then put on full steam once more and fairly raced away from the "Hyacinth," reaching Berehaven long before her rival. The test of the Belleville boiler on the "Hyacinth" on this occasion was unusually severe. Every ounce of steam was requisitioned, and extra men were sent down to the stokehold to assist in the trimming of the fires and the working of the bunkers. One of the after group of boilers primed to such an extent during the run as to render it necessary to draw the fires. Again there was the excessive and unaccountable loss of feed water which characterized the run from Gibraltar to Portsmouth. The loss of water on the comparatively short run between Cape Finisterre and Berehaven was over 50 tons.

## THE NATIONAL ACADEMY OF SCIENCES.

BY MARCUS BENJAMIN, PH.D.

The scientific session of the National Academy, which is held in the autumn, began its meetings at the University of Pennsylvania, in Philadelphia, on the morning of November 13. Alexander Agassiz, the President of the Academy, and Asaph Hall, its Vice-President, were unavoidably absent, in consequence of which the Foreign Secretary, Ira Remsen, President of the Johns Hopkins University, presided over the sessions.

It is not customary to open the meeting with an introductory address, but to proceed immediately to business, in consequence of which the reading of the papers was promptly taken up.

These included a paper by George F. Barker, of the University of Pennsylvania, on "The Monatomic Gases." He explained the difference between diatomic and monatomic molecules, and of the positive and negative elements. He described the history of the discovery of helion, neon, argon, krypton, and xenon, and the fulfillment of William Ramsay's remarkable prediction made in his address before the Chemical Section of the British Association for the Advancement of Science, at Toronto, a few years ago, as to the existence of the gas called Neon, and its exact relationship to the others in the same series. These gases are all monatomic, having only one molecular motion, and are incapable of combination with any other elements. He said that they were the equivalents of zero, or of nothingness. In mathematics one may go from the negative to the positive, or the opposite, by passing through zero. This series of elements was placed equidistant between the negative series, in which were hydrogen and the haloids and the positive series, in which were lithium, sodium, and the other alkalies.

The "Transmission of Heat Through Vapor of Water at Small Pressures" was the title of a joint paper by Edward W. Morley, of Adalbert College, Cleveland, with Charles F. Brush, the well-known electrical expert. It gave a series of results of experiments made by the authors. Prof. Morley also presented a second paper descriptive of "Two Forms of Gage for the Recording of Small Pressures of Gas," which were especially devised in order to measure the pressure of aqueous vapor. With these gages it is possible to make measurements in which the mean error of a single reading is not much greater than a ten-thousandth of a millimeter. The description of the apparatus as given by Prof. Morley was highly technical, and was illustrated by means of drawings, which he presented before the Academy.

Charles S. Pierce, of Milford, Pa., presented a paper on "The Logic of Research into Ancient History." He contended that the logical procedure on which students of ancient history had worked was as bad as logic could be. No new truth ever came from induction or deduction, but can come only from abduction. The correct method, he said, is that our hypothesis ought to explain all the related facts. It is not sufficient to say that testimony is not true. It is our business to find out how it came to be such as it is. After testing our hypotheses, they should not be abandoned until conclusively refuted. There is no practice more wasteful than that of abandoning any hypothesis once taken up, until it becomes evident that it is quite untenable. A hypothesis being accepted on probation, the process of testing it should consist in examining such of the consequences of the hypothesis as will be capable of direct verification rather than in examining the facts to see how well they accord with the hypothesis. Mr. Pierce illustrated his propositions by a number of false hypotheses, which he took from the published lives of Aristotle and Pythagoras.

Henry F. Osborn, Professor of Biology in Columbia University, presented a paper on "Dolichocephaly and Brachychephaly as the Dominant Factors in Cranial Evolution." Prof. Osborn announced that after studying the fossils of the rhinoceros found in this country and abroad, he found the grouping of the rhinoceros fossils to be largely false, and reached the conclusion that the length of limb and the proportions of skull of the fossilized rhinoceros were correlated. His recent study on American fossils led him to apply this principle, and he found it exceedingly useful in studying any heterogeneous group, the inter-relationship of which is not at once entirely clear. His deductions were that there was but very little doubt that the first step in the production of long skulls is connected with the elongation of the limbs and feet, which is caused by the moving about of the animal over a large extent of country in search of food. Then the lengthening of the skull follows, especially in grazing animals, by reason of the necessity of bringing the front teeth nearer to the ground. His conclusion was that it might be laid down as a fundamental principle, unless there be some compensating cause producing a different outcome, that, giving these conditions, the result as announced by him would always be brought about. Prof. Osborn also presented brief papers on the "Cranial Evolution of Titanotherium, II," and on "Latent and Potential Homology," which were the results of his recent studies in vertebrate paleontology.

"Observations on Tungsten" was the title of a paper by Edgar F. Smith, of the University of Pennsylvania, who has undertaken a careful study of the various tungsten-bearing minerals for the purpose of ascertaining precisely to what extent hitherto unobserved quantities of iron, manganese, vanadium and phosphorus are compounds of these minerals, as he believes that the various determinations of the atomic value of that element is due to the errors caused by failure to determine these unobserved elements in the minerals. His paper was largely of the nature of a preliminary announcement.

Dr. Horatio C. Wood, Jr., of the Medical Department of the University of Pennsylvania, read a paper on the "Vaso-Motor Supply of the Lungs." He said that while it had long been known that the general blood vessels of the body were controlled by nervous mechanism, still this had not been shown to be true of the blood vessels of the lungs, and this proposition he sought to establish, contending that the blood vessels of the lungs were in fact supplied with vaso-motor nerves, and that these were affected by the administration of drugs in a manner different to that in which any other blood vessels of the human body were affected. Dr. Wood expressed the opinion that the discovery regarding the vaso-motor nerves of the lungs would have a considerable value in practical medicine, and might influence particularly the treatment of pneumonia, a disease that temporarily affects the caliber of the blood vessels, which condition might be counteracted by the use of certain drugs.

Prof. Samuel L. Penfield, of the Sheffield Scientific School of Yale University, presented a paper "On the Use of Stereographic Projection in Making Accurate Maps; with Criticism of Some Recent Methods of Map Projection," which he illustrated with a series of photographs reflected upon a screen. He contended that for accuracy and ease of geographical and geodetic measurements it afforded very great advantage over the polyconic method and Mercator's projection. Known to scientists hundreds of years ago, the wonder was that the stereographic method had fallen into disuse. In its principles it was absolutely exact, and for the navigator made it possible to save considerable distances in laying a course, as compared with the ordinary marine charts. In all flat projection there must, of course, be greater or less distortion of dimensions and outlines; but the distortion under the stereographic system was insignificant in contrast with that under the system that prevailed in most modern atlases, where arbitrary circles instead of the true great circles of the earth were employed as parallels.

In addition to the foregoing, George F. Becker, of the United States Geological Survey, presented papers entitled "Note on Linear Force Exerted by Growing Crystals," and "Note on the Organic Theory of Tilted Blocks," but, as he was not present, his papers were read simply by title.

A joint paper by S. Weir Mitchell, the celebrated neurologist, and Simon Flexner, of the medical school of the University of Pennsylvania, bearing the title "Snake Venom in Relation to Hæmolysis, Bacteriolysis and Toxicity," as well as a paper "On the Nature of Double Halides," by Ira Remsen, of the Johns Hopkins University, and one "On the Pseudo-catalytic Action of Concentrated Drugs," by James M. Crafts, of the Massachusetts Institute of Technology, were presented by title only, or with a brief statement of their contents by the authors.

Two biographical memoirs of deceased members were presented before the Academy. The first of these was a memoir of Frederick Augustus Genth, by George F. Barker. Prof. Genth came to the United States as a young man, and after filling various professional chairs, was ultimately called to the charge of the Chemical Laboratory in the University of Pennsylvania. His skill in chemical analysis gained for him a high reputation, and he was analyst for several State geological surveys, acquiring a very high reputation as an expert in the domain of mineral chemistry.

The second biographical memoir presented was one on Gen. John Newton, by Cyrus B. Comstock. Gen. Newton was a distinguished army engineer, and held high rank during the civil war, commanding a corps at Gettysburg and in the later Virginia campaigns. He became chief of engineers, and during his administration had charge of the explosions at Hell Gate. Subsequent to his retirement, New York city became his home.

The social features of the meeting included a reception by Provost Harrison and Mrs. Harrison, of the University of Pennsylvania, at the Free Museum of Science and Arts, and a dinner given at the Hotel Bellevue, by Dr. S. Weir Mitchell, at which more than thirty of the members were present.

The meeting was remarkably well attended, nearly half the members of the Academy being present at the sessions, which were adjourned at the conclusion of the reading of the papers on Thursday.

The next stated meeting of the Academy will take place in Washington, in April, 1902.

## DR. STEIN'S TRAVELS IN CHINESE TURKESTAN.

Dr. M. A. Stein, the well-known explorer who recently returned from Chinese Turkestan and his researches among the buried cities of Asia, has discovered much valuable unknown information regarding the culture and daily life of those cities which for two thousand years have been immersed in the sand, and about the history of which comparatively nothing is known. The expedition was productive in the discovery of a large quantity of sculpture, fresco paintings, objects of industrial art, seals and so forth, dug out of the buried temples and houses, which afford a valuable link in the history of ancient China, India, and the West. A very comprehensive idea has also been gained regarding the extent of the advancement of the Turkestan desert. Some of the settlements excavated by Dr. Stein were found to be as much as 100 miles beyond the edge of the present cultivated area. From the results of his investigation the explorer opines that the inhabitants of these places were in possession of a culture mainly derived from India, and that they were Buddhists. The excavations prove that their culture was highly advanced, and that the art influence of Greece and Rome was felt even at that great distance from the classical centers. The most striking excavations were made in the heart of the desert north of Niya. There one settlement was exposed, covering with its scattered dwellings and shrines an area of about twenty-four square miles. Until digging began all that was visible were weird-looking rows of bleached timber pieces, projecting in various places like the framework of a wrecked ship from between the sand dunes.

The refuse-heaps which were unearthed near some ruined houses were specially interesting. These domiciles were apparently tenanted by village officials. The refuse heaps contained hundreds of documents, beautifully written on wooden tablets and carefully tied and sealed. Owing to the preservative nature of the sand, many of these were in splendid condition—the ink as black, and the seals and string as perfect, as if they were only a few weeks old. As these documents are in a known Indian script, their decipherment can be expected to reveal in a fascinating manner many of the details of the ancient village life. But it will be a task requiring years of close study, as in India itself the materials available of this early script have so far been very scanty.

Round most of the sand-buried houses were discovered carefully-planned little gardens, with avenues of trees, fenced lanes, orchards, and so forth. On clearing away the sand under the shriveled hedges were brought to light heaps of dried leaves, just as they had fallen in ages gone by. The gardens were much the same character as those found in Turkestan to-day. The trees were mostly poplars, peach, mulberry, and apricot. There is no evidence that these settlements were abandoned owing to any sudden catastrophe, but that their gradual desertion was due to the impossibility of continued irrigation, causing an advance of the sand.

## GERMAN PORT OF EMDEN.

Mr. Jackson, secretary of the embassy at Berlin, under date of September 25, 1901, reports that the new port of Emden has been opened. The Reichsanzeiger says that this port can accommodate the largest seagoing ships. The inner harbor has everywhere a depth of more than 6 meters (19.6 feet), while the depth of the outer harbor at mean high water is more than 11 meters (36 feet), so that it can accommodate ships drawing 8.2 meters (26.8 feet) at all times. The harbor will be kept open in winter, and the channel of the Ems from Emden to the sea is to be made 10 meters (32.8 feet) deep. Quays have been built in the outer harbor; electric cranes, coaling chutes, etc., have been provided. The outer harbor is a free harbor, and provision has been made for the loading and unloading of goods and for storage, with comparatively little supervision by the customs authorities.

As between pneumatic riveting and hand work, an English engineer says that with the former men drive 500 rivets per working day, while with the latter only 250 rivets can be driven, but the size of the rivets is not given.