carried on by aid of European collections. Four men were especial leaders in active search for minerals peculiar to American rocks. Dr. Archibald Bruce founded, in 1810, the *American Mineralogical Journal*, and described in it the first discoveries made in this country, and described by an American, namely, the *native magnesia* of Hoboken, and the *red zinc* oxide of Sussex Co., N.J. In 1805, Col. George Gibbs, of Rhode Island, brought back with him from Europe the most valuable collection of minerals ever brought to this country. He then devoted his great wealth to extensive journeys and unselfish research to unfold the resources of his native land, generously aiding others in the same direction. Another was Prof. Parker Cleaveland whose treatise on Mineralogy and Geology (1816) met a pressing need, felt by all classes of students, for a distinctly American text book. The fourth name was that of Prof. Benj. Silliman who raised the funds to purchase the splendid cabinet of Col. Gibbs, which has probably done more to stimulate research and create an interest in mineralogy than any other one agency. This was added to minor collections previously made in his travels in this country and in Europe. Silliman also established in 1818, the *American Journal of Science*, to which he furnished many original contributions. For more than fifty years he was a professor in Yale College; and when he resigned he was happy in having Prof. J. D. Dana as his successor, who had already made himself eminent as a mineralogist.

Prof. Brush traced the results of the work done by these pioneers whose individual enthusiasm really upheld the science, to which they were devoted, during the first twenty-five years of this century. Besides the four men to whom pre-eminence was given, others were named, whose long journeys on horseback, by canal boats, and in other primitive ways in the intereste of science, were such as to command our admiration. The public mind at length caught their enthusiasm, and government came to the aid of science. The first State Geological Survey was made by North Carolina, in 1824; the example was followed in 1830, by Massachusetts, and then by other States, until now the whole territory of the United States and Canada either has been or is being surveyed. It cannot be attempted, however, to follow the admirable sketch of work now being done by living mineralogists, nor to reproduce the highly suggestive remarks on the relation of this science to chemistry and kindred sciences. Evidently a broader foundation is now needed for it than in earlier days, and there must be co-operation between special investigators. There is an inter-dependence between mineralogy, geology, chemistry, and physics, such as warrants the continued existence of an association that shall make sure that every new fact and law observed shall be used for the common advancement of all the sciences.

The Vice-Presidents of the several Sections opened work in their respective rooms by addresses. In Section A, (Astronomy and Mathematics) the subject of the opening address by Mr. Harkness was "The Transit of Venus." In Section B (Physics), Prof. Meddenhall spoke on "Methods of Teaching Physical Laws." In Section C (Chemistry), the address by Dr. H. C. Bolton reviewed the history of chemical literature. In Section D (Mechanical Science), Prof. Trowbridge spoke on the "Importance of Experimental Research" in this era of applied science. Prof. E. T. Cox laid before Section E (Geography and Geology) some results of his observations along the Pacific slope. Prof. W. H. Dall reviewed the progress of American conchology, in Section F (Biology). Section H (Anthropology) was opened by an address by Prof. Daniel Wilson, read by Prof. Otis T. Mason, on the "Physical Characteristics of Native Tribes of Canada." Section I—a new section of economic Science and Statistics—was opened by an address by Mr. Elliott, chiefly devoted to explaining the special scope and province of Economic Science. All these addresses were of a most interesting character.

It would be gratifying to give a full account of all the papers read in the various sections from day to day; but, considering that there were about 250 of them in all, it cannot be expected that they should even be given in a condensed form. The very list of titles is formidable to the eye and one wonders how even the devotees of science can be induced to listen to so much learning in the sultry days of August. The attendance, however, was good in every room, from first to last, and the interest did not seem to flag.

Recognizing the fact that another might mention other articles of equal merit with those that attracted the writer's notice, I may mention a few of the noteworthy contributions, without specifying in each case the section before which it was laid.

An important paper was read in the section of Mechanical Science, by Mr. Joseph L'Etoile, of Ottawa, on "Atmospheric Currents, Electricity, and Gases, as related to Practical Aerial Navigation by Balloons." He held that such navigation of the air is perfectly feasible, but that many improvements in balloons are needed as to their form and general construction; some of these he pointed out. He proposed that the balloon should take the shape of a fish, and be provided with a propeller, a rudder, an air compartment, gas and air pumps, electric battery, electric motor, safety valve, ropes and ballast. Each improvement was particularly described, and it was shown that the balloonist might have a vehicle as safe and controllable as any other machine, with certain advantages of a remarkable nature.

Prof. W. A. Rodgers offered a communication concerning the problem of "Fine Rulings, with reference to the Limit of Naked Eye Visibility and Microscopic Resolution." The finest lines ever reached are those of Nobert's bands, namely, 113,000 to the inch. No one has been able to go with certainty beyond this limit, although Mr. Fasoldt, of Albany, claims to have ruled one million lines to the inch. Conceding this to have been done, it is not conclusive as to their visibility. In the discussion that followed it was shown that when ruled lines are filled with graphite and the surface covered with a film of moisture, they become for a moment easily visible, even though their width is but one hundred-thousandth part of an inch.

Prof. C. A. Young gave a description of the new twenty-three inch equatorial recently erected in the Halsted Observatory, at Princeton, N. J., and which is regarded as the most nearly perfect telescope in this country, if not in the world.

A singular discussion arose in consequence of a paper read by Prof. De Volson Wood, of Hoboken, on "A Correction in Newton's "Principia" in regard to the Time of the Approach of the Two Spheres." Newton says that if two spheres of the same material as the earth, and each one foot in diameter, be placed $12\frac{1}{4}$ inches from each other between their centers, in void space, they will be a month's time in coming together by their mutual attractions; whereas the experiments of Prof. Wood showed the time required to be less than $5\frac{1}{2}$ minutes. Dr. Haughton at once challenged the quotation, saying that it was incredible that so accurate a writer as Sir Isaac Newton should have fallen into such an error. A spirited discussion followed, that led to the production of the Jesuits' edition of the famous Principia, with numerous foot-notes. Dr. Haughton claimed that the second volume, from which Prof. Wood had quoted, while a great literary curiosity, was not genuine, because it referred to matters that were unknown in Newton's time. Prof. Wood, in defense, asserted that the error he had corrected was found also in the larger edition of Newton's works, page 527, in his "Treatise of the System of the World," and he took it for granted that it was genuine.

Dr. Haughton read a paper on Darwin's Theory of the Evolution of the Earth-Moon System, in its Bearing on the Duration of Geological Time." Concurring in Darwin's published calculations, he differed from his physical conceptions. The eighteenth century astronomers believed in the perpetual motion of the planetary system, but now we know that perpetual motion is as impossible among planetary bodies as it is at the surface of the earth. It used to be held that the planets passed through a liquid to a solid condition, and that the earth now consists of a solid crust resting on a fluid mass. But Sir Wm. Thomson has proved that the present condition of the earth, as a whole, is more rigid than glass or steel. From the most probable hypothesis as to the rings of Saturn being composed of discrete meteoric stones; from the low specific gravity of Jupiter and other outer planets; from recent researches as to meteoric showers and comets; and from investigations into the true nature of asteroids, as well as from other considerations, it is probable that when the earth and moon separated from the solar nebula, they did so as a swarm of solid meteoric stones, each having the temperature of interstellar space, *i. e.*, about 460° F. below the freezing point of water. The earth and moon were pushed apart by tidal friction; and the algebraic calculations by which this may be proved fit equally well the hypothesis of a viscous earth or that of a rigid earth with a liquid ocean. Sir William Hamilton's theory, that one hundred million years ago the earth was as hot as melted steel, differs greatly from Dr. Haughton's theory that its component particles were intensely cold, and that volcanoes were but as pustules on the surface. His paper was discussed by Profs. Chase, Young and others, eliciting much interest.

Dr. George F. Barker's observations on secondary batteries, in which he directed attention to the cheapest possible method