century, has been presented to the University of Cambridge, as the best means of rendering it subservient to the advancement of mineralogical science.

M. Augustin Cauchy* had the good fortune to belong to that middle class of society which is neither exposed to the miseries of poverty nor to the temptations of wealth. His father was Archiviste-Secrétaire of the Sénat Conservateur from about 1800 or 1801, and of the Chamber of Peers from 1814 to 1830. Of two brothers, both younger than himself, one became an ornament to the highest court of justice, to which he was promoted, and the other succeeded his father as Secrétaire-Archiviste to the Chamber of Peers. Augustin Cauchy was born on the 21st of August, 1789. His classical education commenced early under his father, and was continued afterwards by able teachers at the École centrale du Panthéon. He left this school in 1804, at the age of fifteen, carrying off the second prize for Latin composition, and the first for Greek and Latin verse. This success procured for him the wreath given to the best classic among the pupils of the École centrale. After having attended for one year only the public mathematical lectures of an excellent Professor, Dinet, Cauchy felt himself qualified to enter the examination of candidates for admission to the École Polytechnique. He was admitted, being second on the list, in 1805, at the age of sixteen years; and at the end of the two years' course, he came out third in 1807. On quitting the school he adopted the career of the Ponts et Chaussées, in which he passed rapidly through the inferior grades, was employed in many works, and became ingénieur en chef in 1825.

On the 6th of May, 1811, at the age of twenty-two years, he presented to the mathematical class of the Institute, a very remarkable memoir on the polyhedron of geometry, and completed the theory of a new kind of regular polyhedrons discovered by M. Poinsot. Legendre, a most austere judge, regarded this memoir as the production of well-exercised powers which promised in due time the highest success. He urged the young author to follow out these researches, and to endeavour to establish a certain theo-

* This notice is extracted principally from the Letter of M. Biot to M. de Falloux.

rem not previously demonstrated. Cauchy obtained it in 1812. Legendre reported on it to the Academy with an enthusiasm very foreign to his character. "We only intended," he said, "to give an idea of this demonstration, and have extracted almost the whole of it. We have thus furnished a new proof of the sagacity with which this young geometer has succeeded in conquering a difficulty which had arrested the progress of the masters of the art, and which it was of importance to solve in order to complete the theory of the solid bodies." These first two memoirs of Cauchy seemed to foretell a peculiar and exclusive aptitude for pure geometry; but it was soon discovered that his genius had a much wider range. In the years 1813 and 1814 he produced two remarkable analytical memoirs, and in 1815 he presented a memoir on the theory of numbers, in which he proved and extended a theorem enunciated by Fermat, a theorem some particular cases of which only had been established by the most able writers in that department of mathematical science, Legendre and Gauss. He published an elegant theorem on the number of values which a function can assume, when the letters which it contains are interchanged. Twenty years later, this theorem enabled the celebrated Abel to prove the impossibility of solving algebraic equations of the fifth or higher degrees. In the same year, the Academy proposed, as the subject of the great mathematical prize, the investigation of the theory of the propagation of waves on the surface of a heavy fluid of indefinite depth. Cauchy gave a complete solution of the problem. His memoir, which obtained the prize in 1816, has for its motto the line of Virgil—

"Nôsse quot Ionii veniant ad littora fluctus."—Georg. ii.

A peculiarly happy quotation, as the line may be said to contain a striking enunciation of the problem proposed.

This fertility in a young man of seven-and-twenty would have secured for him the first place which became vacant in the Mathematical Section of the Institute. He was admitted into it under circumstances much to be regretted. After the short crisis of a hundred days, a royal ordinance, dated March 21, 1816, re-established the old Academies under their original names,—the Academy of France, of Sciences, of Inscriptions and Belles Lettres, of the

Fine Arts,—and also appointed the members of the restored Academies. In the Academy of Sciences, two celebrated names, those of Carnot and Monge, were replaced by two new names, Breguet and Cauchy. The opinion of men of science was indulgent towards Breguet, but severe towards Cauchy.

Towards the end of 1815 he was appointed Assistant-Professor of Analysis at the École Polytechnique; he became titular Professor in 1816. It was impossible for any man to be more zealous than Cauchy in discharging the duties imposed upon him. Appointed to teach, he turned all his thoughts to the art of teaching. Between 1816 and 1826 he published his Course of Algebraic Analysis, of Differential Calculus, of the application of Infinitesimal Analysis to the Theory of Curves; three excellent works, well arranged, proceeding by vigorous demonstrations and rich in new details, leaving nothing to be desired except perhaps a little condescension in explaining the abstractions of analysis by geometrical considerations. In the same interval he published a memoir on integrals taken between imaginary limits, which has been the foundation of important investigations for many of our young geometers. But even this was not sufficient for his indefatigable ardour; he undertook and commenced publishing, in 1826, a kind of periodical review of his own, entitled 'Exercices Mathématiques,' in which every department of mathematics, the most elementary as well as the highest, was handled with so much generality, fertility and inventive power, that on reading this publication, Abel, one of the most profound analysts of our times, wrote to one of his friends, "Cauchy is, of all others, the geometer who best understands how mathematics ought to be studied." In fact, the discoveries of methods and the sketches of new views, scattered through these 'Exercises,' have been not only to the author, but also to many other geometers, the fertile initiative of brilliant researches. Cauchy continued the nurture and publication of this mathematical treasury up to the time of his death.

The calm flow of his existence was unexpectedly disturbed by the Revolution of 1830. At this epoch he was married and the father of two daughters. He had allied himself with an honourable family, whose social position, tastes and sentiments were in harmony with his own. Besides his Professorship at the École Polytechnique, he

filled a chair in the Faculté des Sciences de Paris, and was Assistant-Professor of Mathematics applied to Physics, at the Collége de France. The new government thought proper to establish its title to power *de facto* by an oath of allegiance imposed upon all public functionaries, even on those who had no duty beyond that of teaching the mathematical and physical sciences. Cauchy took refuge in Switzerland in order to preserve his loyalty to Charles X. unimpeached. The presence of so distinguished a geometer in the country of the Bernoullis and of Euler could not remain long concealed. The king of Sardinia, informed of his voluntary exile, created for him a chair of mathematics at Turin, the duties of which Cauchy discharged with *éclat*, pursuing at the same time his other researches. Thus France lost one of her most illustrious geometers, and one of the most able of her Professors. In 1832 Cauchy was elected a Foreign Member of the Royal Society. In the same year he was invited to Prague by Charles X., to take a part in the education of the Count de Chambord. He sent for his wife and two daughters, and with them followed the princes to Goritz; and during the six years devoted to this honourable employment found leisure to write a multitude of valuable memoirs on various parts of mathematics, which, scattered throughout Germany, are not easy to obtain. He took leave of his pupil in 1837, returned to France, and resumed his place in the Institute, which, contrary to rule, had been left vacant,—protected by the admiration which the genius of its possessor inspired. From this period, his studies being no longer disturbed by the duty of teaching, his mathematical labours being never interrupted except when engaged in works of charity, Cauchy poured forth at the meetings of the Institute the inexhaustible abundance of his mathematical genius. During the last nineteen years of his life, he composed and published in the volumes of the Academy or in the 'Comptes Rendus,' more than 500 memoirs, besides a multitude of reports on memoirs presented by others. Of this immense mass of labour, many parts have a great value of their own; others present the initiative of ideas and of methods, which have been or will at a later time be fertile. All bear upon the highest departments of mathematics, the perfection and extension of pure analysis, the investigation and direct determination of the planetary movements and of their most complicated inequalities, the theory of the undulatory

movement of light, considered in its utmost generality. Unfortunately, this haste in production did not leave him patience to bring his works to maturity. Each new way that presented itself to his mind occupied him exclusively; and in order to follow it he quitted that which he had begun to explore, even without taking time to see to what it would lead. For the sake of proceeding more rapidly, he almost always condensed his new researches in an unusual notation, which rendered them unintelligible to everybody but himself; and often he did not discover that these innovations only disguised under some strange form results already known.

In 1840 a place in the Bureau des Longitudes became vacant by the death of Poisson. The members of this body are renewed by election, subject to the approbation of the Chief of the State. Cauchy was unanimously elected, but declined to take the oath of allegiance to the government of Louis Philippe, consequently his election was not ratified. In 1843 Cauchy was commissioned by the Academy to verify the determination of an inequality of long period in the planetary motions. M. Leverrier announced the discovery, in the motion of the planet Pallas having a period of 795 years. Its maximum effect upon the longitude of Pallas exceeds 15′, according to the calculations of M. Leverrier. For want of a direct analytical method, he had determined its amount by an extremely bold numerical interpolation which required an immense amount of calculation. In order to avoid the trouble of verifying it, Cauchy invented a direct analytical method, by which all inequalities of this kind can be determined in every case. He obtained the same coefficient as that found by M. Leverrier, and from that time, in problems of this kind, the power of abstract science replaced individual exertion. In 1848 Cauchy resumed the Mathematical Professorship in the Faculté des Sciences de Paris, the only one of his former posts which remained unoccupied. In 1851 Cauchy resigned this Professorship for the second time, but soon afterwards, the Minister of Public Instruction, M. Fortoul, easily obtained permission from the Emperor for Cauchy to resume his Chair unfettered by any condition or political test. He expressed his gratitude for this indulgence by devoting the whole of the income he received from the Faculté des Sciences to charitable purposes in the little Commune of Sceaux, where he resided. Once, when the

Maire, who was the dispenser of his charities, expressed some astonishment on seeing him so prodigal, he exclaimed, "Be not alarmed, it is the Emperor who pays."

Cauchy's determination of the number of real and imaginary roots of any algebraic equation; his rigorous method of calculating approximately the same roots; his new theory of the symmetric functions of the coefficients of equations of any degree whatsoever; his *à-priori* valuation of a quantity less than the least difference between the roots of an equation; his mathematical theory of light, and especially of dispersion; his *à-priori* determination, without any previous photometric observations, without any data besides two angles, of the quantity of light reflected at the surfaces of metals,—have placed him among the number of the truly creative minds, and have made him the illustrious chief of a new mathematical school, much superior in its aims to the school of Laplace his master, or that of his rival, Poisson.

A classical education had developed his natural aptitude for the study of languages. At Turin he lectured in Italian; at the age of fifty-three he learned Hebrew, that he might assist his father in some scriptural researches in which he was engaged.

In the sitting of the Institute on the 4th of May, 1857, M. Cauchy read a second memoir on the employment in astronomy of coefficient regulators, an employment which constitutes an artifice in analysis on which he founded the greatest hopes and which he classed among the happiest of his discoveries. He was present at the sitting of the 11th of May, but was suffering from a bad cold; his family and friends perceived with grief that he appeared much weakened, and that his features were changed. On Tuesday, the 12th of May, he repaired to his pleasant residence at Sceaux. He was unable to leave his room, yet nothing indicated his approaching end. He was continually occupied with the new developments in series, for which he was indebted to his *regulator*, and he completed the programme of his lectures at the Faculté des Sciences. On Thursday, the 21st of May, he conversed for some time with the Archbishop of Paris. His weakness increased on Friday, but he slept well that night; he awoke at three o'clock on Saturday morning, the 25th of May, in a state of great feebleness, and in about half an hour expired, apparently without pain.