

scribed and an interesting comparison is made with 'the standard California type formations.' The concluding paper, the 'Arapahoe Glacier in 1905,' is by Professor Junius Henderson.

The American Naturalist for October contains articles on 'A Peculiar Variation of *Terebratalia transversa* Sowerby,' by H. W. Shimer; 'Studies on the Plant Cell, VIII,' by Bradley M. Davis; and '*Diadasia* Patton; a Genus of Bees,' by T. D. A. Cockerell. The article on the plant cell is the final one of the series and it is noted that the author has a number of complete sets of reprints, and that enquiries concerning them may be addressed to him at the University of Chicago. Professor Cockerell's article includes a table for the identification of all the species of the genus.

The Museums Journal of Great Britain for October has for its leader an article on 'Local Museums,' by J. Willis Bund, one of several papers dealing with this subject that were read at the last meeting of the Museums Association. The matter is one that should be specially commended to the attention of our schools and colleges, local museums being all too rare in the United States, where much time and effort is thrown away in the attempt to make a small museum cover the universe instead of devoting its energies to the immediate locality. Among the notes American readers will blush to find the prominence given to some comparatively recent occurrences at the Metropolitan Museum of Art.

THE closing (October) number of volume 6 of the *Transactions of the American Mathematical Society* contains the following papers:

MAURICE FRÉCHET: 'Sur l'écart de deux courbes et sur les courbes limites.'

JOHN EIESLAND: 'On a certain system of conjugate lines on a surface connected with Euler's transformation.'

L. P. EISENHART: 'Surfaces of constant curvature and their transformations.'

N. J. LANNES: 'Volumes and areas.'

E. O. LOVETT: 'On a problem including that of several bodies and admitting of an additional integral.'

F. R. SHARPE: 'On the stability of the motion of a viscous liquid.'

A. LOEWY: 'Ueber die vollständig reduciblen Gruppen, die zu einer Gruppe linearer homogener Substitutionen gehören.'

W. B. CARVER: 'On the Cayley-Veronese class of configurations.'

This number also contains: Notes and Errata, volumes 5, 6; Table of Contents, volume 6.

SOCIETIES AND ACADEMIES.

THE PHILOSOPHICAL SOCIETY OF WASHINGTON.

THE 604th regular meeting was held October 7, 1905, with President Littlehales in the chair.

The evening was devoted to a paper by Professor W. D. Miller, of the University of Berlin, on 'Symbiosis.' He defined symbiosis as a life relationship existing between different kinds of animals or plants, or between animals and plants. The relation of the mistletoe to the tree on which it grows, for instance, is a symbiosis. According as advantage or disadvantage accrues to one or the other or to both of the parties concerned the symbiosis is designated as parasitism, commensalism and true or mutualistic symbiotism.

By parasitism we designate that type of symbiosis in which one individual lives at the expense of the other, doing it some harm without making any return; the first being called the parasite, the latter the host. Such is the relation of fleas, lice, bugs, tapeworms, etc., to the human being. By far the most important of this type is that existing between bacteria and the human subject.

By commensalism (*con, mensa*) we designate a symbiosis in which the one party lives from the superabundance or from the crumbs of the table of the other, deriving thereby a benefit from the relationship, but doing no harm and also making no return. In true symbiosis *both parties* derive an advantage from the relationship. Such is the symbiosis between the hermit crab and the sea anemone, between ants and plant lice, etc.

Especial attention was called to the tripartite symbiosis existing between animals, higher plants and bacteria, all animals being dependent upon plants for their food, the higher

plants upon bacteria for keeping up the store of carbon dioxide and of combined nitrogen necessary for plant life, and bacteria dependent upon animal or vegetable matter for their nourishment. The very important and beneficent rôle here played by bacteria in the household of nature has led to the view that they also hold a similar relation to the human body directly, and that the myriads of bacteria found in the alimentary canal not only serve as aids to digestion, but are absolutely essential to this process.

This view was placed upon a scientific basis by Schottelius, who sterilized hens' eggs, hatched them in sterilized incubators and fed them on sterilized food to find that they ate voraciously, but instead of increasing in weight, gradually grew thinner and died in the second or third week. If, however, hen manure was added to the food before the chicks had succumbed, they soon revived and developed rapidly and normally. This experiment proves that bacteria as a matter of fact are necessary to digestion in the case of chicks. It does not follow, however, that the same is true of human beings or of mammalia in general. Thierfelder and Nuttall found that guinea-pigs, taken aseptically from the mother and fed aseptically, developed perfectly normally; this experiment was carried on, however, but for a few days.

There are many other reasons for doubting the usefulness of bacteria as aids to digestion in the human being:

1. The ferments of the alimentary juices (ptyalin, pepsin, trypsin, pancreatin, etc.) are capable of carrying on digestion without the aid of bacteria.

2. Digestion by bacteria in the stomach is impossible under normal conditions, on account of the acid reaction of its contents.

3. It is a question whether the bacteria of the intestines, being bathed in foodstuffs already digested do not in a great measure lose the power of peptonizing albuminous substances just as nitrogen-fixing bacteria cultivated on media rich in nitrogen lose the power of fixing nitrogen from the air.

4. By far the great majority of bacteria are found in the large intestines, whereas the

digestion and absorption of food take place almost solely in the small intestines. Metchnikoff emphasizes this point in particular and maintains that the large intestines are not only useless, but positively harmful, and even suggests the idea of removing them surgically.

5. Digestion by bacteria is accompanied by the production of substances which are poisonous to the animal body and, for instance, eggs, meat, fish, oysters, etc., undergoing bacteritic digestion (putrefaction) are absolutely unfit for use and in some cases violently poisonous. This fact tallies also with practical experience, which teaches us that wherever bacteria obtain the upper hand and the normal process of digestion is replaced by bacteritic action, either in the stomach or intestines, serious disturbances in the shape of 'spoiled stomach,' headache, nausea, vomiting, diarrhœa, etc., take place.

In the mouth most of the bacteria convert the carbohydrates into lactic and other acids which decalcify the enamel and dentine, so causing decay of the teeth and all its accompanying evils, and we have no evidence whatever that the physiological action of the saliva is furthered by them, in a corresponding degree.

Bacteria are consequently not only not essential to digestion, but they produce serious disturbances in the mouth, stomach and intestines wherever they multiply in excessive numbers. They should consequently be kept down by every means at our disposition and especially as to the mouth; a thorough cleansing of the teeth after every meal not only goes far to keep the teeth and gums in a healthy condition, but contributes much to the general health.

There are, however, in the various cavities of the human body communicating with the outer world (mouth, intestines, vagina) certain bacteria which constitute the peculiar floræ of these cavities and which serve a beneficial purpose by their antagonism to other bacteria.

Some thirty lantern views illustrated the general subject and the speaker's own researches on the bacteria of the mouth; there were several beautifully stained sections of

teeth and microphotographs of other sections showing the infiltration of the dentine with bacteria.

The paper was discussed by Dr. Wiley from the chemical standpoint and by Dr. Kober with reference to the question of soils.

A vote of thanks was tendered the speaker for his very interesting and important paper.

CHARLES K. WEAD,
Secretary.

THE SOCIETY FOR EXPERIMENTAL BIOLOGY AND MEDICINE.

THE thirteenth meeting of the Society for Experimental Biology and Medicine was held in the Physiological Laboratory of Columbia University, at the College of Physicians and Surgeons, on Wednesday evening, October 18. The president, Edmund B. Wilson, was in the chair.

Members present.—Adler, Auer, Brooks, Burton-Opitz, Calkins, Dunham, Emererson, Ewing, Field, Gies, Hiss, Jackson,¹ Lee, Levene, Levin, Lusk, Meltzer, Meyer, Murlin, Noguchi, Norris, Park, Richards, Salant, Sherman, Sweet, Torrey, Wadsworth, Wilson, Wolf, Woodworth, Yatsu.

Members elected.—Carl L. Alsberg, S. P. Beebe, R. H. Chittenden, P. M. Dawson, W. J. Elser, G. M. Meyer, P. A. Shaffer, Douglas Symmers, L. L. Woodruff.

*Abstracts of Reports of Original Investigations.*²

A Fatigue Wheel. FREDERIC S. LEE.

The author exhibited a wheel designed for fatiguing mammals by means of voluntary muscular work.

Mutation in the Evening Primrose, Onagra biennis (L.) Scop., with demonstrations.

ELIZABETH BILLINGS and FREDERIC S. LEE.

Culture experiments by the authors confirmed MacDougal's discovery of a narrow-

¹ Non-resident.

² The abstracts presented in this account of the proceedings have been greatly condensed from abstracts given to the secretary by the authors themselves. The latter abstracts of the communications may be found in current numbers of *American Medicine and Medical News*.

leaved mutant of this species. It is possible that a second mutant was found, but further observations are needed to confirm this.

Influence of Thyroid Feeding, and of Various Foods and of Small Amounts of Food upon Poisoning by Acetonitril. REID HUNT. (Presented by Alfred N. Richards.)

The experiments were performed on mice. *Resistance* to the action of acetonitril was *increased* by administration of thyroid or potassium iodid, or by feeding a carbohydrate diet or a 'limited diet.' Resistance to the action of hydrocyanic acid was *not increased* by administration of thyroid or by feeding a 'limited diet.' Resistance to sodium nitroprussid was *not increased* by administration of thyroid.

Susceptibility to the action of acetonitril was *increased* by administration of thyroid-ectin and parathyroid and by feeding a protein diet.

A Case of Spirochætal Infection in Man, with demonstrations. CHARLES NORRIS.

The author described the first case reported in this country of spirochætal infection verified by microscopical examination of the blood. In July of this year the patient shipped as an assistant steward on the S. S. *Denver*, of the Mallory Line. He stayed five days in Galveston, slept on board and returned on the same steamer to New York. The spirochæte of this case, as seen in the blood of inoculated monkeys, as well as in the human blood, was similar to the spirochæte refringens.

The case directs attention to the probability of mild spirochætal infections, more or less constantly occurring, in sailors or travelers coming from southern parts into New York. The author also called attention to the possibility that spirochætal infection may be communicated, from person to person, through the bites of ticks and bed-bugs, and through wounds.

The Chromosomes in Relation to the Determination of Sex in Insects. EDMUND B. WILSON.

Two types of differences between the chromosome-groups of the two sexes occur in the Hemiptera. In one type the females have one

more chromosome than the male (*Anasa*, *Alydus*, *Protenor*); in the other type both sexes have the same number of chromosomes, but differ in respect to a particular chromosome (the 'idiochromosome'), which is smaller in the males than in the females (*Lygæus*, *Euschistus*, *Cænus*, *Podisus*). The relations show that these differences must be determined at the time of fertilization, and they arise from the fact that two classes of spermatozoa exist in equal number. In the first type one half of the spermatozoa possess one more chromosome than the other half. In the second type half the spermatozoa possess a large idiochromosome and half a small one. Females are produced in each case upon fertilization by spermatozoa of the first class, males upon fertilization by spermatozoa of the second class.³

Experimental Hepatic Cirrhosis in Dogs from Repeated Inhalations of Chloroform. C. A. HERTER and WILLIAM R. WILLIAMS.

Repeated chloroform inhalations caused, in dogs, an abundant, richly cellular connective tissue growth between and into the hepatic lobules. The bile ducts were proliferated and the liver cells showed much fatty and hyaline degeneration. The percentage of arginin obtainable from the proteids of the hepatic tissue was less after the chloroform treatment than that obtainable from the normal tissue. The proportion of fat in the liver cells was also reduced.

These observations open the question whether the fatty and parenchymatous degenerations of the liver, which in some cases follow narcosis by chloroform in the human subject, may not occasionally pass on to interstitial cirrhosis—a single narcosis in man being sufficient to induce the primary damage to the protoplasm of the liver cell.

Color Sense in Different Races of Mankind. R. S. WOODWORTH.

The author endeavored to ascertain whether races of mankind which seem to represent the more primitive stages in human development are specially subject to color blindness. The experiments were carried out in association

with Mr. Frank G. Bruner, under the Anthropological Department of the St. Louis Exposition. Of 252 adult male Filipinos (including Christians and Moros), 14, or 5.6 per cent., were red-green blind. Of 75 males of the 'wild tribes' of the Philippines (Igorots, Tinguianes and Bagobos), 2, or 2.7 per cent., were red-green blind. Of 13 male Negritos, none was color blind. A negative conclusion is warranted as to the suggestion that the color sense has developed, within human history, from anything approaching red-green blindness. Various additional results also opposed the view that the color sense has developed within human history from a more primitive type in which only the red end of the spectrum appeared as colored.

On the Practical Concentration of Diphtheria Antitoxin. R. B. GIBSON.

The author described a new method for the preparation of concentrated diphtheria antitoxin. The serum is precipitated with an equal volume of saturated ammonium sulfate solution, and the precipitate extracted with a solution of saturated commercial sodium chlorid. The antitoxin globulin dissolves in the latter and the insoluble globulin is separated by filtration. The antitoxin is separated from the filtrate by addition of a half-volume of saturated ammonium sulfate solution, or better still, by addition of acetic acid in the usual way. The precipitate separated by filtration is pressed as dry as possible between absorbent paper and dialyzed a few hours in parchment paper. The resultant dialyzed solution is then neutralized and re-dialyzed for several days. A quarter of a per cent. of sodium chlorid and some toluol are added and sterilization effected by double filtration through a Berkefeldt filter.

The concentrated antitoxin solution thus prepared contains probably from two to three times the proportion of protein present in normal serum. Large quantities of serum can easily be worked over at comparatively small expense by the method indicated and the product thus prepared is as good or better than ordinary antitoxic serum, in practically all respects.

³ SCIENCE, 1905, XXII., p. 500.

*On the Effect of Magnesium Salts upon the
Excitability and Conductivity of Nerves.*

S. J. MELTZER and JOHN AUER.

Numerous applications of solutions of magnesium salts to the sciatic, pneumogastric, depressor and sympathetic nerves of rabbits failed to produce any evidence of excitation, but in each case there resulted sooner or later a profound inhibitory effect upon the conductivity of the nerve under observation. Thus, after application to the sciatic nerve, the conduction of motor and sensory impulses was manifestly inhibited: a strong stimulus applied below the 'block' caused strong contractions of the muscles of the thigh but no pain; when applied above the 'block,' stimulation induced pain but failed to cause contraction. Such effects were obtained with hypertonic as well as with isotonic and even with strongly hypotonic solutions. The weaker the solution the longer it took to establish complete interruption of conductivity. Conductivity could be restored by washing the nerve with Ringer's solution.

WILLIAM J. GIES,
Secretary.

DISCUSSION AND CORRESPONDENCE.

THE GEOGRAPHICAL DISTRIBUTION OF STUDENTS.

TO THE EDITOR OF SCIENCE: In Dr. Tombo's interesting article on 'The Geographical Distribution of the Student Body at a Number of American Universities' which appeared in SCIENCE for October 6, 1905, he was careful to state that 'in the case of Harvard University the students of Radcliffe College (undergraduate women) are not included.' May I amend that statement by saying that only men were counted in the Harvard table, the graduate students as well as the undergraduate students of Radcliffe College having been excluded. Had these 407 students been included, several comparative statements in the article would have been affected. Harvard would have led in the North Atlantic division by 47, and would have gone from fourth place to third place in the South Atlantic division. In the line of grand totals Harvard would have led by 361, Columbia being second and Michigan third. Had women been wholly omitted or

separately counted in Dr. Tombo's table, several rearrangements would obviously have been necessary.

JEROME D. GREENE.

HARVARD UNIVERSITY.

THE MAKING OF LANTERN SLIDES.

TO THE EDITOR OF SCIENCE: Every one knows how troublesome it is, in the making of lantern slides from a variety of objects, to accurately center the images on the negative plates; how very troublesome it is to get a centered lantern slide from an eccentric negative, and how much time is required in cutting paper mats for bounding the field of a lantern slide. For several years I have employed a method which I find obviates these difficulties almost completely.

In making my negatives I take pains to get the desired size of image, but do not take the trouble to center the image upon the spot where the negative plate is expected (?) to be.

I take these negatives and trim them by means of a cutting diamond to the size of the transparent square desired on the lantern slide. I can trim thirty negatives in fifteen minutes.

I then take my lantern plates, lay them film side up on a black ground, lay a trimmed negative centrally on each, and print by a light held above.

The resulting positives are perfectly centered, and the desired field is sharply bounded by a nearly opaque border which is as satisfactory as a carefully cut paper mat.

W. S. FRANKLIN.

SPECIAL ARTICLES.

ORTHOGENETIC VARIATION.

SINCE I am responsible for the term 'orthogenetic variation,' whilst the far greater idea of 'orthogeny' falls to the credit of the late Theodor Eimer, I am anxious that it should not be misrepresented.

The paper by Mr. Robert E. Coker, entitled 'Gadow's Hypothesis of Orthogenetic Variation in *Chelonia*,' Johns Hopkins University Circular No. 178, May, 1905, calls for some remarks on my part by way of protest and