that frequently bacteria are encountered which are not ordinarily classed among the pyogenic organisms. The frequency with which certain of these organisms were encountered and the fact that some of these organisms had previously been encountered in suppurating wounds; that organisms of a similar character had been encountered in catarrhal mammitis in cows; moreover, the fact that similar organisms have been encountered in abscesses occurring spontaneously in mice, led to the opinion that they might possibly have a

more intimate connection with suppuration under certain conditions than had been supposed. For this reason specimens of pus were obtained in the hospital from thirty cases in the surgical wards. Aside from the ordinary pyogenic organisms—as the staphylococci, streptococci and *Bacillus pyocyaneus*—bacillus coli was encountered several times; an organism belonging to the group of pseudo-diphtheria bacilli and also an organism belonging to the proteus group were encountered several times, so that it appeared probable that they were not accidental contaminations of the pus. The extent to which these organisms are capable of producing suppurations when acting alone has not been fully worked out. Neither has their effect upon the processes of the pyogenic organisms been studied with sufficient detail to make positive statements. The frequency, however, with which these organisms were encountered in the conditions studied seemed to warrant a preliminary report upon the studies so far made.

The Bacteriology of Some Railroad Water Supplies: L. H. PAMMEL, Iowa College of Agriculture.

The author gave an account of an examination of three water supplies of railroads. Generally speaking, the newer wells along the line of the C. & N. W. R. R. are deep wells, 125–150 feet deep. In some cases the Iowa railroads depend on city water supplies. It is interesting to note that in the few cases where the city water supplies have been used, *B. coli communis* has been found. Several new species have been found, among them a red *Planosarcina*. The average number of bacteria varies from 40–150, though in some cases somewhat higher. Best results have been obtained with litmus lactose agar; the gelatine has been unsatisfactory.

Changes in the Bacterial Content of Water in Passing Through a Distributing Reservoir: B. G. PHILBRICK, Metropolitan Water and Sewage Board, Boston, Mass.

The data reported represent routine weekly analysis, covering a period of ten years, of the influent and effluent streams of Chestnut Hill Reservoir. The number of bacteria in the influent is small, only 220 on the average, and is not markedly affected by rainfall, since the water experiences considerable storage and sedimentation before it reaches that point. The general average of bacteria in the effluent is 179, 82 per cent. of the influent figure, but the ratio for different years varies from 50 per cent. to 123 per cent. Considering the monthly average for ten years, an increase during passage through the reservoir is noted at the time of the spring and fall overturns bringing the ratio of effluent to influent up to 123 per cent. for April and 134 per cent. for September.

During the winter the ratio decreases from 96 per cent. in December to 71 per cent. in March and after the spring overturn it rises from 69 per cent. to 95 per cent. in August. It appears that in a reservoir receiving water fairly low in bacteria the growth at the bottom of the reservoir itself and the mixture of its various layers, are the main factors in determining the effluent count.

The New Bacteriological Laboratory of the Boston Board of Health. B. R. RICKARDS.

A detailed description of the new laboratory including several special features such as (1) chute leading to an incubator to receive cultures sent after the laboratory is closed, (2) open trough system of plumbing, (3) combination draining board and tray for the transportation of glassware from one part of the laboratory to another,

(4) Portland cement benchtops under incubators and on other benches where gas flames are in constant use.

The Construction of a Thermostat-room: N. MacL. Harris, University of Chicago.

Every well-appointed laboratory engaged in teaching large classes should have an incubator room. The costly copper thermostat is entirely inadequate. The thermostat in this case was built for the pathological laboratory of the Johns Hopkins University and was modeled somewhat after one seen in Kjoebenhavn, Denmark, and one in the Institute for Infectious Diseases in Berlin.

The cost of this room was one hundred and twenty dollars exclusive of the thermoregulator and Koch safety burner, a sum often exceeded by the larger sizes of the ordinary copper-built apparatus on the market.

A complete description of this room will soon appear in the *Journal of Experimental Medicine* or in the *Centralblatt für Bakteriologie.*

The Utilization of Leaky Incubators: C. F. Dawson, University of Florida.

The leaky incubator is not an uncommon piece of apparatus in the older laboratories. Owing to the difficulty with which they are kept in repair when once they have begun to go to pieces, it is doubtful economy to attempt, in most cases, to keep them in commission.

As in the case of old and tried friends, we dislike to part with them. Although it is not the possession of such an incubator, at present, that has prompted this short note, a long laboratory experience has shown me that many fine and expensive old ovens have been consigned to the worn-out apparatus pile, because of their leaky propensities.

The writer is at present using one of Bausch and Lomb's finest incubators, without the usual water-jacket, and has never seen a more perfectly regulated apparatus. In this case the mercury regulator is, of course, passed through one of the tubulatures into the culture chamber.

We thus directly regulate the amount of heat in the place where it is wanted, and not through the medium of heated water. Such an apparatus is easily and quickly regulated. There are no long periods of over-heating or under-heating, as is the case when we have a large volume of water to heat up or to cool down.

Some might object to the rapid cooling when the door is opened; but this is quickly counteracted by an almost immediate return to the temperature for which the regulator is set, when the door is closed again.

Were this system adopted the expensively constructed incubator would be a thing of the past, as cheaper materials, such as wood and tin, could be employed in their manufacture.

I., *Demonstration of an Efficient Thermo-Regulator:* A. Robin, Wilmington Water Department Laboratory.

The thermostat consists of an ordinary automatic gas burner, such as is sold in hardware stores, connected with a regulator made on the same principle as the minimum and maximum thermometer with three electrodes, one reaching 38° C., the other 37° C., and a third connected at the bend of the U tube. The spring wires opening and closing the valve in the gas burner are slightly bent so as to permit a small amount of gas to pass, thus doing away with the spark coil generally used to light the burner. Two open-cell constant-current batteries supply the necessary current. When the temperature in the incubator reaches 38° C. the mercury rises, making a contact with the electrode on

the dark side, and the flame is automatically turned down. When the temperature falls to 37° C., the mercury column on the left side makes the contact, turning on the flame. Thus, the temperature is regulated within one degree. Instead of the mercury regulator, one made of thin brass and hard rubber strips securely fastened together and arranged between two contact points, may be used. The metallic thermo-regulator may be bought in the open market.

II., *A Simple Method of Making Anaerobic Plates.*

The medium consists of lactose agar, 1.2 per cent., which is plated in the usual way and placed on a nivellator. When thoroughly solidified, 7 c.c. of an agar jelly made of 1.2 per cent. agar in distilled water, are poured on each plate making a closely adhering transparent film. This practically accomplishes what the mica plate does, with the advantage, however, that the agar film adheres more closely, covers the medium more satisfactorily and is readily applied.

Laboratory Expedients. S. DEM. GAGE, Lawrence Experiment Station.

In the modern public health laboratory, a large amount of routine work of considerable detail is often required, and while an increase in the necessary funds is often not forthcoming, constant pressure is usually exerted upon the head of the laboratory to increase the scope of the work and the output of the working force. Under these conditions it is often a problem for the working bacteriologist to satisfy all requirements and at the same time to be able to carry on experimental work. The solution of this problem usually lies in systematizing the work and in the use of labor-saving devices whereby the time consumed in routine work may be shortened. It is the purpose of the author in the present paper to describe some of the laboratory expedients at the Lawrence Experiment Station as regards both the system in vogue and the labor-saving devices in use there, under the following headings: (1) Apparatus should stand rough handling, (2) color system and use of tubes of different dimensions for identifying media, (3) dilution bottle filler, (4) apparatus for holding inoculating needles during sterilization, (5) improvised apparatus, (6) loose sheet system of keeping records, (7) methods of keeping track of samples and experiments, (8) numerical systems.

A Method for the Direct Microscopical Enumeration of Bacteria: C.-E. A. WINSLOW, Massachusetts Institute of Technology.

One twentieth of a cubic centimeter of the liquid to be examined is discharged from a sterile graduated pipette on a carefully cleaned cover glass of known diameter. This is dried in the air, fixed and stained in the usual way with carbol-fuchsin. The bacteria in ten square fields, 0.1 mm. on a side, are counted by the aid of a Sedgwick-Rafter micrometer and the total number determined by multiplication. The method is rapid, easy and accurate, but applicable only to fluids like sewage which contain 25,000 or more bacteria per cubic centimeter.

The results obtained when pure cultures are examined check very closely with those of the plate method even when the number of bacteria present is decreasing very materially. Thus it appears that dead bodies of bacteria are quickly removed in the presence of other living germs and introduce no serious error. On the other hand, sewage and sewage effluents show numbers 10 to 100 times as high as the plate count, due mainly to the inclusion of forms which do not grow on ordinary media.

Full paper to be printed in the *Journal of Infectious Diseases* (with G. E. Willcomb).

A Simple Method for Determining the Ability of Bacteria to Ferment Different Sugars: L. A. Rogers, U. S. Bureau of Animal Industry.

In volume VII., page 241, of the *Cent. f. Bakteriologie,* 2d Abt., Linder describes a simple method for the determination of the ability of yeasts to ferment different sugars. This method consists essentially in filling the cavity of a concave glass with sterile water, inoculating with yeast, adding a very small amount of the sugar and sealing on a cover glass. The fermentation of the sugar is indicated by the appearance of bubbles under the cover-glass.

With a few minor variations this method may be used with bacteria. For this purpose litmus is added to sugar-free bouillon until it has a deep blue color. The sugars to be tested are made to a syrup and sterilized in small phials. The slides and cover-glasses may be sterilized in Petri dishes. A single tube of the litmus bouillon is inoculated with the organism to be tested and incubated for a few hours. A ring of vaseline is run around the cavity of the slide while it is warm and the cavity completely filled with the culture. A loopful of the sugar solution is added to each and a cover-glass placed carefully over the cavity and pressed onto the vaseline without admitting any air bubbles. The surplus media may be taken up with a filter paper. After a period of incubation the fermentation of the different sugars will be indicated either by the appearance of gas bubbles or by the reddening of the litmus, or by both.

The advantages of this method over the ordinary fermentation tubes are the rapidity with which the fermentation of a large number of sugars may be determined and the very slight expense required for the sugars.

With the fermentation tube the expense of determining the fermentation of the rarer sugars is so great that the fermentative ability of an organism is ordinarily given for three or four sugars.

With the culture-slide method the amount of sugar used is so slight that a small amount may be kept always ready for use, thus obviating the necessity of keeping on hand a large number of different kinds of media. The danger of contamination may seem a serious obstacle, but with ordinary care it is very slight and may be reduced to a minimum by the use of a case for the protection of the slides. A convenient arrangement for this purpose is a box with glass sides made after the pattern of a balance case, with a sliding door so that the slides may be prepared with only the forearms inside the case.

A Simple Method of Cultivating Anaerobic Bacteria: B. R. Rickards, Boston Board of Health Laboratory.

With solid media, an ordinary inoculated slant or stab tube immersed mouth down in a receptacle containing alkaline pyrogallic acid is used. Plates are made by using an Erlenmeyer flask instead of a Petri dish, inverting and immersing as with tubes.

For liquid media, the Lawrence form of fermentation tube is used, the liquid being allowed to run into the closed arm before inverting and immersing the mouth of the tube in the pyrogallic acid.

(*Cent. f. Bakt.,* Orig. XXXVI., s. 557.)

New Apparatus: H. W. Hill, Boston Board of Health Laboratory.

Porous Top for Petri Dishes.—The porous top is an exact duplication, in porous flower-pot earthenware, of the ordinary glass top, and is used in every way

similarly to, and as a substitute for, the glass top, except that it is best not to wash it between uses.

Its function is to absorb the excess moisture which, when glass tops are used, results in 'spreaders.'

In use, the percentage of 'spread' plates found in routine plating work of milk on agar at 37° C. in a saturated atmosphere has been reduced from 38 per cent. with glass tops (plates inverted) to 3 per cent. with porous tops (plates not inverted).

(*Journal of Medical Research,* 1904, XIII., 93.)

Staining Bacterial Fields under Microscopic Observation.—This is a mechanical device for applying stains, decolorizers, mordants, etc., directly and readily to the lower smeared surface of a cover-slip, in such a manner as to stain, decolorize or mordant, successively, in any order, a selected microscopic field, while the same is under observation, with provision also for a water flush to remove the surplus solutions applied. Particularly useful for Gram's stain, comparison of different stains, etc.

Method for Obtaining Smears for Flagella Staining.—The organism to be obtained is grown in broth, on the principle that in broth flagella are better developed than on the solid media usually recommended. To remove the broth from the organisms, repeated centrifugalization, decantation and addition of distilled water or normal salt solution is used. Numerous experiments show that the centrifugalization does not denude the bacilli of flagella to any extent.

(*Journal of Medical Research,* 1904, XIII., 97.)

A Method of Obtaining a High Percentage of Serum from Blood: C. W. LINCOLN, Glenolden, Pa.

In this method the blood is drawn into a tall narrow bottle without shoulders. A drip flask is made of a narrow glass percolater of the same caliber as the blood bottle, resting on a wide mouth quart bottle, the two being bound together by a broad band of paper tied firmly to each. Into the bottom of the percolator is dropped an inverted cone of coiled nickeled wire, the upturned base of which shows a flat surface of coiled wire with interspaces of not over one fourth of an inch. A paper cap is put on the percolator and the whole sterilized together. When clotting has taken place and all the serum has been drawn or poured off, the clot is gently slid from the blood bottle into the drip flask, both being held nearly horizontally. The two vessels being of the same caliber, the clot is but slightly injured and rests on the wire cone on its tough buffy coat, so that the serum that drips is not at all reddened after the drip flask has stood in a refrigerator for 24 hours. By this method 46 per cent. of serum may be obtained and if the pouring is done in a comparatively dust-free room no contamination occurs.

Note on the Occurrence in the Natural Waters of Eastern Massachusetts of Bacteria Simulating Sewage Forms: E. G. SMITH, Massachusetts Institute of Technology.

The author has observed in studying the bacteria of natural waters that species occur with considerable frequency which exhibit to a marked degree the reactions of colon bacilli, and he points out that these organisms may sometimes lead to erroneous conclusions as to the sanitary quality of a water.

Examination of 100 samples of water taken from sources 'presumably polluted.' The samples are from springs and brooks, public water supplies, pools and other sources where rapid personal inspection of

the surroundings showed them not liable to pollution. These, for the most part, are through the eastern section of Massachusetts. Most of the samples contained forms liquefying gelatin so rapidly as to make the counting of numbers impossible after forty-eight hours at 20° C. The most striking fact is the prevalence in these open waters of the development of red colonies on lactose-litmus-agar, sixty of the samples showing distinct red colonies either on the surface or imbedded in the medium. All typical growths have been differentiated and found to give more or less fully the colon reactions. Open brooks such as would be used for any impounding reservoir give often the most questionable data when rigidly interpreted; for example, from a small brook flowing through woodland and abandoned pasture with no tillage land above gave as high as six red colonies, differentiating out as modified colon forms, to the cubic centimeter. In but two cases, however, has the writer been able to isolate the streptococci—once in an open brook near Whitman, Mass., and once near the mouth of Elmer's Brook in South Hadley, a famous trout stream. Neither of these are polluted waters as we understand them, but the above determinations should not be accepted as final until further study of the area may have removed all possibility of contamination from animals. So far as we have gone in this inquiry the statements of Houston appear to be justified. It is of some importance, therefore, that careful inquiry as to the occurrence of the streptococci forms in nature be continued. Any considerable pollution of a natural water by fecal material will show these forms, which are readily distinguishable on the litmus-lactose-agar plate; and if continued examinations may show them not to be present in normal country waters their significance from the sanitary point of view is evident.

The Steam Still: F. C. HARRISON and B. BARLOW, Ontario Agricultural College.

Some Large but Inexpensive Incubators for Teaching and Working Laboratories: S. C. PRESCOTT, Massachusetts Institute of Technology.

Some Experiences with Test-tubes: H. A. HARDING, Experiment Station, Geneva, N. Y.

FREDERIC P. GORHAM,
Secretary.

BROWN UNIVERSITY,
PROVIDENCE, R. I.

THE SOCIETY FOR PLANT MORPHOLOGY AND PHYSIOLOGY.

THE eighth annual meeting of this society was held, in conjunction with the meetings of the American Association for the Advancement of Science and the affiliated societies, at the University of Pennsylvania, Philadelphia, December 28–30, 1904, under the presidency of Dr. George T. Moore. The meeting was large in point of numbers, and in all ways successful. The following officers were elected for the ensuing year:

President—Professor E. C. Jeffrey, of Harvard University.

Vice-President—Dr. C. O. Townsend, of the United States Department of Agriculture.

Secretary-Treasurer—Professor W. F. Ganong, of Smith College.

The following new members were elected: Dr. G. P. Burns, of the University of Michigan; Dr. A. L. Dean, of Yale University; and Messrs. C. F. Kellerman, W. M. Scott and D. B. Swingle, of the United States Department of Agriculture. As its delegate to the International Botanical Congress in June the society elected Professor Farlow, and made provision for an alternate if he can not be present. The society accepted the principles, recommended by its committee of conference (published in this journal, XXI., 197), upon which it will merge, along with the Botanical Society of America and the American Myco-