quite so complete, direct and obvious in their structural change as the Equidæ. But the results obtained by a careful consideration of the phyla of Camelidæ, Rhinoceridæ, Tapiridæ, Canidæ, etc., do not appear to me to differ materially.

It is only in a very general and tentative way that we can apply these standards to the Mesozoic. A comparison of the amount of evolution in vertebrates between the end of the Permian and the end of the Cretaceous in comparison with the maximum change from the end of the Cretaceous to the present day, gives in turn the impression of a distinctly higher order and more fundamental quality of change. My impression would be that each of its four periods, Triassic, Jurassic, Comanchic, Cretacic witnessed structural changes in vertebrate phyla as extensive and profound as those that took place in the Mammalian phyla during the Tertiary. As to the Palæzoic, I have no basis for an opinion. It should be remembered that it is the maximum rate of change that is used as a measure. Many races, more often many characters in a race, changed slowly or not perceptibly.

It will be obvious that, if these proportions hold true, an estimate of the length of the Pleistocene will afford a measure of the length of the Tertiary and older periods in years. But the estimates of Pleistocene time differ enormously. The lowest estimate is perhaps by G. F. Wright, who will not allow more than 25,000 years. At the other extreme stand Penck and other authorities with estimates of 1,500,000 years or more. The more moderate figures of 50,000 to 200,000 years generally adopted seem more probable than either extreme. According to the proportions above estimated of Tertiary to Pleistocene time, we should have

Pleistocene	Tertiary	Mezozoic
25,500 years (Wright)	2½ million	10 million
100,000 years (Walcott)	10 million	40 million
1,500,000 years (Penck)	150 million	600 million

If the proportions usually assigned to the Paleozoic be correct, it was as long as or longer than Mesozoic and Tertiary combined. This would give twenty-five million years for the whole of the fossiliferous record upon the extreme figures of Professor Wright; on Walcott's estimate over 100 million, and on Penck's over 1,500 million years. For various reasons I am disposed to believe that the relative length of the Paleozoic should be revised upward, but the estimate of ten million years for the Tertiary and forty for the Mesozoic does not seem unreasonable.

W. D. MATTHEW

AMERICAN MUSEUM OF NATURAL HISTORY

SCIENTIFIC NOTES AND NEWS

AMONG the large numbers of American scientific men and university professors now detained on the continent and in England, probably the most serious inconvenience is suffered by the surgeons who attended the recent congress in London, some nine hundred of whom are said to be unable to obtain passage home. The only serious difficulty so far reported is the arrest and imprisonment of Mr. and Mrs. Archer M. Huntington in Nuremburg, Bavaria. Mr. Huntington is president of the American Geographical Society, and it is said was making a study of aeronautical routes.

PROFESSOR ELIE METCHNIKOFF, assistant director of the Institut Pasteur, will next year celebrate his seventieth birthday and the fiftieth anniversary of his doctorate. A committee has been formed, under the presidency of Dr. Roux, director of the Institut Pasteur, for the celebration of the anniversary which will include the publication of a "Festschrift."

MR. MARCONI has had the order of the Honorary Grand Cross of the Victorian Order conferred upon him.

AMONG those upon whom the University of Aberdeen conferred honorary degrees at the recent meeting of the British Medical Association were Mr. W. T. Hayward, Mr. T. J. Verrall, Sir Victor Horsley, Dr. Archibald Garrod and Sir John Bland-Sutton.

THE first presentation of the Saville medal, established by the West End Hospital of Nervous Diseases, London, in memory of the late

Dr. T. D. Saville, has been presented to Dr. Knowles Boney.

MR. A. T. BRADLEE has been awarded the medal offered by the National Association of Cotton Manufacturers for investigations upon the effects of moisture in testing cotton yarns and fabrics.

IN addition to those already named in SCIENCE Dr. C. C. Abbot, director of the astrophysical observatory of the Smithsonian Institution, will attend the Australasian meeting of the British Association as the guest of the New Zealand government.

THE foreign medical men who attended the Aberdeen meeting of the British Medical Asscciation included: Professor Stéphane Leduc of Nantes; Dr. E. Pontoppidan, professor of medical jurisprudence at Copenhagen; Dr. Clemens von Pirquet, professor of pediatrics at Vienna; Dr. Umberto Gabbi, professor of tropical medicine at the University of Rome; Dr. Karl Jung, professor of psychiatry at the University of Zürich; Dr. Alban Bergonié, professor of biological physics at the University of Bordeaux; Dr. H. Morestin, professor of surgery in the University of Paris; Dr. Rist, professor of clinical medicine in the same university; Dr. Fritz Frank, professor of midwifery at Cologne; Professor D. S. Demetriades, of Athens; Professor Adolf Onodi, the laryngologist of Budapest, and Dr. J. R. Macleod, professor of physiology, Western Reserve University.

MR. WATSON NIGHTINGALE, B.S. (Mass. Inst., '14), has been sent by the Bureau of Fisheries to make a series of microscopic observations of plant and animal life on the Grand Banks off the coast of Labrador.

MESSRS. F. E. MATTHES and F. C. Calkins, of the U. S. Geological Survey, have returned to the Yosemite region, in California, to resume the geological and geographical studies they began last year.

THE American Museum of Natural History has sent two expeditions from the department of vertebrate paleontology, the first in charge of Mr. Barnum Brown, to the Red Deer River of Alberta, Canada, to collect Cretaceous dinosaurs, and the second, in charge of Mr. Albert Thomson to Agate, Nebraska, to secure additional *Moropus* skeletons.

PROFESSOR J. C. BOSE, of Calcutta, will deliver a lecture before the Royal Society of Medicine, London, on October 30, on the modification of response in plants under the action of drugs.

THE biennial Huxley lecture will be delivered by Sir Ronald Ross, K.C.B., F.R.S., at the Charing Cross Hospital Medical School on October 1.

WE learn from *Nature* that it was decided at a meeting of alpinists held at Zermatt on July 25 to commemorate the fiftieth anniversary of the first ascent of the Matterhorn (falling on July 14 next) by the erection of a marble statue of Mr. Edward Whymper at the age he was when he first climbed the Matterhorn. The pedestal is to be of granite taken from the Matterhorn and the monument is to face the peak. The memorial will also commemorate Lord Francis Douglas, Mr. Hadow, the Rev. C. Hudson, and the guides, Michel Croz and the two Tangwalders. The cost will be borne by subscriptions. Mr. Justice Pickford, president of the Alpine Club, is to be invited to become the honorary president of the memorial committee. Dr. A. Seiler was appointed treasurer, and Mr. J. Grande, of Berne, honorary secretary.

THE death is announced of the Rev. Dr. Stephen D. Peet, editor of the *American Antiquarian and Oriental Journal,* which he established in 1878 and conducted for thirty-two years.

DR. R. J. ANDERSON, professor of natural history and geology at University College, Galway, has died at the age of sixty-five years.

THE Russian government's ice breaking steamer *Taimyr* arrived at Nome, Alaska, on August 4, and left the following day for Wrangell Island to take off the twenty-one men who found refuge there after the wrecking of the Stefansson exploring ship *Karluk* in the ice north of Herald Island last January. The United States revenue cutter *Bear* sailed for Wrangell Island via Point Barrow on

July 21. After she sailed news was received that the ice about Wrangell Island was unusually firm, and the Russian government decided to send the powerful *Taimyr,* which can cut a way where the wooden *Bear* would be helpless.

ACCORDING to its program, the ninety-seventh annual meeting of the Swiss Scientific Association will be held at Berne, on August 31 to September 3. The general addresses include: "The Influence of Natural Science on Modern Medicine," by Professor H. Sahli, of Berne; "The Synthetic Dyes," by Professor Noelting, of Mühlhausen, and "The Primates of the New World," by Dr. H. Bluntschild, of Zürich. The association meets in nine sections for the reading of special papers.

WE learn from the *Journal* of the American Medical Association that an international school hygiene congress will be held in Brussels next year. The program takes up the following subjects: school buildings and equipment; medical inspection of urban and rural schools; prevention of contagious diseases in schools; the teaching of hygiene to teachers and parents; school hygiene in its relation to physical education of children; methods, syllabuses and school equipment in their relation to school hygiene; school hygiene in its relation to the children, and school hygiene in its relation to adolescents. The congress is under the patronage of the King of Belgium, and under the auspices of the National Institute of Pediology and the Belgian Pedotechnic Institute. The committee of organization is presided over by M. J. Corman, director general department of sciences and art, and Dr. J. Demoor, director of the Free Institute in Brussels.

ACCORDING to the *Bulletin* of the American Geographical Society a large relief model of the Yosemite Valley is being constructed at the Office of Public Roads in Washington for the government exhibit at the Panama-Pacific Exposition. It is twelve feet long, six feet wide and carries relief to a height of 18 inches. The vertical dimension is not exaggerated, and as a consequence all features are shown in their correct proportions. Indeed, so rugged is the topography of the Yosemite Valley, that any increase in the vertical scale would have resulted in a peculiar, distorted appearance of the great cliffs, domes and spires. The model is being executed, with painstaking exactness, by an expert model maker, and is based upon the detailed topographic map of the Yosemite Valley, prepared in 1905–06 by Mr. F. E. Matthes, of the United States Geological Survey. Portions of this map were enlarged photographically to five times the original scale, that is, to a scale of 440 feet to the inch. The contour lines then were used as patterns for the sawing out of thin wooden boards. These boards were built up in layers and the rough form thus obtained was plastered over with a special preparation of great durability that will bear transportation across the continent. Large numbers of photographs are being used for local details, and a special effort is being made to reproduce with fidelity the peculiar cliff sculpture which is so prominent a factor in the Yosemite landscape. Inasmuch as these sculptural forms are intimately associated with the lines of structure in the granites in which the valley lies hewn, the model promises to become an unusually fine medium for the study of these relations of form to structure. Students of geology and geography will therefore, in all likelihood, find it an object worthy of a special visit at the San Francisco Exposition. Explanatory legends will be placed on the sides of the case at various places, directing attention to the most interesting features. In order to heighten the sense of reality, small streams of water, blown to spray by atomizers, will represent the waterfalls.

THE committee appointed by the Paris Academy of Sciences to allocate the amount placed at its disposal by Prince Bonaparte is reported by *Nature* to have made the following proposals for grants during 1914: 2,000 francs to Dr. Pierre Breteau, for the continuation of his researches on the use of palladium in analysis and organic chemistry; 2,000 francs to M. Chatton, to enable him to continue his researches on the parasite Peridinians; 3,000

francs to Dr. Fr. Croze, for the purchase of a concave diffraction grating and a 16 cm. objective, to be used in work on the Zeeman phenomena in line and band spectra; 6,000 francs to Dr. Hemsalech, for the purchase of a resonance transformer and battery of condensers, to be used in his spectroscopical researches; 2,000 francs to P. Laïs, for assisting the publication of the photographic star map; 2,000 francs to M. Pellegrin, to assist him in pursuing his researches and continuing his publications concerning African fishes; 2,000 francs to Dr. Trousset, to assist him in his studies of the minor planets; 2,000 francs to M. Vigouroux, to enable him to continue his researches on silicon and its different varieties; 3,000 francs to M. Ailuaud, to assist the publication (with Dr. R. Jeannel) of the scientific results of three expeditions to eastern and central Africa; 9,000 francs divided equally between MM. Pitart, de Gironcourt and Lecointre, members of the Morocco expedition, for scientific study, organized by the Société de Géographie; 2,000 francs to M. Vasseur, for the continuation of his geological excavations in a fossil-bearing stratum in Lot-et-Garonne; 3,500 francs to Dr. Mauguin, for the continuation of his work on liquid crystals and the remarkable phenomena presented by these bodies when placed in a magnetic field; 2,000 francs to Dr. Anthony, to defray the cost of his researches on the determinism of morphological characters and the action of primary factors during evolution; 4,000 francs to M. Andoyer, to assist the publication of his new set of trigonometrical tables; 4,000 francs to M. Bénard, to enable him to continue, on a larger scale, his researches on experimental hydrodynamics; 2,000 francs to Dr. Chauvenet, for the continuation of his researches on zirconium and the complex combinations of that element; 2,000 francs to François Franck, for the chronographic study of the development of the embryo, with special examination of the rhythmic function of the heart; 2,000 francs to M. Sauvageau, for the pursuit of his studies on the marine algæ. The committee recommends these eighteen grants after considering nearly sixty applications for assistance. The amount allocated for the year is 54,500 francs.

Wide variation in the pay for the same or similar work is one of the most striking situations revealed by the investigation of teachers' salaries just completed by the U. S. Bureau of Education, under the direction of J. C. Boykin, editor of the Bureau. Public elementary school-teachers may receive $2,400 a year, as some do in New York City, or $45 a year, as in certain rural communities. Even in cities of the same class there are considerable differences in the salaries paid teachers. On the administrative side there are county superintendents with pay ranging from $115 to $4,000 per annum, and college presidents receiving salaries from $900 to $12,400. In city school systems salaries have increased steadily in recent years, particularly in the western states; and, in general, salaries in city school systems are fairly well standardized. The average salary of the superintendent of schools in cities of over 250,000 population is $7,178; the range is from $4,000 to $10,000. In the same group of cities high-school principals average $3,565 and elementary teachers $1,018. Even in the smallest cities listed, those between 5,000 and 10,000 population, salaries are fairly uniform. The maximum for superintendents in this group is $3,600 and the average $1,915; but elementary teachers show an annual average of $533, with salaries as high as $1,350 and as low as $104. It is in the colleges and universities that the widest variation prevails. The salaries of men with the rank of "professor" range from $450 to $7,500. "Professors" in some institutions receive less than "instructors" or even "assistants" in others. Salaries of deans of these institutions vary from $500 to $5,000. University teachers of subjects for which there is direct commercial demand outside receive somewhat higher salaries than those in charge of the traditional academic subjects, but the difference is less than might be expected. The highest average salaries for full professors are paid in law and civil engineering. Law claims the highest paid professorship in any subject, with one salary of $7,500; but there are professors of

physics, geology and Latin who receive $7,000. It is significant, however, that on the basis of the figures reported most college teaching, particularly in the first two years, is done by men of instructor grade with salaries of $1,000 to $1,200, or by assistants who receive on the average about $500, usually for half-time services.

UNIVERSITY AND EDUCATIONAL NEWS

DR. H. T. SUMMERSGILL, superintendent of the New Haven Hospital, has been appointed superintendent of the University Hospital in San Francisco. Dr. Summersgill has arrived to take charge of the present hospital of the University of California Medical School, and to aid in completing the plans for the new teaching hospital buildings, to erect which $615,000 has been given by various friends of the university. Dr. Winford H. Smith, superintendent of the Johns Hopkins Hospital, recently spent a month in San Francisco, coming to California as expert adviser for the plans for the new hospital.

THE six-weeks' summer session of the University of California, for 1914, enrolled 3,101 students. It is expected that next year's summer session, coming while the Panama-Pacific Exposition will be in progress in San Francisco, will much exceed this year's enrollment. The freshman class at the University of California this year, excluding special students, will number over 1,700.

THE first summer school of the George Peabody College for Teachers has just come to a close. The total enrollment reached 1,006 regular students and 99 part-time visitors, coming from 28 states, including all of the southern states. This is possibly the largest enrollment with which any summer school has started. Next year the summer school will continue for twelve weeks instead of six, thus becoming a very integral part of the year's work which is to be divided into four quarters of twelve weeks each.

FRANCIS C. LINCOLN, associate professor in the mining department of the University of Illinois, has been made the head of the Mackay School of Mines of the University of Nevada.

MR. J. E. RUSH, of the University of Wisconsin, has been made assistant professor, in charge of the departments of biology and bacteriology, at the Carnegie Technical Schools, Pittsburgh.

THE governors of the Imperial College of Science and Technology, London, have appointed Dr. A. N. Whitehead, F.R.S., to the newly constituted chair of applied mathematics, and Dr. C. G. Cullis to the professorship of economic mineralogy.

DR. T. J. JEHU, lecturer on geology at the University of St. Andrews, has been appointed Murchison regius professor of geology and mineralogy in the University of Edinburgh, in succession to Professor James Geikie.

DISCUSSION AND CORRESPONDENCE

YOUNG WHITEFISH IN LAKE SUPERIOR

THE literature on the two species of whitefish that are so important commercially in our Great Lakes (*Coregonus albus* and *C. clupeaformis*), as well as unpublished statements received by the writer from prominent ichthyologists and fish culturists, makes it appear that little, if anything, is known concerning the very young of these fish as they exist in these bodies of water. Where the young whitefish, both native and those that are planted, live and what they feed upon in their natural habitats, constitutes an important problem for ichthyologists and fish culturists. Jordan and Evermann (1902),[1] writing of *Coregonus clupeaformis*, say:

> Nothing is definitely known regarding the general distribution and habits of the young, but they are supposed to remain chiefly in the deep waters of the lake.

During August, 1913, the writer studied the fish-life of the Whitefish Point Region in Northern Michigan, as one of the investigators sent there by the University of Michigan, with funds given for the work by the Hon.

[1] "American Food and Game Fishes," page 128; published by Doubleday Page and Company.