As a public official in the Perth Royal Asylum, his bearing and administration were admirable; nor were his relations in private life less worthy of esteem. He placed the institution on a sound basis financially, in his early years, and reorganised every department; while in his later years of office he greatly improved and beautified the internal arrangements of the various wards, and he did so with uncommon ingenuity and taste. Shrewd and acute to an extraordinary degree, he proved himself a most accomplished alienist-physician, kind and considerate to his patients, skilful in promoting their comfort and recovery, and an apt organiser of all the events that constantly take place in such institutions. His thorough medical training, and his natural penetration, made him always a safe and prudent adviser.

Originally of a slight build, his intense application to work caused his health to give way after his marriage in 1859, and even the improvement gained by the year's relief in 1861–62 gradually wore off on the active resumption of literary and official engagements. Indeed, for years before his death he was an invalid. Yet he bravely did his duty to the last, and kept a cheerful word for every one—even while he doubted if his strength would enable him to conclude his visit. Probably for the same reason he avoided society, solacing himself rather with his books and microscope. His health unfortunately showed no sign of improvement, and he had hardly been a year out of office when he succumbed to the increasing exhaustion on the 28th November 1880, at the comparatively early age of fifty-one. Much of the work his ardent mind sketched out for himself he left undone; but he achieved enough to win a solid reputation, and to furnish a worthy example of what ability and application can do under difficulties.

Professor Benjamin Peirce. By Professor Simon Newcomb.

Professor Peirce was born at Salem, Massachusetts, April 4, 1809, and graduated at Harvard College in 1829. He made the acquaintance of Dr Nathaniel Bowditch, the translator of the *Mécanique Céleste*, and assisted him in getting his great work through the press. He spent two years after his graduation in teaching. He was appointed tutor in mathematics at Harvard

College in 1831, and professor in 1833. During the few years following he published a series of mathematical books covering the course then taught at the college from Algebra to Differential Equations. His elementary books were remarkable for their condensation. In the geometry, especially the short and terse and comprehensive forms of mathematical thought and expression, natural to the mathematician, were substituted for the minute demonstrations of Euclid. Free use was also made of infinitesimals. The volumes of geometry and the infinitesimal calculus were published under the title of *Curves*, *Functions*, and *Forces*. The subject of Forces, which was intended to cover mechanics, was, however, dropped from the series. The concluding portion of the second volume is devoted to the Differential Calculus, and is noteworthy for the brevity and conciseness of style, and the free use of operative symbols.

After the death of Bowditch in 1838, Peirce stood at the head of mathematical science in his country, as the leading one of the very few who had access to foreign journals. About 1842 he commenced, in connection with Professor Lovering, the publication of a serial under the title of the *Cambridge Miscellany of Mathematics* and *Physics*, of which, however, only a few numbers appeared. He took an active part in the foundation of the Harvard Observatory, the occasion being afforded by the great comet of 1843. The work which first extended Peirce's reputation, was his computation of the general perturbations of Uranus and Neptune. The formulæ to which he was led were published in the first volume of the *Proceedings of the American Academy*, but were accompanied by no description of his process. Subsequent investigations, however, showed them to have been remarkably accurate. In his views of the discrepancy between the mean distance of Neptune as predicted by Leverrier, and as deduced from observation, he was less fortunate, although, when due consideration is given to Leverrier's conclusions, there was much plausibility in the position taken by Peirce. As the subject has frequently been discussed without a due comprehension of all the circumstances, a brief review of them may be appropriate.

Leverrier, from his researches, found for the mean distance of the disturbing planet 36·1539, and a consequent period of 217 years.

He also announced that the limits of the mean distance which would satisfy the observed perturbations of Uranus were 35·04 and 37·90. He founded this conclusion on a supposed inadmissible increase of the outstanding differences between theory and observation, as the mean distance was diminished below 35. But when the planet was discovered its mean distance was found to be only 30; and yet the observations of Uranus were as well satisfied as by Leverrier's hypothetical planet. It was, therefore, an expression of Peirce's high confidence in the accuracy of Leverrier's conclusions that led him to announce that there were two solutions to the problem; the one being that found by Leverrier, and the other that corresponding to the actual case. He also sought to show a cause for the two solutions in a supposed discontinuity in the form of the perturbations, when the period was brought to the point at which five revolutions of Uranus would be equal to two of Neptune. As a matter of fact, however, it has been shown by Professor Adams that there was no such discontinuity in the actual perturbations during the limited period; from which it would follow that Leverrier must have made a mistake in tracing out the conclusions which would follow when the mean distance of the disturbing planet was diminished.

In 1849 the preparation of the *American Ephemeris and Nautical Almanac* was commenced at Cambridge, by Lieutenant C. H. Davis, and Peirce, in the capacity of consulting astronomer, took an active part in planning the work. It being especially desired that accurate tables should be employed in the new *Ephemeris*, Peirce made use of Airy's reduction of the Greenwich lunar observations, then recently published, to prepare new tables of the moon. He prepared the formula and plans for the table which were executed in the office of the *Ephemeris*. *Gould's Astronomical Journal* was commenced at this time, and Peirce contributed a number of short papers, the most important of which related to the theory of Saturn's rings. The suspicion had been expressed by Bond and others, that temporary divisions took place in the rings from time to time, thus showing that they could not be solid. Peirce showed that the equilibrium of a fluid ring was necessarily unstable, as well as that of a solid one, and therefore suggested that the equilibrium was preserved by the attraction of the satellites. The research, however, was

left in an unfinished state, but taken up some twelve years later in the first volume of the *Memoirs of the National Academy of Sciences.*

Among all of Peirce's contributions to science, that which he himself seemed to value most highly was his *Linear Associative Algebra,* which, however, was only published by lithographing and privately distributing a few copies. It essayed a general theory of the multiplication of units of different classes, subject to the law of association and distribution, but not of commutation.

In 1867 he was appointed Superintendent of the Coast Survey, to succeed Professor Bache; but finding administrative duties little to his taste, he resigned in 1874.

During the last few years of his life a tendency towards speculation, partly of a philosophic and partly of a cosmological character, which he had exhibited during most of his life, showed itself yet more strongly. He delivered before the Lowell Institute a course of lectures on Ideality in Science which have been published in book form, and afford an interesting view of the speculative operations of his mind.

The influence exercised by Peirce on the progress of mathematical science in his own country, is at least equal in importance with his scientific work. He was an ardent and enthusiastic friend, ever ready to encourage younger men and promote their work. He had an especial fondness for seeking out comparatively unknown men whose ability had been overlooked. As a teacher, he was very generally considered a failure. The general view he took was that it was useless for any one to study mathematics without a special aptitude for them; he therefore gave inapt pupils no encouragement, and made no attempt to bring his instruction within their comprehension. His extreme generality and terseness of expression, and his fondness for brevity of notation, sometimes made it difficult even for an expert to follow him; while a certain imaginative and poetic vein, in which his fundamental principles are laid down, was unsuited to most minds. The most characteristic as well as the most extensive of his works is his *System of Analytic Mechanics.* The exposition of dynamical concepts in the first forty pages is pleasant reading for one already acquainted with the subject, but that a student beginning the subject could understand it without a clearer distinction between definitions, axioms, and theorems seems hardly possible.

The President announced that the Council had awarded the Keith Prize, for the Biennial Period 1879–81, to Professor Chrystal, for his paper "On the Differential Telephone," published in the Society's *Transactions* for the Session 1879–80; and the Neill Prize, for the Triennial Period 1877–80, to Mr. John Murray, for his paper "On the Structure and Origin of Coral Reefs and Islands," communicated to the Society on 5th April 1880, and printed (in Abstract) in the *Proceedings* for that date.

The President read a letter from M. Dumas, perpetual Secretary of the Academy of Sciences, Paris, inviting the Fellows of the Society to subscribe to a Fund to be formed, in order to present to M. Pasteur a Medal, commemorative of his work and services. Professor Tait announced that the Council had replied to M. Dumas' letter, informing him that the Society has no funds which can be devoted to such a purpose, but that an opportunity would be given to individual Fellows of subscribing to the Medal to be offered to M. Pasteur.

The following Communications were read:—

1. On Mirage. Part II. By Professor Tait.

2. Report of the Boulder Committee, with Remarks by the Convener, Mr. Milne Home. (Plate V.)

The Convener being now no longer able to climb hills, or walk to any considerable distance, his own contribution of information to the Committee is, this year, exceedingly small.

I. Cantire.—Loch Tarbert.

The only place visited by him during last autumn was East Loch Tarbert, Loch Fyne, at the suggestion of Mr. Alexander of Lochgilphead, whose services to the Convener during the two previous years were peculiarly valuable.

Having procured a horse, the Convener, under Mr. Alexander's guidance, rode up two-thirds of a hill, about two miles to the N.W. of East Loch Tarbert, on the property of Mr. Campbell of