

since been reestablished by Wolf, who, after prolonged attention to the subject, proved the spot-period to be a little over 11 years. In 1837 the Trigonometrical and Topographical Survey of Norway was commenced, and Hansteen was placed at the head.

In 1856, when he had completed his 50th year as a teacher of Science, his jubilee was celebrated, and a medal struck in commemoration of it.

In the year 1861 he retired from active work. His great work was translated into German soon after its publication; and he also made various contributions in that language to Schweigger's 'Journal,' to Pogendorff's 'Annalen,' and to the 'Astronomischen Nachrichten.'

He published some valuable contributions to Meteorology and Astronomy.

He was a member of the American Academy of Arts and Sciences, of the Academies of Paris, Berlin, and St. Petersburg, and a foreign member of the Royal Society.

His death took place on the 11th of April, 1873.

CHARLES EUGÈNE DELAUNAY was born at Lusigny, in the Department of the Aube, in the year 1816. He studied at the École Polytechnique, of which school he became a distinguished pupil. In the year 1836 he joined the École des Mines. While there he wrote several reports on the Coal-seams of the Valley of St. Etienne and Creusot, as well as on the principal iron and steel works of France, which were remarkable for clearness of thought and skill in theoretical speculations; and he was still a pupil in the School when a proposal was made by his former masters at the École Polytechnique that he should be appointed as Teacher of Geodesy in their school. There were difficulties in the way of this; but the anxiety to obtain the benefit of the talents of young Delaunay was so great that the Council of the school, at the head of which was M. Cordier, gave their sanction to the arrangement, and Delaunay was appointed. He subsequently became a Professor in the École Polytechnique, and later on also in the École des Mines. From the year 1845 to 1850, Delaunay held a Professorship in that section of the École des Mines which was specially devoted to the instruction of Engineers, whether attached to the Corps des Mines or those connected with the mining industry of France. He had classes for descriptive Geometry, Stereotomy, Machine drawing, Analytical Mechanics, and Elementary Physics, and his teaching is said to have been most successful. In 1850 Delaunay attached himself exclusively to the École des Mines. He was appointed to successive grades in the Corps des Mines, and became Engineer in Chief in 1858. In 1867 he was raised to the first class of his rank.

His first memoir, "Sur la Distinction des Maxima et des Minima dans les questions qui dépendent de la Méthode des Variations," was published in 1841. Other important works followed it, on the Theory of

the Precession of the Equinoxes, Theory of the Motion of the Moon, elementary treatises on Astronomy and Mechanics, and many miscellaneous papers in the 'Comptes Rendus,' 'Connaissance des Temps,' and in the Journal of the *École Polytechnique*. He was also the author of some excellent elementary books on astronomy and mechanics. Soon, however, his attention became engaged by astronomical questions, and before long he was entirely absorbed by them. He published an important treatise on the Theory of the Tides, and about the same time the question of the Lunar Theory began to occupy him.

His greatest work, '*La Théorie de la Lune*' (the first part of which occupied him fourteen years), was published in 1860 as an entire volume of '*Mémoires*' of the *Académie des Sciences*. It made his name famous among astronomers. In 1862 the Royal Astronomical Society of London elected him one of their Associates; and in February 1870 Professor J. C. Adams presented to him, in the name of the President, the Gold Medal of the Society, in acknowledgment of the high opinion of his work entertained by English astronomers.

During the same time he published a number of papers relating to the theory, one in particular on the secular acceleration of the mean motion of the moon, which was then a subject of much controversy.

The second volume of his '*Théorie*' appeared in 1867. The preparation of the Lunar Tables necessary for the completion of the work was undertaken by the Bureau des Longitudes, under the direction of Delaunay. A government grant of funds was obtained for the purpose, and the tables were in course of preparation at the time of his death. It was uncertain whether the calculations were sufficiently advanced to be carried on without him; but M. Puiseau, Member of the Bureau des Longitudes, says, "Quoique l'auteur ne soit plus là pour y mettre la dernière main, il ne sera sans doute pas impossible de terminer ce monument scientifique. Espérons pour la gloire de l'astronomie française que ce service sera rendu à la science, que ce suprême hommage ne manquera pas à notre illustre confrère."

In the year 1854, when the administration of the observatory of Paris was separated from that of the Bureau des Longitudes, several of the members of its staff retired to a house in the Rue Notre Dame des Champs, where they established a small observatory. Delaunay occupied an apartment in the same house, and there he formed a life-long friendship with Mathieu and Laugier. It was there that he worked out most of his researches, seldom going out except to give his lessons at the *École des Mines* or the *Sorbonne*. He often began work as early as five in the morning, and invariably continued until late in the evening. From this tranquil life he was called away in 1870 by the Emperor Napoleon the Third to succeed M. Leverrier as Director of the Paris Observatory. Many alterations and improvements had taken place in the Observatory since the death of Arago, and Delaunay soon became

convinced of their importance. But he had not long been installed in his new office when the terrible war between France and Germany broke out; and his whole time and attention were soon absorbed in the preservation of the observatory from the effects of a bombardment. All the delicate instruments were dismantled and stowed away and the observations suspended. On the restoration of peace the observatory was soon restored to order and the observations were resumed.

Feeling the great want of public and private observatories in France, Delaunay, in conjunction with Leverrier, made an application to the government for the establishment of a certain number of geodetical and astronomical stations in different places. The observatories were to be established according to plans arranged by Delaunay and the Bureau des Longitudes.

To Delaunay is owing the independence of the Observatory of Marseilles, which had hitherto been in connexion with the Paris Observatory, also the foundation of one at Toulouse and the plan for one at Besançon. His energies were devoted to making the Observatory of Paris the great centre of astronomy in France. Shortly before his death he remarked, "We are going to do many things. The Observatory intends to devote all its energies to the reobservation of Lalande's Catalogue, to continue the ecliptic star-charts commenced by Chacornac, to observations of double stars; and, finally, we are making preparations for new determinations of the longitude of Brest, Greenwich, and Neufchâtel."

He continued his observations of the minor planets during the second half of the lunation with great success, excepting during the siege.

Delaunay lost his wife a few years after his marriage. He has left one son, who is guardian of the Forests of Vitry le Français. His aged mother, to whom he had been a most devoted son, survived him.

It remains only to relate the painful circumstance of his death. On Tuesday, July 30th, 1872, he left Paris in company with his cousin M. Millot, Controller of the Post, for a few days holiday. On the following Sunday he wrote from Bayeux that he intended spending a few days at Cherbourg, and should return to Paris on the following Thursday. On the Tuesday following a telegram was received in Paris announcing that he and his cousin and two boatmen had been drowned by the upsetting of a pleasure-boat in the roadstead of Cherbourg. It is a singular fact that both his father and brother perished by drowning.

Delaunay was a member of the Académie des Sciences of the Institute of France, and towards the close of his life had occupied the Chair. He was a Doctor of Science, a member of several learned societies, and was elected a foreign member of the Royal Society in 1869.