announced by the Secretary, were commemorated in short addresses by those present at the meeting. Among those who had passed away were the venerable Jules Oppert, Friedrich von Spiegel, and President Harper. Over thirty new members were elected, an unusually large number. Professor Toy was elected president to succeed Dr. Gilman. On Wednesday the Society adjourned to meet again on April 4, 1907, in Philadelphia.

MEETING OF THE NATIONAL ACADEMY OF SCIENCES.

WASHINGTON, April 21, 1906.

Owing to the Franklin celebration at Philadelphia, the National Academy of Sciences held a session on Monday, April 16, the day before its annual statute meeting, and adjourned at the end of the following Wednesday. The papers may have been fewer than they would have been but for the exceptional circumstances of this year, yet they included four or five of capital importance. Of the sixteen communications, four related to Geology, Geognosy, and Palæontology, three to Zoölogy, one to Botany, two to General Physics, two to Heliography, one to Statistical Psychology, and one to Logic; while two were memoirs of deceased members, George P. Marsh and Admiral John Rodgers.

In respect to pertinence to the history of these days, the palm must be awarded to Major Dutton's proposed explanation of volcanic eruptions. It was more than thirty years ago that this savant submitted to the Academy evidences that the centres of volcanic actions have nothing to do with the supposed molten interior of the earth, but are, on the contrary, never more than five miles below the surface; and by the majority of students of the subject his argument has been accepted as substantial proof of this. There are some difficulties, it is true, of which the greatest has been that neither Major Dutton nor anybody else could specify any adequate cause for so enormous an evolution of heat in the upper crust of the earth. Stromboli, for example, certainly reminds one strongly of a geyser; and for many reasons it is generally believed that the more immediate cause of any volcanic eruption is the penetration of sea-water into some space where it is subjected to considerable heat and to tremendous pressure, and sets up some chemical action which suddenly liberates a titanic energy. It is very difficult to believe that sea water ever can penetrate to any considerable fraction of the radius of the spheroid of the earth, and yet it has hitherto seemed impossible to specify any probable cause for the heat requisite to kindle any great chemical action only a few miles underground. The discovery of radio-activity at once suggested the interrogation whether this might not be the cause sought. Major Dutton, in his new paper, shows that it might supply sufficient energy, not only for kindling a chemical action, but even for producing the eruption directly. It still remains to find evidence that it actually, or even that it probably, furnishes either the whole heat or the kindling heat that is required. Thus far, no known source of radium and no known product of radio-activity has been signalized in lavas or in the beds where volcanic action has its probable centre; nevertheless, there is no reason to deny the presence of radium there.

Our leading palæontologist, Prof. H. F. Osborn, read a paper by Mr. W. J. Sinclair upon the Bridger beds of Wyoming. We may mention that there is in Wyoming a basin, some two hundred and fifty miles in diameter, called the Green River Basin. Upon the floor of this there are various deposits, some of the lowest of which are known as the Bridger beds. One of the earliest operations of Clarence King's survey of the fortieth parallel was the examination of the Green River Basin. In those days microscopic petrography was not yet practised, and the parties were unsupplied with microscopes. Nevertheless, it was distinctly made out that some of the deposits in the basin were formed of débris from the erosion of the Uinta Mountains, while some other deposits were as clearly volcanic; but the provenance of the material of the Bridger beds was not ascertained. That they are largely lacustrine appeared clearly from the great numbers of fossil turtles and crocodiles found in them, and it was commonly assumed that they were composed of erosional matter. But Mr. Sinclair, in a most thorough search, could not discover the least bit of any. These beds, therefore, must be wholly volcanic, and Mr. Sinclair thinks it probable that the same conclusion may be extended to all the other Eocene basins of the Rocky Mountain region.

Professor Osborn also read a paper of his own upon the faunal and geological succession in Eocene and Oligocene basins of the Rocky Mountain region. He began by mentioning the prodigious multitude of fossils that had been collected, and the enormous amount of isolated study that had been made of the separate specimens. The time has now, he said, only just begun for putting the results together, and the present paper was understood to be merely preliminary to this further work. At the beginning of the geological age to which the paper refers, no ancestor of our present mammals was to be found on this continent, and some great change must have taken place by which these mammals were introduced. Last year, however, an armadillo was found at the bottom of the Bridger beds, and the White River basin affords a large number of new types derived from Europe.

The director of the Geological Survey, Dr. Charles D. Walcott, gave a résumé of the results obtained from the study of the collections of the Carnegie Institution expedition to China, under Messrs. Bailey Willis and Eliot Blackwelder. They brought home collections of fossils showing the faunas of the Middle Cambrian especially, but also of the Lower and of the lower part of the Upper Cambrian; the latter agreeing substantially with that of the upper Mississippi basin. The fauna of the Lower Cambrian was found to be of the same type as that of the Cambrian of the Salt Range of India, which is thus at last definitely placed. Furthermore, the fauna of the Middle Cambrian in China turns out to be altogether comparable to that of the Middle Cambrian of Mt. Stephen in British Columbia and of Utah and Nevada. And again, for the first time a species of cephalopod has been found in the Cambrian, four or five hundred feet below the top of the Cambrian limestones, and it agrees with the predictions of Hyatt, although the very simplest form which he expected has not yet been unearthed. Lantern illustrations were shown of 217 species, trilobites, brachiopods, gasteropods, and half a dozen other orders. The memoir was evidently regarded by the geologists as of unusual importance even among the works of Dr. Walcott.

The chief zoölogical paper was read by Dr. Agassiz with his inimitable hereditary charm of manner, in his own name and that of Dr. H. L. Clark. It related to the classification of certain sea-urchins called the *Cidaridæ*, of which the very same genera have subsisted from the Jurassic era down through all the ages of geological life even to this day. The spatial range of single forms is as remarkable as their duration. One form may extend from the shore to a depth of eleven or twelve hundred fathoms. The shore species are naturally more widely distributed than the deep species, because they are transported by tides and other currents. The material studied for this work of classification embraced select specimens and series of thirty-four of the sixty-four species found. The classifications hitherto proposed have rested too much upon single features, especially upon the shapes of the spines with which these creatures are covered or upon the tubercles which are only the beginnings of spines. They have, moreover, often resulted from the examination of single specimens of the different species. The consequence has been that Messrs. Agassiz and Clark would now and then find a single individual which, according to the definitions, belonged at once to two or three different genera. The new study, conducted with far fuller collections and (we may venture to say) with equally greater diligence, has brought out a classification that has none of the inconveniences of former attempts. In commenting upon this paper, the eminent naturalist and ethnologist, Dr. Edward S. Morse, in trenchant terms added the weight of his disapproval of the too common practice of basing not merely definitions of species, but even classifications, upon single characters.

A memoir on the life history of Pterophryne, by Dr. Theodore Gill, was read only by title, but perhaps we may hope to enjoy the perusal of it in the quarterly issue of the Smithsonian Collections. We were not entirely deprived of the pleasure of listening to Dr. Gill's refined and clear elocution, for he gave us a very curious account of a phenomenon found in the Sargasso Sea. It seems that this sea is full of small globular snarls of seaweed which are hollow and which contain fish-eggs. Now because these nests are so ubiquitous in that sea; and because by far the commonest of the fishes there is the so-called Sargasso fish, which is a sort of pediculate, the *Pterophryne histrio*; and further, because the eggs of these nests were believed to resemble eggs known to belong to fish allied to the Sargasso fish; and, still further, because the peculiar fins of this fish seemed adapted to building the nests, it has been unhesitatingly taken for granted by all naturalists, beginning with Louis Agassiz, who first described the balls of seaweed, and including Alexander Agassiz, who has collected and still possesses a number of them, that the eggs are those of the Sargasso fish. But Dr. Gill thinks this cannot be. Setting out from the assumption that the eggs are not fertilized before being deposited—such a phenomenon being quite unprecedented, except among ganoid fishes and their allies—he remarks that it seems quite impossible that they should be fertilized after they are thickly wrapped in the globe of seaweed. Therefore, we must suppose they were fertilized before being wrapped up. Then, because a hollow ball would be far more easily shaped by a creature inside it than by one which should be compelled to swim all over its convex surface in correcting its form, and also because the hypothesis comports better with what we know of the habits of fishes, he assumes that the ball is formed around the fertilized eggs by these eggs themselves, which are provided with long filaments that seem peculiarly fit for such work. Next, among all the fish that naturalists have remarked in the Sargasso Sea, the only one which is at all likely to have eggs like those of the nests are the *Exocetidæ*, or flying fishes, which abound round the borders of the rafts of seaweed; and Dr. Gill propounds the hypothesis that these, being surface-fishes, deposit the eggs just under the surface of the water, where they are incontinently fertilized, after which the eggs, by automatic motions of their filaments, wind themselves up in balls of seaweed. Mr. Agassiz, as was quite proper (for there is a system of advocacy even in science; only it is held in check by a genuine desire to learn the very truth), raised such objections as he could to Dr. Gill's hypothesis, urging that there were no flying-fish in the Sargasso Sea. But Dr. Gill, though he had never himself been in this unfrequented wilderness of the ocean, cited sundry authorities who named the flying-fish among the chief denizens of this region, next after the Sargasso fish itself; and among these authorities Alexander Agassiz was preëminent.

The truth perhaps is, that even exploring steamers avoid penetrating the great rafts of seaweed, that all about their borders flying fish abound, and whether there are or are not many of the nests in the middle parts of the great rafts is not known. The Sargasso Sea is a great whirlpool, as large as the United States, its centre is eleven feet lower than the surrounding sea-level, and it is in a region of calms. Consequently, it is a bad place for either a sailing vessel or for a steamer, whose screw might get all snarled up in seaweed, so as to be retarded, or stopped, or even broken.

Of the two papers on General Physics, one was by the world-renowned chemist, J. M. Crafts. It related to determinations of temperature between 100° and 350° C. After sketching the history of thermometry, beginning with an account of the Florence collection of thermometers supposed to have been made by Galileo, and coming down to the unrivalled thermometers of Baudin, *père et fils*, and to the new kinds of glass made by Schott of Jena, of which he mentioned one particular borosilicate of calcium and sodium as the most suitable for thermometers (noting by the way that glasses containing both sodium and potassium acted badly, showing not only a lag he mentioned that chemical thermometers always suffer a rise of their zero points, which sometimes amounts to twenty or more degrees of the Centigrade scale. Nevertheless, some physicists express their determinations of temperatures to thousandths of a degree, and Dr. Craft thinks that the errors can be brought within a hundredth of a degree. For that purpose, it is desirable to have as many liquids as possible, each capable of entire purification, freezing at a definite temperature, boiling at a constant temperature, and not undergoing spontaneous decomposition. Mercury and water are held to be two such substances. The only others that Dr. Crafts has been able to find are naphthalene and benzophenone. In order to use these, it is necessary to know their boiling-points under all pressures, or, what is the same thing, their vapor densities or tensions at all temperatures, or say at five-degree intervals from their freezing-points to the point of softening of glass. In the course of his own well-known researches, Dr. Crafts did this for himself. But methods have since been improved, and glass has been greatly improved, and it is more than desirable that the work should now be done by some bureau of standards. The other physical paper was by Professor Pupin, who, in a narrative of entrancing interest, carried us through the whole course of mathematical reasonings, of experiments, trials, and exercises, by which he finally attained success in getting his coils for cables made and adjusted without highly expert workmen.

The two papers on heliography were by the two chief masters of that subject, Hale the former, and Campbell the present, director of the Yerkes Observatory. Dr. Hale's spectro-heliograph has already been briefly explained in this journal, showing how he photographs the sun at different levels of its atmosphere. He has now mounted on Mt. Wilson, California, a five-foot spectro-heliograph, such as could of course never be carried on any equatorial telescope, and has obtained new and most surprising photographs, which were thrown upon the screen; but you could not afford the space for any description of them or of this most ingenious and superb instrument. The paper of Dr. Campbell, who availed himself of the collaboration of Dr. C. D. Perrine, related to observations of the solar corona by an exceedingly interesting and ingenious method, the description of which must likewise be postponed. One very interesting result is, that the matter of the fibres of the solar corona are at rest relatively to the sun, or at any rate have no motion greater than one kilometre per second.

Of the two remaining papers, one, by Professor Cattell, on the distribution of the thousand American Men of Science given in his just published volume bearing that title can hardly be said to have been read, so very brief was the time allotted for it. The other was a long paper by Mr. C. S. Peirce, on the Method of Existential Graphs, by means of which he showed that this system gives a sort of diagram of the mind in reasoning, and also that there is, strictly speaking, but one way in which the differ-being indefinite or indeterminate in some respect in which another element renders it determinate.

Correspondence.

INTELLECTUAL ALLIANCE BETWEEN ITALY AND THE UNITED STATES.

TO THE EDITOR OF THE NATION:

SIR: I desire to inform the American public through your columns of a plan which, if put into effect, as we who are engaged in it are now encouraged confidently to hope, ought to have far-reaching consequences for good in the development of American culture. This plan contemplates nothing less than a formal intellectual alliance between Italy and the United States, the object of which shall be to bring the citizens of these countries into as close a relation as possible, more especially on the side of their higher intellectual life. It will be observed that the scheme is somewhat similar, though wider in scope, to that of the Alliance Française. It embraces five principal objects, to wit:

(1.) The exchange of popular lectures between Italy and the United States. Since the intention is to reach as wide a public as possible, some of the lectures in the United States would be in English, and some of those in Italy in Italian.

(2.) The establishment of Italian professorships in American universities and of American professorships in Italian universities. This would mean both permanent chairs in the higher institutions of each country and the temporary residence of Italian professors in America and of American professors in Italy. Since, of course, Italian studies are already recognized in America, and English studies in Italy, one of the chief ends to be secured by this arrangement would be instruction, for America in Italian literature in the Italian language, and for Italy in English literature in the English language. The interchange of professors would also enable the teachers of each country to study and profit by the educational methods of the other.

(3.) The establishment in every part of the United States of clubs for the cultivation of Italian literature and art. Besides literary and musical gatherings of a more popular nature, vacation studies of the sort already familiar to Americans from "Chautauqua" and similar organizations, and free Italian circulating libraries, this part of the enterprise would include the systematic study of the Italian language and literature by those who have leisure and inclination to take them up, thus giving paid employment to native Italian teachers.

(4.) The exchange of students between Italian and American universities in such wise as would enable a student of either country to pursue courses in the institutions of the other, which, when properly certificated, should be recognized by the faculties at home. It is also desired that younger students be sent from one country to the other, and find homes in private