thus exert an effect opposed to the action of visible light, the points acted upon by the former becoming less sensible to subsequent exposure of luminous rays. These differences are clearly shown, when exposing celloidine paper to the action of either kind of rays; cathode rays, in fact, are found to produce a brown color, whereas a violet tint is observed in the case of ordinary light. If a strong brown color is produced on celloidine paper exposed to cathode rays, this colorization wil gradually vanish, on subsequent action of light. Similar effects to those of cathode rays are observed when heating the paper before exposure to light, when the points colored by the influence of heat will become insensible to any action of luminous rays. The heating produced by cathode rays cannot, however, be alone responsible for the above phenomena, as the tint produced by heat will never pass away on being next exposed to light.

The author thus succeeds in reversing negative images into positives. By prolonged exposure, these images may be made wholly to disappear.

Becquerel rays will act in a manner quite analogous to that of luminous rays; canal rays behave in a way similar to cathode rays, as well as ultra-violet light. These phenomena are likely to afford a new means of investigating and analyzing these rays, which possibly might serve to elucidate their nature.

ABSTRACTS OF PAPERS PRESENTED AT THE NATIONAL ACADEMY OF SCIENCES.

BY MARCUS BENJAMIN, PH.D.

The annual stated session of the National Academy of Sciences was held in Washington from April 21 to 23, 1903, under the presidency of Dr. Alexander Agassiz.

At that session, which is the business session, the Academy devoted its time chiefly to the consideration of the award of medals, the reports of committees, appointment of new committees, the election of officers, and election of members.

The Draper medal which is awarded biennially for astronomical advances, was given to Prof. George E. Hale, of the Yerkes Observatory, Williams Bay, Wis., for his recent researches on solar and stellar spectroscopy. Dr. Hale is one of the youngest members of the Academy, but he has already achieved a high reputation for his brilliant researches in the domain of celestial physics.

At the request of Secretary Hay, of the Department of State, the Academy appointed a committee, consisting of Prof. Chandler, of Columbia University, Dr. Billings, of the New York Public Library, and Dr. Remsen, of Johns Hopkins University, to consider a method by means of which the original copy of the Declaration of Independence might be preserved. It will be recollected that in the early history of the Academy a similar committee was called upon to propose a method of restoring the ink, which had become faded. At that time it was suggested that an application of a solution of potassium ferrocyanide, if washed over the parchment, would produce a precipitate of prussian blue, and so preserve the written text of that precious document, but no action was taken. The parchment is now, however, showing signs of age, and it is very essential that some satisfactory means should be adopted to prevent its entire disintegration.

The papers, which were brief summaries of progress, and for the most part highly technical, were comparatively few in number.

The first presented before the Academy was by James M. Crafts, of the Massachusetts Institute of Technology, on The Law of Catalysis in Concentrated Solutions. It dealt chiefly with his experiments on the sulphonic acids, on which he has been experimenting for the last few years. George E. Hale, under the title of The Rumford Spectroheliograph of the Yerkes Observatory, described in detail the spectroheliograph recently constructed at the Yerkes Observatory for photographing the sun in monochromatic light, in conjunction with the forty-inch telescope. Photographs which have been taken with the spectroheliograph show a finely mottled structure covering the entire surface of the sun. In certain parts of the sun, and especially in the neighborhood of sun spots, there are extensive regions of very bright calcium vapor. The photographs taken with this instrument include those which represent the denser calcium vapor at low levels in the solar atmosphere, and others showing the less dense vapor at higher levels. A series of slides showing these photographs were thrown upon the screen. Prof. Lewis Boss, of the Dudley Observatory, Albany, contributed a valuable paper entitled The Determination of Standard Right-ascensions Free from the Personal Equation for Star-magnitude, in which, after referring to the fact that the personal equation of an astronomer's vision was of less moment than the differing degrees of brightness of the light in which the star was observed, showed a series of observations, from which he obtained as a factor 0.0077 of a second as the average constant error found.

A paper of special interest was Radio-activity of Thorium Minerals, by George F. Barker. At the outset he gave a summary of the development of radio-activity, beginning with the work of Becquerel in 1896, after which he described the discovery of polonium by Madame Curie, and the subsequent discovery of the elements radium and actinium. The four principal sources of radio-activity are the new elements mentioned, together with thorium. The investigations in Europe had led to the presumption that thorium was only radio-active when found in connection with uranium. This, he demonstrated from his own experiments, was incorrect, and that all thorium minerals were more or less radio-active. In this country the minerals samarskite and monazite, both from North Carolina, are the principal sources for thorium. His researches further showed a definite relation between the atomic weight and proportion of radio-activity in these substances, the heaviest being the most radio-active. He showed impressions of thorium and uranium taken through sheets of brass, copper, lead, silver, and other metals. Another paper, by Prof. J. M. Crafts, was The Standardization of Thermometric Measurements, in which he argued in favor of further investigation of these measurements. His own experiments, made with different varieties of glass, convinced him of the superiority of Jena glass. The subject was one, he contended, which should be taken up by a bureau of standards, and he recommended that Regnault's experiments should be revised with modern facilities. Water, mercury, naphthalene, and benzol-phenol, he contended, were excellent solutions to work with. Dr. S. Weir Mitchell, whose experiments on the venom of snakes are famous, announced, under the title of The Discovery of an Antidote for Rattlesnake Poison, that a serum had recently been prepared in Philadelphia, which, when given to animals that had been inoculated with rattlesnake poison, seemed to counteract the effect of that venom.

Prof. Bell read a paper on his kite experiments, an abstract of which was published last week.

A biographical memoir of Matthew Carey Lea, the distinguished chemist, who was an accepted authority on the actinic values of silver, was read by Prof. G. F. Barker, and Dr. Theodore Gill presented a memoir of Dr. John E. Holbrook, of South Carolina, whose researches on herpetology and ichthyology made him famous.

Owing to the absence of Prof. Henry F. Osborn, the following papers by him, An Estimate of the Weight of the Skeleton in the Sauropoda, or in the Sauropodous Dinosaurs; New Characters of the Skulls of Carnivorous and Herbivorous Dinosaurs; and Models Illustrating the Evolution of the Amblypoda, also of the Dinosaur *Diplodocus*, together with a Theory as to the Habits of the Sauropoda, were read by title only. Also, The Diffusion of Vapor into Nucleated Air, by Carl Barus, and The Nomenclature of the Topography of the Bottom of the Oceans, by Alexander Agassiz, as well as Biographical Memoir of Clarence King, by S. F. Emmons, Biographical Memoir of A. A. Gould, by Jeffries Wyman, Biographical Memoir of James E. Keeler, by Charles S. Hastings, and Biographical Memoir of Theodore Lyman, by H. P. Bowditch, were presented by title only.

In addition to the foregoing, two papers were presented by non-members of the Academy. The first of these, On the Semi-diurnal Tide of the Northern Part of the Indian Ocean, by R. A. Harris, who was introduced by Dr. Cleveland Abbé, was accompanied by a chart of cotidal lines, and had for its purpose the showing of the times of the tide over the northern part of the Indian Ocean. There is no difficulty in drawing lines, chiefly arbitrary, however, to harmonize with all reliable observations, because the latter have been confined to shores and islands. But in the chart presented before the Academy, Mr. Harris had not only as his purpose the demonstration of the agreement with the observations, but also consistency with reasonable hypotheses respecting the origin and nature of the tide. In brief, the tides are ascribed primarily to seiche-like oscillations sustained by the disturbing forces of the moon and sun, the free period of the body approximately agreeing with the period of the forces. A binodal area extends from northwestern Australia to Somali and Arabia, and a uninodal area from Mozambique Channel to Baluchistan and India; the tides in the latter area are, however, influenced by the tides south of the channel. The co-tidal lines are generally crowded together near the nodal lines, through straits, and in shallow arms of the sea, while they are generally spread apart at and near the loops of the oscillations. Similarly, the tides in the Red Sea and Persian Gulf were also shown. A second was on The Melting Point of a Simple Glass, by Arthur L. Day, who was introduced by G. F. Becker, and consisted of an exhaustive study of the phenomena attending the change of state of anhydrous tetraborate of soda (borax), from the vitreous solid, borax glass, to the viscous liquid form, and its solidification again. Dr. Day found that when undisturbed this change was practically continuous, and that no melting point or solidifying point in the ordinary sense, existed. A little disturbance at any temperature between 490 deg. C. and 740 deg. C. was sufficient to produce a stable anhydrous crystalline form (hitherto unknown), with a constant and characteristic melting point at 742 deg. C. Another important result of the investigation is expressed by the author as follows: "That the temperature to which a liquid rises after undercooling, is not necessarily constant or in any way related to the melting point, and therefore is not entitled to be regarded as a physical constant."

The Academy adjourned on Thursday, April 23, and the scientific session, which is held in the autumn, will be convened in Chicago on November 17.

SCIENCE NOTES.

The Geographical Society of Paris has conferred the La Roquette gold medal on Capt. Sverdrup, the Arctic explorer, for his explorations in 1898 and 1902.

A French professor, M. Gadot, proposes to make the barometric column a standard of length. The pressure of the atmosphere will sustain a column of water 10.33 meters high, or a column of quicksilver of 0.76 meter. A long series of observations of the barometer at a given place at known temperatures and at the level of the sea would give a height that could be taken as a "natural" standard. M. Gadot assumes as his unit one-tenth of the height of a barometric column of water, which is nearly a meter, and upon this unit he has constructed a system of weights and measures not without ingenuity.

Two French officers, Capt. Truffert and Naval Ensign L'Huard, have completed an exhaustive exploration of Lake Chad and its numerous islands, hitherto very imperfectly known. According to these two explorers, the lake is 185 miles in length by 89 miles in width. Curiously enough, it is on the whole extremely shallow, the deepest part being the western side, where the water is 25 feet in depth, while on the eastern shores it is only 5 feet in depth. The lake is interspersed with eighty islands divided into three groups—the first, void of vegetation; the second, covered only with grass and herbs, but used by the natives for pasturing cattle; and the third, inhabited islands, which are thickly and well forested, and contain extensive millet plantations. Altogether, some 50,000 people dwell on these islands. One of the most notable achievements of this expedition was the discovery of a hitherto unknown tree, the wood of which is lighter than cork. The explorers found navigation in small boats hazardous, since the water becomes agitated when the wind blows from certain quarters.

The London Zoological Gardens have secured an excellent specimen of the exceedingly rare black-crested monkey (*Semnopithecus melanolophus*) first described by Sir Stamford Raffles in 1821 in the Transactions of the London Linnean Society. This species, the "Simpai" of the Malays, is confined to the island of Sumatra. The color of the fur of this monkey is chestnut red, darker on the outside of the limbs than elsewhere. The under surface is whitish; the palms and soles are black. The long, slender fingers seem all the longer by contrast with the tiny thumb. The face is bluish black; a dark line runs from the eyes to the ears. The crest is prominent. On the tail is an orange tinge. The tail is nearly twice as long as the body, and shows indistinct traces of barring near the root. This kind of marking is rare in monkeys, though there is a striking example of it in the ring-tailed lemur (*Lemur catta*), the only one in which the tail is not uniformly colored. This specimen of the black-crested monkey is housed with a hoolock gibbon, and thus affords an opportunity of comparing the different modes of progression in the two animals. The black-crested monkey leaps, while the gibbon swings and lets go, the impetus thus obtained enabling it to cover a wider space.

Some interesting discoveries of the pre-Romanic era have been made by the various parties of explorers working in different parts of Italy for archæological treasures. One party was stationed at Ancona, where the site of a burying ground which evidently belonged to the pre-Roman era was discovered. A female and male skeleton were disinterred, together with three bronze buckles, an amber necklace, some bronze chains, and a bronze waistbelt with pendants, a heavy bronze spear, sword, and iron dagger, and a large drinking cup. A third skeleton, also of a man, was found with a sword, dagger, knife, some small rings, probably belonging to a waistband, and some buckles lying near him. In Rome under the Quirinal, where the workmen are boring a large subway, several beautiful pieces of carved marble, two fine marble tablets, adorned with bas-reliefs, representing tragic and comic plays and bacchic dances, and several tablets bearing votive inscriptions to the gods have been unearthed. In the neighborhood of Segni the finest discovery was made by a workman of a tall bronze statue of a young man, his arms hanging down by his sides, and his hair parted in the middle and flowing down over the shoulders. There is little doubt that this work is a piece of original Etruscan art.