

lections,' by S. L. Moseley, shows how much harm may be wrought by the private collector and pleads for a more public spirit. The number is specially rich in notes on art museums and records the 'discovery' of a number of paintings by Turner in the cellars of the National Gallery.

The Museum News of the Brooklyn Institute for April contains articles on 'Zuni Pottery-making,' the 'Great Anteater' and 'The Care of an Aquarium,' besides numerous notes relating to the collections and libraries of the museums.

The Bulletin of the College of Charleston Museum has articles on the 'Birds of the Coast Region of South Carolina' and a synopsis of the museum lecture on typhoid fever.

SOCIETIES AND ACADEMIES.

THE NATIONAL ACADEMY OF SCIENCES.

THE regular annual session of the National Academy of Sciences was held in Washington, April 16 to 18, inclusive.

The following members were present during the session: Messrs. Abbot, Agassiz, Becker, Billings, Boss, Brewer, Brush, Campbell, Cattell, Chittenden, Crafts, Dall, Dutton, Emmons, Gill, Hague, Hale, Holmes, Howell, Merriam, Morley, Morse, Newcomb, Noyes, Osborn, Peirce, Pupin, Remsen, Trelease, Walcott, Webster, Welch, Wells and Woodward.

The following new members were elected: Benjamin O. Peirce, Cambridge, Mass.; William B. Scott, Princeton, N. J.; Josiah Royce, Cambridge, Mass.

Professor Wilhelm Ostwald, of Leipzig, and Professor H. A. Lorentz, of Leiden, were elected foreign associates.

Messrs. Billings, Chittenden, Hale, Osborn, Welch and Woodward were reelected members of the council for one year.

The Draper medal was presented to Mr. W. W. Campbell at a dinner given by Mr. Alexander Agassiz at the New Willard Hotel on Tuesday evening, April 17.

The following program was presented:

J. McK. CATTELL: 'The Distribution of American Men of Science.'

C. S. PEIRCE: 'Recent Developments of Existential Graphs and their Consequences for Logic.'

THEO. HOLM: 'Commelinaceæ. Morphological and Anatomical Studies of the Vegetative Organs of Some North and Central American Species.' (Presented by Theo. Gill.)

A. AGASSIZ and H. L. CLARK: 'On the Classification of the Cidaridæ.'

THEO. GILL: 'Interference of Oviposition of a Sargasso Fish with a Flying Fish.'

H. F. OSBORN: 'Faunal and Geological Succession in Eocene and Oligocene Basins of Rocky Mountain Region.'

W. J. SINCLAIR: 'Volcanic Ash in the Bridger Beds of Wyoming.' (Presented by H. F. Osborn.)

C. E. DUTTON: 'Radioactivity and Volcanoes.'

C. D. WALCOTT: 'Cambrian Faunas of China' (with lantern illustrations).

GEORGE E. HALE: 'Recent Solar Investigations' (with lantern illustrations).

W. W. CAMPBELL and C. D. PERRINE: 'Some Recent Solar Eclipse Results.'

M. I. PUPIN: 'Feeble Rapidly Alternating Magnetization of Iron.'

J. M. CRAFTS: 'Primary Standards for Temperature Measurements between 100° and 350°.'

ASAPH HALL: 'Biographical Memoir of Admiral John Rodgers.'

W. M. DAVIS: 'Biographical Memoir of George P. Marsh.'

THEO. GILL: 'The Life History of Pterophryne.'

SOCIETY FOR EXPERIMENTAL BIOLOGY AND MEDICINE.

THE fifteenth meeting of the Society for Experimental Biology and Medicine was held in the Physiological Laboratory of the New York University and Bellevue Hospital Medical College on Wednesday evening, February 21, 1906. The president, Edmund B. Wilson, was in the chair.

Members Present.—Auer, Beebe, Brooks, Calkins, Emerson, Field, Gies, L. Loeb,¹ Lusk, A. R. Mandel, J. A. Mandel, Meltzer, W. G. MacCallum,¹ Murlin, Opie, Park, Richards, Salant, Shaffer, Sherman, Torrey, Wallace, Wilson, Wolf.

Members Elected.—Walter R. Brinckerhoff, Warren P. Lombard, B. T. Terry, E. E. Tytzer.

Officers Elected.—President, Simon Flexner; vice-president, E. K. Dunham; librarian, Gra-

¹ Non-resident.

ham Lusk; treasurer, Gary N. Calkins; secretary, William J. Gies.

Abstracts of Reports of Original Investigations.²

On the Intermediary Metabolism of Lactic Acid: A. R. MANDEL and GRAHAM LUSK.

Administration of phlorhizin to a dog poisoned with phosphorus causes excretion of dextrose, the mother substance of lactic acid, and the latter then disappears from the blood and urine. On the other hand, *d*-lactic acid (Kahlbaum), when given to a diabetic dog, may be completely converted into dextrose.

The Primary Factor in Thrombosis after Injury to the Blood Vessels: LEO LOEB.

The author has observed that in invertebrates as well as in vertebrates an agglutination of blood-cells or of blood plates may take place around foreign bodies or at the place of injury of the vessel wall. The formation of such agglutination thrombi was found to correspond to the clumping of the same cellular elements outside of the body, where the agglutination can take place without being accompanied by a coagulative process. This phenomenon is observed in vertebrate as well as in invertebrate blood.

In birds the injection of hirudin does not materially alter the readiness with which a thrombus is formed. In dogs, on the other hand, it is very probable that injections of hirudin delay or may sometimes prevent the formation of agglutination thrombi. The effect, however, is not directly due to the inhibition of the coagulation of the blood, but probably to changes in the blood which will have to be determined.

Granula and Ameboid Movements in the Blood-cells of Arthropods: LEO LOEB.

The author's investigations of the changes in freshly drawn blood of *Limulus* and other arthropods show that the fate of the granules

of the blood-cells depends upon certain mechanical conditions and that the apparently spontaneous dissolution of cell granula can be inhibited, to a large degree, by preventing certain mechanical irritations of the cells. It seems probable that the ameboid movements, the spreading out of the cells and the dissolution of the granules are caused by certain metabolic changes which are induced in each instance by similar conditions.

On a Course in the Pathological Physiology of the Circulation, with Demonstrations of Tracings, Anatomical Specimens, Instruments, etc.: W. G. MACCALLUM.

The author described the course given by him during the past year in the new laboratory of experimental medicine at Johns Hopkins University. It was the aim of the course to reproduce experimentally such diseased conditions as are seen by medical students in the wards of the hospital, so that the diseases might be studied with the aid of any or all of the methods at the command of the physiologist and of the pathologist. The author's description and demonstrations made it evident that the object of the course has been attained with an unusual degree of success.

On the Blood-pressure Relations in Experimental Mitral Insufficiency and Stenosis, with Demonstrations of Tracings and Anatomical Specimens: W. G. MACCALLUM and R. D. McCURE.

Blood pressure was recorded in various portions of the circulatory system after mitral insufficiency had been produced by introducing a curved knife hook into the left auricular appendage and cutting some portion of the mitral valve. A systolic murmur could then be heard, which was especially loud over the auricle and along the pulmonary veins with usually a thrill felt over the auricle. The hypertrophy of the right ventricle was studied and discussed.

Mitral stenosis was produced by means of a clamp or by a coarse suture passed through the heart and about the mitral ring. The pressure is seen to rise very high in the pulmonary circulation, but, because of the smaller amount

²The 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 the *New York Medical Journal*.

of blood to circulate there, it is lower throughout the systemic circulation.

Paramecium Aurelia and Mutation: GARY N. CALKINS.

In March, 1905, a pair of conjugating *Paramecium caudatum* was isolated from a culture in an epidemic of conjugations. The ex-conjugates had all of the characteristics of *P. aurelia*. One died before many generations in culture, the other is still living and is now in the 346th generation. This one retained the characteristics of *P. aurelia* until about the 45th generation after conjugation, when it lapsed again into the *P. caudatum* form, with one micronucleus and other characteristics of *P. caudatum*. The latter characters are still maintained.

The observation indicates one of two things. Either, this is an interesting case of mutation of species, with lapse into the parent form after several generations, or the specific characteristics are inadequate and *P. caudatum* and *P. aurelia* are but variants of one species. The latter is the more reasonable hypothesis, and on grounds of priority the common forms of paramecium should be called *paramecium aurelia*.

Experiments with some Saline Purgatives given Subcutaneously: JOHN AUER.

The author's experiments lead to the conclusions that the subcutaneous injection of sodium sulfate and sodium phosphate does not produce purgation in rabbits, and that the pendular movements of the small intestine are moderately increased.

The Effects of Extra Stimuli upon the Heart in the Several Stages of Block, together with a Theory of Heart Block: JOSEPH ERLANGER. (Presented by S. J. Meltzer.)

The author's observations suggest the following theory of heart block: Clamping the auriculo-ventricular bundle reduces the efficiency of the cardiac impulses that reach the ventricles. With a certain degree of pressure the impulses become subminimal with respect to the irritability of the ventricles. Such an impulse would, therefore, fail to elicit a contraction of the ventricles. The next following auricular impulse would be no stronger than

the preceding one, but in the interval the irritability of the ventricles has increased to the extent that the weakened auricular impulse now acts as an efficient stimulus. In this state of affairs the rhythm would be 2:1. A further reduction in the efficiency of the auricular impulse would give higher degrees of partial block and finally complete block. With this theory as a basis it becomes possible to explain all of the important phenomena of heart-block.

On the Nature of the Reflexes Controlling the Successive Movements in the Mechanism of Deglutition: S. J. MELTZER.

The experiments demonstrate that the function of deglutition is provided with two sets of reflex mechanisms. One mechanism has only one initial afferent impulse which travels within the center independently of any further aid from the esophagus; it is very sensitive to anesthesia and may be called a higher reflex. The other is a lower reflex, consisting of a chain of local reflexes which are very resistant to anesthesia.

The Enzymes of Inflammatory Exudates. A Study of the Enzymes concerned in Inflammation and their Relations to Various Types of Phagocytic Cells: EUGENE L. OPIE.

The phagocytic cells of an inflammatory exudate contain two enzymes. One of these ferments, characterized by its power to digest protein in an alkaline medium, is contained in the polynuclear leucocytes with fine granulation, and since it is derived from the bone marrow, may be designated *myelo-protease*. The second ferment characterized by its power to digest only in acid medium, in this respect resembling the autolytic ferments of other organs, is contained in the large mononuclear cells of the exudate and is increased in lymphatic glands adjacent to the seat of inflammation; it may be designated *lympho-protease*.

Experimental Myocarditis. A Study of the Histological Changes following Intravenous Injections of Adrenalin: RICHARD M. PEARCE. (Presented by Eugene L. Opie.)

The author gave many detailed results of an elaborate study. He stated that there is little

evidence to support the theory of a direct toxic action of adrenalin on the heart muscle. Indeed, the limitation of degenerative lesions to the heart and larger blood vessels and their practical absence in all other tissues contraindicate a toxic action and point to some influence of a mechanical nature affecting these structures alone. That some of the more unusual forms of fibrous myocarditis in man which are difficult of explanation may be due to circulatory disturbances of the same general nature as those caused in rabbits by adrenalin can not be denied. It is to these only that the results of this experimental investigation appear to have any relation.

Stable and Detachable Agglutinin of Typhoid Bacilli: B. H. BUXTON and J. C. TORREY.

By heating an emulsion of typhoid bacilli to 72° C. for half an hour a detachable agglutinin may be separated from the bacilli. This may be obtained in the filtrate after passage through a Berkefeld filter. Rabbits which have been inoculated on the one hand by this filtrate and on the other by the heated bacilli, which have been thoroughly washed, show specific differences in their serums, as regards agglutination. The animal inoculated with the washed bacilli or stable agglutinin, produces a serum which agglutinates normal typhoid bacilli very slowly and with the formation of fine clumps. In contrast to this, the filtrate containing only detachable agglutinin gives rise to serum which clumps normal typhoid bacilli rapidly and with the formation of large flocculi.

Absorption experiments, furthermore, show that the *s* or stable agglutinin and the *d* or detachable agglutinin are distinct in character.

It has also been determined that the substance in typhoid bacilli which gives rise to precipitins for filtrates of typhoid cultures is split off from the bacilli, together with the detachable agglutinins. The possibility suggests itself that the *d* agglutinin and the precipitin in a typhoid serum are identical.

The Effect of Alcohol on Hepatic Glycogenesis (Preliminary Communication): WILLIAM SALANT.

Thus far in his experiments the author has found that the administration of alcohol, even in relatively large doses, is without effect on glycogen metabolism in the livers of fasting rabbits.

The Viscosity of the Blood during Fever and After Injection of Phenylhydrazin: R. BURTON-OPITZ.

The viscosity was increased in these experiments, whereas the specific gravity was decreased. These results agree with the author's previous observations, to the effect that the viscosity and the specific gravity of blood may vary independently.

WILLIAM J. GIES,
Secretary.

THE BIOLOGICAL SOCIETY OF WASHINGTON.

THE 414th meeting was held March 17, 1906, with President Knowlton in the chair and 31 persons in attendance. Mr. J. W. Gidley presented the first paper, 'Evidence bearing on Tooth-Cusp Development, based on a Study of the Mesozoic Mammals.' A study of the Mesozoic mammal collection in the U. S. National Museum has led to some discoveries of importance bearing on the question of tooth-cusp homologies in the mammalian molars.

According to the tritubercular theory, as advocated by Osborn, the primary cone in the upper molars is always to be found on the inner or lingual side and is the homologue of the central cone in such forms as *Triconodon*. Against this theory Scott has shown, from paleontological research, that in the upper molariform premolars the primary cone is on the *outside*. M. F. Woodward has found from embryological studies of certain groups of insectivores that the main anterior *external* cusp is the first to develop, not only in the premolars, but in the molars as well, while the internal cone (*protocone*) is third in making its appearance.

Notwithstanding this opposition evidence, Osborn still supports the hypothesis of an internal position for the primary cone in the

upper molars, and as conclusive evidence of the correctness of this view has cited the upper molars of *Triconodon*, in which the main cone is central, and *Dryolestes* and other forms, in which he states the main cone is internal.

Owing doubtless to the incompleteness and minuteness of the teeth examined, Osborn was apparently led to error in observations, for instead of three cusps, one internal and two external, as stated by Osborn, the upper molars of *Dryolestes* have five distinct cusps, one internal, three external and one posterior median. This arrangement admits of a different interpretation of the cusp homologies. The three outer cusps supported by two fangs now appear to be homologous with the three main cusps and two fangs of *Triconodon*, the inner cusp being readily interpreted as a secondary or internal heel development. This view is strengthened by a third type, *Dicrocyonodon*, in which the outer portion of the upper molar is very similar to that of *Dryolestes*, but the large inner cusp is totally different. In *Triconodon* a broken external cingulum and two incipient inner heel-like cusps preclude the probability, at least, of this form of molar ever passing to a typical triconodont stage through the outward shifting of its lateral cusps. These forms, therefore, apparently represent distinct types of molars separately derived from the simple cone, and *Triconodon* and *Dryolestes* do not represent successive stages in the development of the trituberculate molar, as supposed by Osborn.

Thus, the evidence of the Jurassic mammals apparently agrees with the embryological evidence and supports the 'premolar-analogy' theory, while it lends no support to the tritubercular theory in so far as it involves the position of the primary cone.

The second paper was by Mr. M. C. Marsh, on 'Hemoglobin Estimates and Blood Counts in Fishes in Health and Disease.' The species observed were the brook trout and rainbow trout. Apparently normal brook trout from the Au Sable River in Michigan varied widely in hemoglobin and no norm was established save a very broad one. Thirty-five specimens

gave an average reading of 43 with the Dare hemoglobinometer, 100 representing normal human blood. The readings varied from 33 to 59. The hemoglobin of domesticated brook trout averaged 34 from 23 observations. Wild rainbow trout, represented by only two closely agreeing readings, were 92 in hemoglobin, while the same species domesticated averaged 54 from 19 observations. The chief conclusions of interest derived from these figures are that trout blood is lower in hemoglobin than human blood, that the brook trout, whether wild or domesticated, is considerably lower than the rainbow in the corresponding condition, and that domestication is attended with a considerable falling off in hemoglobin content. This latter fact is possibly correlated with the increased susceptibility to disease in domesticated fish. Such a correlation is more forcibly suggested by the comparative insusceptibility of rainbow trout, even in domestication, to a bacterial disease which under exactly the same conditions attacks readily the brook trout. The question is raised of the possibility of increasing the hemoglobin in the blood of the latter species by feeding iron salts, as in human medicine.

The wild brook trout has about one million red corpuscles per cubic millimeter and the number is not diminished in domestication. The rainbow trout domesticated has 1,487,000, being the average of eleven individuals, while a single observation of the wild rainbow showed 1,830,000.

Trout in fish-cultural ponds have occasionally true neoplasms of a malignant nature located in the region of the gills and causing a pronounced anemia. Ten brook trout thus afflicted had an average hemoglobin reading of 17. An apparently primary anemia in the young of this species has been observed, in some individuals so extreme that the gills in life were white. The red cells had fallen off greatly in number, the lowest count recorded being 38,000.

On the other hand, the most destructive epidemics of protozoan and bacterial infection in trout are not attended by any marked anemia.

Mr. Austin H. Clark read the last paper of the meeting, describing 'A Case of Melanism in West Indian Honey Creepers.'

M. C. MARSH,
Recording Secretary.

DISCUSSION AND CORRESPONDENCE.

DR. O. F. COOK'S CONCEPTION OF EVOLUTION.

IN SCIENCE, March 30, 1906, p. 506, Dr. O. F. Cook expresses the opinion that in the recent discussion of isolation as an evolutionary factor there is 'a need of a simple distinction,' and asserts that isolation does not play a part in evolution. A similar idea, that neither isolation nor natural selection nor mutation factors in evolution, had been maintained by him previously in a series of publications, the last of which is a paper printed by the Washington Academy of Sciences.¹

This astonishing view should be carefully investigated and analyzed, for up to the present time every writer on evolutionary subjects, no matter what his standpoint, has taken it for granted that any of the factors introduced, if they are admitted at all, are admitted on the ground that they are factors cooperating in the general process called evolution. Dr. Cook, however, believes that isolation, natural selection, mutation, etc., have nothing to do with evolution, and that the last is a different process, due to 'causes resident in species.'

Looking more closely upon his views, it becomes evident that Dr. Cook's conception of 'evolution' is different from that of other writers, and, of course, the propriety of his criticism of the latter depends on the correctness of his new conception of evolution.

As every student of evolution knows, and as also Dr. Cook admits,² 'evolution,' as the word implies, was originally intended to characterize the whole process by which the organic world has been formed. According to the view of Linnaeus, the organic world, as it now exists, divided up in species, was created

¹O. F. Cook, 'The Vital Fabric of Descent,' *Proc. Wash. Acad. Sci.*, 7, March 19, 1906, p. 301 ff.

²O. F. Cook, 'Evolution not the Origin of Species,' *Pop. Sci. Mo.*, 64, 1904, p. 445.

so, and the number of existing species has remained permanent since their creation; according to Cuvier, a number of successive creations of species have taken place, each destroyed by a catastrophe. The 'theory of evolution' is opposed to the assumption of a permanency or stability, and introduces the view that the present organic world has developed out of preexisting forms, the former being evolved, or developed, or descended from the latter, and it admits the possibility of the splitting up of one species into two or more. Thus 'evolution' becomes a concept contrary to permanency or stability, and expresses the belief that organisms have reached their present state by degrees, by a change or transmutation, which they have undergone during the process of descent from their ancestors, connected with a differentiation. Since this theory has been proposed in order to explain the present condition of things, chiefly the separation of the organic world into a large number of species, the whole process of evolution has been called by Darwin 'origin of species,' and Darwin's theory is known as the 'theory of evolution,' or the 'theory of descent,' and the terms 'evolution,' 'descent,' 'development' have been used as synonyms.

But this is wrong, according to Dr. Cook. Already Darwin's phrase 'origin of species' (the 'species-origination box,' as Dr. Cook very elegantly calls it) does not include the factor of 'evolution,' for evolution is different from 'speciation,' or the making of species. Evolution is a 'process of organic change and development, universal and continuous'; it is a 'continuous progressive change'; it is the 'progressive development of organisms'; it is a 'process of change in species'; which means to say that it is characterized by a continuous *change* of the organisms, which becomes evident and visible by the fact that the descendants differ from their ancestors. This *change* observed in the organic world is paramount in Dr. Cook's conception of 'evolution'; he restricts this term thus, and uses it exclusively to express this fact. What happens later to the changed organisms through the action of natural selection, segregation, etc., is entirely