Obituary Notices of deceased Fellows.

Henry James Brooke was born at Exeter on the 25th of May, 1771. His relations were engaged in the manufacture of broad-cloth. After having received an ordinary scholastic education, he studied for the bar, and had very nearly completed the usual period, when the prospect of advantageous connexions with the manufacturing firms in the west of England induced him to engage in the Spanish wool trade in London, for which object he spent nearly two years in Spain.

The precise habit of thought and expression which the active study of the law must necessarily induce, was perhaps mainly instrumental in imparting the tone of extreme precision by which all his subsequent acts and observations were characterized.

Soon after he took up his residence in London, in the year 1802, his attention was turned to the subjects of Mineralogy, Geology, and Botany; and to the two former of these sciences, then in their infancy, the greater portion of his leisure hours was devoted. He was elected a Fellow of the Geological Society in 1815, of the Linnean in 1818, and of the Royal Society in 1819. He served on the Council of the Royal Society in 1842–44.

Mr. Brooke was associated with the late Mr. Henry Hase, cashier of the Bank of England, and others in the establishment of the London Life Assurance Association, the commercial success of which bears ample testimony to the soundness of the principles on which it was established.

On the decline of the Spanish wool trade, which was superseded in a great measure by that with Germany, Mr. Brooke sought a commercial pursuit more congenial to his tastes, and devoted his energies to the establishment of companies to work the mines of South America; but in these undertakings the fairest prospects were blighted by an entire absence of good faith abroad, and failure was the inevitable result. After this period he accepted the office of secretary to the London Life Association, the duties of which he discharged for many years; and on his retirement, the appreciation of his services by the Society was evinced by the grant of a liberal annuity.

During a period of several years, his devotion to his favourite pursuits was much interfered with by the result of an accident:—he

was knocked down by a horse suddenly turning the corner of a road near his residence at Stockwell, and the fall produced a slight concussion of the brain; after which, for a considerable period, his accustomed mental efforts were followed by sleeplessness and other symptoms of undue cerebral excitement. During this period, finding absolute inaction extremely irksome, he sought pursuits which would occupy his hands, with less demand on the brain than those to which he had been devoted. He formed a large collection of shells, but feeling the pursuit to be objectless, if irrespective of the structure and functions of their living tenants, he abandoned it, and presented the collection to the University of Cambridge. Mr. Brooke then became a collector of engravings,—having in early life imbibed a taste for art, and exercised that of water-colour drawing. These he was so successful in cleaning and restoring, that when, having so far recovered as to resume his original pursuits, he disposed of his collection, the aggregate value was greatly augmented, notwithstanding the presentation of some specimens of rare excellence to the national collection in the British Museum.

Having been blessed to the last with an unusually perfect enjoyment of his faculties, his favourite studies were actively pursued until a very short period before his decease, which occurred from natural decay, accelerated by the depression of the system produced by a severe cold, on the 26th of June, 1857.

The 'Familiar Introduction to Crystallography,' the first systematic treatise on this branch of science, was published in 1823. In this, following the steps of Haüy, he referred the existing forms of crystals to an unnecessarily large number of *primary* forms; but the trigonometrical relations of the various existing plane surfaces of crystals were then first clearly traced out.

In the subsequent treatise on Crystallography published in the Encyclopædia Metropolitana, the former system was much simplified and the number of primary forms reduced to six, which, differing essentially from each other, correspond with the six systems generally adopted by continental crystallographers.

The discovery and description of thirteen new mineral species are due to Mr. Brooke's researches: to these may be added two others, the published descriptions of which were just anticipated, in point of time, by those of continental mineralogists. These notices will be

found in the pages of the Philosophical Magazine and Annals, and of the Edinburgh Philosophical Journal.

He was the first to make extensive use of the reflective goniometer in determining the forms of the crystals of artificial salts. The Annals of Philosophy for 1823 contain the determination of the forms of no less than fifty-five different laboratory crystals,—a work of much persevering labour. If only the chemical composition of these salts had been accurately known in England at the time, their measures would have served as a basis whereon to found the theory of Isomorphism.

The treatise on Mineralogy in the Encyclopædia Metropolitana was the first systematic work on the subject with which the name of Mr. Brooke is associated. This was originally intended to have been a very complete treatise, but repeated editorial remonstrances on account of want of space compelled our author to cut it down to little more than a mere catalogue of minerals, with a few of their more important chemical characters. The only complete treatise on Mineralogy with which his name is connected is the recent re-edition or rather reproduction of W. Phillips's treatise, in conjunction with Professor W. H. Miller, who took upon himself by far the greater portion of the labour incidental to publication.

It may be here remarked that Mr. Brooke entertained a strong impression of the desirableness of rendering the study of crystallography more attainable to many, whose minds are not so habituated to the abstractions of analysis as to contemplate a plane merely as the geometrical impersonation of $ax+by+cz=0$: this object he proposed to attain by means of a more direct reference of the existing planes of crystals to simple geometrical, or *primary*, forms than the last-mentioned treatise presents.

Mr. Brooke's latest efforts were directed to the general relations and geometrical similarity of all crystals belonging to the same system. A paper on this subject, read before the Royal Society, which was in the press at the time of his decease, contains a comparison of the forms of all known minerals belonging to the Rhombohedral and Pyramidal systems, and will probably be found to throw some new light on the theory of Isomorphism.

His unrivalled collection of minerals, comprising the choicest specimens that he could, with ample opportunities, collect during half a

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.

The Rev. WILLIAM DANIEL CONYBEARE, Dean of Llandaff, was born in London, 7th June, 1787, and died 12th August, 1857, aged 71. The family name has been for some time honourably connected with the Church of England. His father was Rector of St. Botolph, Bishopsgate.

Following at a short interval, in Oxford, the academical progress of his brother John Josias Conybeare, and his friend William Buckland, he speedily associated himself in their mineralogical and geological studies, contributed actively to the growth of the Oxford Museum, and assisted in the early labours of the Geological Society. He explored personally much of the country round Oxford, and examined the north of Ireland, the vicinity of Bath and Bristol, and the coasts of Dorset, Devon, and South Wales.

Organic remains attracted his attention in the early part of his career. In 1814 he presented to the Geological Society remarks on some singular impressions occurring in flint*; in 1821, he was associated with De la Beche in the discovery of a new fossil animal, forming a link between the Ichthyosaurus and the Crocodile†; and in 1824, completed this investigation on the almost perfect skeleton of the Plesiosaurus‡.

In these papers Conybeare opened a new and very fertile field of research, and cultivated it with success; manifesting so much knowledge of anatomy and the skeleton of reptiles, as to win from the great author of the 'Ossemens Fossiles' the free adoption of his conclusions, novel and startling as they appeared. Whoever will now read the admirable descriptions by Owen of this extinct reptile, or strive for himself to recompose from the ordinary fragments in museums its strange figure, will revere the early and successful labours of Conybeare, and comprehend in how high a degree they have helped forward the Palæontology of Britain.

From time to time the interest of the restorer of *Plesiosaurus dolichodeirus* was revived by the discovery of other species of the genus, so far as to give them a name, but he never again tasked his powerful mind on a systematic review of the subject:—satisfied, perhaps, with one long and steady gaze on these wonders of the earlier world, he resigned to other travellers the road which he had

* Geol. Trans. 1st Ser. ii. 328.

† Geol. Trans. 1st Ser. v. 559.

‡ Geol. Trans. 2nd Ser. i. 381.

opened to his own field of research. Always zealous in descriptive geology, he gave to the Geological Society in 1816 *, "Notices of the Sections presented by the Cliffs of Antrim and Derry," the fruit of a tour with Buckland, whom he also accompanied to Germany. In 1822 appeared the first volume of the 'Geology of England and Wales,' in which the names of W. Phillips and W. D. Conybeare occur together,—a most valuable work, of which the weightiest parts were contributed by Conybeare. Strange that thirty-five years elapsed in the life of the author, without drawing from his hand the second part of that capital work—not less remarkable the fact, that the deep respect of English geologists prevented any other hand from taking up the pen to complete the work he had begun so well. Among other contributions to his favourite science may be mentioned, Memoirs on the Hydrographical Basin of the Thames †,—on the Structure of the South Wales Coal Basin ‡,—on the Extent of Coal in the Midland Counties §,—and on the Great Landslip of Axminster ‖.

English geology, under all its aspects, was the familiar theme of his daily conversation; no one hailed with more delight the discoveries of Murchison and Sedgwick in Siluria and Wales; the work of Wood, and Buddle and Hutton in the Coal-fields of the North; the successful researches of Mantell in the Wealden, and of Webster and Lyell in less ancient deposits. Nor was he negligent of the great contemporary geologists of France and Germany,—Cuvier, De Beaumont, Bronn, Von Buch,—or of the cultivators of this science in other parts of Europe. Perhaps nowhere can be found, previous to 1832, so large and so liberal a review of the progress of Geology in the Old World and in the New, as in the still very valuable Report ¶ on the state and prospects of this science, which he read to the British Association assembled in Oxford. In that and in separate Essays ** he enters fully into the phenomena which bear most directly on theoretical speculations, and presents, among other data for reasoning, a large section of the crust of the earth from the northern extremity of Great Britain to Venice.

In examining some of the districts which he has described, he acted

* Geol. Trans. 1st Ser. ii. 196.
† Proc. Geol. Soc. i. 145.
‡ Phil. Mag. Ser. iii. xi. 110.
§ Phil. Mag. Ser. iii. iv. 161; v. 44.
‖ Edin. New Phil. Journ. xxix. 160.
¶ Brit. Assoc. Report, 1832.
** Phil. Mag. 2nd Ser. viii. 215; ix. 19, &c.

in conjunction with Buckland; in other cases his pen was supported by the pencil of De la Beche; but in every record of his scientific life, just self-reliance, close study, logical expression, and completeness of view, strongly mark the mind of W. Conybeare,—a mind well trained in letters and philosophy before it was turned to the difficult problem of the physical history of the earth.

Dean Conybeare was a Corresponding Member of the Institute of France; he was admitted Fellow of the Royal Society in 1819, but he was not a contributor to the Philosophical Transactions.

Dr. MARSHALL HALL was born at Basford in Nottinghamshire, in the year 1790. His father is stated to have been a man of superior ability, and to have made considerable attainments in chemistry and mechanics, whereby he was enabled to introduce improvements into the cotton-spinning trade in which he was engaged.

Dr. Hall received his early education at Nottingham and Newark, and at the age of twenty entered on the study of medicine at the University of Edinburgh, where three years later, in 1812, he took his degree. For the next two years he held the office of Clinical Clerk (or as it is now termed, 'Resident Physician') in the Royal Infirmary of that city, after which, with a view to further professional improvement, he visited Paris, Berlin, Göttingen, Giessen, and other medical schools of the Continent of Europe. Having commenced practice in Nottingham in 1815, he was appointed Physician to the General Hospital there, and rapidly rose to eminence.

During the ten years that Dr. Hall followed his profession in his native county, his mind was actively engaged in scientific pursuits; and it was at this time that he communicated to the Medical and Chirurgical Society of London his well-known memoir "On the Effects of the Loss of Blood," subsequently published as a separate work, which was directed against the practice, at that time prevalent, of what the author considered excessive depletion in inflammatory and supposed inflammatory disorders.

Having already earned a name in the medical profession, Dr. Hall, in 1826, transferred himself to London. His career as a physician in the metropolis was eminently successful, so that he was enabled at the age of sixty to release himself from strictly professional labour.

Amid the cares and duties of a London physician's life, Dr. Hall

continued to apply himself assiduously to original scientific research, and physiology, especially in its relations to medicine, was his favourite pursuit. In 1831 he published his "Essay on the Circulation of the Blood," which contains observations on the flow of blood in the capillary vessels of Batrachia and Fishes, and on the characters by which these vessels are distinguished from arteries and veins. On this occasion he made known his discovery of a remarkable pulsating sac or "caudal heart" connected with the vessels in the tail of the eel. The results of further physiological inquiries were published in the Philosophical Transactions for 1832, in two papers, one "On the Inverse Ratio which subsists between the Respiration and Irritability in the Animal Kingdom," the other "On Hybernation;" and a few years later he contributed the articles "Hybernation" and "Irritability" to Dr. Todd's Cyclopædia of Anatomy and Physiology.

But his name will hereafter be best known in connexion with the doctrine of the Reflex Function of the Nervous System, which was his most engrossing subject of pursuit for the last twenty-five years of his life. In the Philosophical Transactions for 1833 appeared his "Memoir on the Reflex Function of the Medulla oblongata and Medulla spinalis," the object of which is to show that certain involuntary acts previously designated as "sympathetic motions" are excited by impressions made on the extremities of certain nerves, and conducted by them to the spinal marrow and medulla oblongata, whence as from a centre they are reflected on the motor nerves of the parts moved; that these motions are concerned especially in various functions which are necessary for the preservation of the individual or of the species, and that they are independent alike of sensation and volition; moreover, that the "tone" of the muscular system belongs to the same order of phenomena and depends on the spinal marrow; lastly, that the reflex function may be exalted or depressed by medicinal agents, and in its abnormal or morbid conditions give rise to various well-known spasmodic, convulsive, and other nervous diseases.

Dr. Hall admitted that the phenomena of which he treated had long been known to physiologists, but he believed himself to have been the first to show their independence of sensation, to bring them together under one generalization, to establish with precision the laws of their production, to assign them their just rank in physiology, and to apply the doctrine to the elucidation of disease. But while we do

not question the sincerity of Dr. Hall's conviction of his own originality, there can be no doubt that he was much more largely anticipated by preceding physiologists than he could ever be brought to recognize; and this not only in the observation, but in the generalization and physiological application of the phenomena, and, in short, in all essential parts of the doctrine, such at least as are likely to maintain their ground. This, however, being admitted, it is equally true that from the time this subject was taken up by Dr. Hall, the physiology and pathology of the nervous system may almost be said to have entered into a new phase. With all the ardour of a discoverer persuaded of being the founder of a great and influential doctrine, he thenceforth made the reflex, or, as he subsequently called it, the excito-motory system, his chief study, and laboured incessantly in extending and consolidating its province for the rest of his life; and to him belongs especially the merit of successfully applying the principle to the interpretation of disease. By his numerous writings and unwearied personal exertions, attention was awakened on all sides to the importance of the phenomena; and they soon became a prominent subject of intelligent observation and earnest discussion among physiologists and medical men both in this country and on the Continent, where Professor Müller had independently and almost simultaneously arrived at results in great part similar to those of Dr. Hall, though he was somewhat later in publication. In this way the principle of the reflex function has come to take its due place in physiology and medicine, and important truths, previously seen or at least comprehended in their systematic connexion only by a few, are now established and familar doctrines in science.

Four years after the date of his first memoir, Dr. Hall communicated a second paper to the Royal Society, which formed the subject of the Bakerian Lecture for 1837. In this paper, which was entitled "On the True Spinal Marrow, and the Excito-motory System of Nerves," he gave a new exposition of the constitution of the nervous system, on the assumption that there are special "excitor" and "motor" nerve-fibres subservient to the reflex function, and different from the sensory and volunto-motory fibres, though mixed with them in the same sheaths; and that these special nerve-fibres are in relation to a special part of the spinal marrow and of its encephalic prolongations, which serves as a centre, anatomically blended with, but physiologically distinct from, the part of the cord ministering to

sensation and volition. Opinion was much divided as to the validity of this hypothesis, and the subsequent progress of inquiry cannot be said to have been on the whole favourable to it. In the same memoir Dr. Hall adduces observations and experiments to show that the ordinary (but not voluntary) movements of respiration are excited in a reflex manner through the medulla oblongata, and do not emanate from that part as their *primum mobile,* as he had previously conceived in common with most preceding and contemporary physiologists. This second memoir was not inserted in the Philosophical Transactions, which was ever after a subject of grievance with the author; but in point of fact the original matter contained in it had already been made public by Dr. Hall himself in his 'Lectures on the Nervous System and its Diseases,' published in 1836; and his new experiments and amended views respecting the respiratory movements had also been communicated by him to the Zoological Society and published in their 'Proceedings' in 1834: it subsequently appeared along with a reprint of the first memoir as an independent publication by the author, under the title of 'Memoirs on the Nervous System,' 4to, 1837.

Dr. Hall's further researches and later views in Neuro-physiology are to be found chiefly in his 'New Memoir on the Nervous System,' 1843, and his 'Synopsis of the Diastaltic Nervous System,' which is an outline of the Croonian Lectures delivered by him at the College of Physicians in 1850. His more strictly professional writings are many and valuable; they appeared partly as independent publications, and partly in Journals and in Transactions of Societies; but it would exceed our limits to give even the titles of the numerous and varied productions of his fertile genius, active temperament and ready pen. The more important of them are indicated in the obituary memoirs of Dr. Hall which have appeared in the medical journals; but we cannot thus pass over his last service rendered to the cause of humanity, in the introduction of a simple and easily applied method of restoring suspended respiration, which, if we may trust the positive testimony flowing in on all hands, has already been the means of rescuing many from untimely death.

In 1853 Dr. Hall paid a visit to America, but in the mean time a severe and exhausting complaint under which he had long suffered was gaining upon him, and to escape its aggravation by our less

genial climate he passed the winter of 1854 in Italy; but his powers of life at length succumbed, and he died at Brighton on the 11th of August, 1857.

Dr. Hall was a member of the Institute of France, and of most of the learned societies of Europe and America. The date of his election into the Royal Society is April 5, 1832; he served on the Council in 1850–52.

John Ayrton Paris, M.D.—The unvaried tenor of a physician's life ordinarily affords few opportunities for remark, even while he is rising in the good opinion of the scientific and learned. This observation must be qualified in relation to the late Dr. Paris. Deeply and thoroughly versed in the practical studies of his profession, he became eminent in general science, and in his own profession his researches tend to throw new lights upon it.

Born in the city of Cambridge in August 1785, and educated there, partly at home, partly under the care of Mr. Barker of Trinity Hall, in his early years, he was matriculated at Caius College on the 17th of December, 1803, and was elected to a Tancred Studentship in Physic on the 3rd of January, 1804. From the commencement of his career at Cambridge he evinced the strong predilection for natural science which afterwards distinguished him, and was a diligent student of chemistry under Professor Farish and of mineralogy under Dr. Clarke. Leaving Cambridge, he proceeded to Edinburgh, and having taken full advantage of the professional teaching of that city, and obtained from Cambridge the degree of Bachelor in Medicine, he proceeded to London. There his talents and acquirements obtained for him at once the high opinion and regard of one similarly accomplished, the late Dr. Maton, which largely promoted his success, and continued for life. Dr. Paris became Physician to the Westminster Hospital in 1809 by a large majority of votes, in his 23rd year.

From London he went in 1813 to Penzance in Cornwall, and there, besides obtaining a high degree of medical reputation, he became eminent in mineralogical and geological researches; he proposed, indeed established with the cooperation of his friends, and largely contributed to, the Royal Geological Society of Cornwall. His contributions comprise papers "On a Recent Formation of Sandstone

occurring in various parts of the North Coast of Cornwall;" "On Accidents which occur in the Mines of Cornwall in consequence of premature Explosion of Gunpowder in Blasting Rocks, and on the Methods to be adopted for Preventing it;" "Observations on the Geological Structure of Cornwall," &c. A valuable paper on the Soils of Cornwall was contributed by him to the Penwith Agricultural Society.

Dr. Paris returned to London in 1817. In the course of an honourable and successful career of practice, he was elected President of the Royal College of Physicians, on the death of Sir Henry Halford, after serving repeatedly in the office of Censor. Finally, in the full possession of his mental powers, and to the last moment devoted to the interests of the College, which he loved, Dr. Paris departed this life, June 24, 1857, under very painful disease, borne by him with great constancy.

Dr. Paris was elected a Fellow of the Royal Society in 1821, and repeatedly served on the Council.

His works were numerous, and obtained a large circulation. The 'Treatise on Medical Jurisprudence,' published in conjunction with Mr. Fonblanque, 1825; the 'Treatise on Diet,' 1827; the 'Life of Sir Humphry Davy,' 1831, a most felicitous instance of perfect biography; his delightful little book, 'Philosophy in Sport made Science in Earnest.' But, greatest of all in its originality and practical usefulness, though earliest in its appearance, was Dr. Paris's 'Pharmacologia'; it came out first as a small volume in 1812. On this last work, if he had published nothing else, his claims, as enlarging the science of medicine, might safely be rested.

The Rev. William Scoresby, son of the well-known whaling captain, was born at Crofton near Whitby in 1789. At the age of ten, having been taken on a farewell visit to his father, who was about to set out on a voyage, he was so delighted with all he saw in the ship, that he contrived a boyish scheme for remaining on board, and thus unpremeditatedly began his acquaintance with the sea. Some of the incidents of this voyage, and among them the clever escape from a hostile cruiser, are related in 'Memorials of the Sea,' a book which he published fifty years afterwards. The voyage made him a confirmed sailor, and from 1803 he accompanied his father in the

Resolution for eight years, and manifested his diligence and turn for observation by keeping a regular journal in addition to his other duties. The fact that he won the responsible post of first mate of the ship while yet in his sixteenth year, and that he was appointed commander in 1811, as soon as he became of legal age, supplies good testimony as to his courage and skill in his adventurous profession.

It was during this period, in 1806, that the Scoresbys sailed to a higher north latitude than, in the absence of trustworthy evidence to the contrary, had ever before been reached. Steering northwards from the western coast of Spitzbergen, they found an open sea, in which they not only captured as many whales as furnished a full cargo, but found on one occasion their position to be 81° 30′ N., about 510 miles from the Pole. The sea was then so clear, that but for the risk of detention from sudden frost, they might have still sailed uninterruptedly to the northward.

In his subsequent voyages, the younger Scoresby observed the disappearance of the vast accumulations of ice that had for years closed the sea on the west of Greenland; and in 1817, pursuing a correspondence of some years' standing with Sir Joseph Banks, he informed that eminent person of the remarkable phenomenon. In the following year the Government, acting on this information, and the recommendation of the Council of the Royal Society, despatched the first of the expeditions which, within the present century, have resolved the important geographical question of a north-west passage.

The winter season between his voyages had always been employed by Scoresby in the acquisition of scientific knowledge: he had studied during two sessions at Edinburgh, where by his assiduity he had gained the friendship of some of the Professors. In 1820, after his seventeenth voyage to the Polar seas, he published, at the suggestion of Prof. Jameson, his well-known book in two volumes, 'An Account of the Arctic Regions, with a History and Description of the Northern Whale Fishery.' Being the first popular work on that subject, it was eagerly read, and while it brought fame to the author, prepared the way for further developments of whaling enterprise, and for arctic research generally.

Meanwhile Capt. Scoresby was making observations on magnetism, a part of science to which, at a later period of his life, he especially

applied, and carrying out measures for preserving the health of his crews, in which, though he maintained strict discipline, he gained their esteem. He owed much of his success to a rigid observance of Sunday, making it a complete day of rest. And it is said that in "his later voyages he adopted the temperance principle on board his vessel, finding that hot coffee was a very much stronger preservative than spirits against the intense cold of arctic regions."

On the death of his second wife in 1822, Capt. Scoresby relinquished the whale fishery, and thenceforth devoted himself to scientific pursuits and religious duties on shore. He had been for some time a Fellow of the Royal Society of Edinburgh, when in 1824 he was elected a Fellow of the Royal Society of London, and subsequently he was chosen a member of the section Geography and Navigation, of the Academy of Sciences of the Institute of France. Yielding however to the religious convictions which had always characterized him, he entered himself as a student of Queen's College, Cambridge, where he took his degree of B.D. in 1834, followed afterwards by that of D.D. and entrance into Holy Orders. He officiated for awhile at the Mariners' Church, Liverpool, then at Exeter, and at Bradford in Yorkshire, but eventually resigned the living and retired to Torquay.

Here he applied himself anew to the study of magnetic phenomena, and published in a collected form, with new facts and observations, the various papers which had appeared from his hand in the Edinburgh Philosophical Journal, the Transactions of the Royal Society of Edinburgh, and the Philosophical Transactions. The important questions of the effect of the iron of ships upon the compass—the effect of concussion and of change of latitude on the permanent magnetism of iron ships—the capacity and retentiveness of steel in different states for the magnetic condition—the nature and phenomena of magnetic induction, and other allied questions, are discussed in the publication referred to, which appeared at intervals from 1839 to 1852, in three volumes, under the title of 'Magnetical Investigations.'

The Reports of the British Association also contain papers by Dr. Scoresby on these subjects. At the meeting of that body at Glasgow in 1855, he communicated additional evidence in favour of his views and suggestions, particularly on the question of elevating the com-

pass to a considerable height above the deck in iron ships. And a few months later, with a view to further observation and experience, he undertook a voyage to Australia in the *Royal Charter*, making careful and laborious investigations on the question which he had so much at heart, both going and returning. His arrival at Melbourne was made the occasion of conferring on him the degree of M.A. of the University of that city.

Dr. Scoresby came back from Australia in a weakened state of health, caused by the fatigues of the voyage; nor did his return home promote recovery. He grew gradually weaker, and died at Torquay on the 21st of March, 1857, at the age of sixty-seven, leaving his third wife a widow.

Dr. Scoresby was the author of several works not mentioned above. Besides a volume of Sermons and books of a religious character, he published in 1822, 'Journal of a Voyage to the Northern Whale Fishery; including Researches and Discoveries on the Eastern Coast of West Greenland.' A translation of this book into German appeared three years later at Hamburg. In 1851 he brought out a volume, entitled 'Memorials of the Sea,' being records of his father's adventurous life, and intended to follow it by a similar volume concerning his own. This will probably now appear as a posthumous work. He published also the 'Zoistic Magazine,' with a view to elicit the scientific principles of mesmeric phenomena; and during the first excitement respecting the lost arctic explorers, he wrote 'The Franklin Expedition,' a small book embodying his views as to the course and fate of the party, and the means to be taken for their rescue.

M. THÉNARD was born on the 4th of May, 1777, at Nogent sur Seine, in Champagne. His father, a farmer in humble circumstances, was a man of strong sense. He soon discovered the abilities of his son, and, at a great sacrifice to himself, procured for him a good elementary education at Sens. There, young Thénard acquired a taste for classical literature, which never forsook him. At the age of sixteen he went to Paris, in order to study pharmacy, with the intention of returning to practise it in Loutière. By good fortune he commenced his chemical studies in the laboratory of Vauquelin, who soon discovered the talents of his pupil. Thénard felt a new life spring up

within him in the midst of the intellectual activity of Paris, and the intention of returning to Champagne was abandoned. Thénard's ability as a teacher, and his power of elucidating science with a kind of dramatic effect, suggested, it is said, by witnessing the performances of Talma, induced Vauquelin to obtain for him the appointment of Répétiteur at the E'cole Polytechnique, where he first became acquainted with Gay-Lussac. This happened about the year 1798. Soon afterwards, Vauquelin deputed him to deliver some chemical lectures for him at the E'cole Polytechnique, celebrated then, as now, for the ability of its lecturers. In this task he was eminently successful, notwithstanding the disadvantage of a strong Champagne dialect, which he overcame with difficulty. About this time, being twenty years old, his labours, for which the E'cole Polytechnique opened a field, attracted the attention, and earned the applause of Laplace and Berthollet. Thénard's first publication, a memoir on the combinations of antimony with oxygen and sulphur, appeared in 1800. Guyton de Morveau, one of the Commissioners appointed to report upon it to the Institute, declared they recognized in M. Thénard, at that time only twenty-three years of age, a chemist practised in the most delicate manipulation, and possessed of all the means of promoting the science, and that he ought to be encouraged in a career upon which he had entered with such success. In 1801 M. Thénard obtained sebacic acid by submitting to distillation various fatty substances. He discovered a new method of making cerusse, which was carried into practice by Roard; also a blue pigment, known by his name, obtained by igniting hydrate of alumina with arseniate or phosphate of the oxide of cobalt, and a very simple and practical method of purifying oils and rendering them more fit for the purposes of illumination. This process has been used on an enormous scale for more than the third of a century. He was the first chemist who devised a process for estimating with accuracy the quantity of carbonic acid present in atmospheric air, by agitating the air with a solution of baryta. In 1802 Thénard was appointed to fill the Chair of Chemistry at the Collége de France, vacant by the retirement of Vauquelin, who recommended Thénard as his successor. About the same period he became one of the ordinary Professors of the E'cole Polytechnique, and may be considered to have fairly established himself on a level with the most eminent men of his time. From the

year 1807 he was associated with Gay-Lussac in the production of the 'Recherches Physico-chimiques,' which have founded their reputation in Europe, and have contributed so largely to the progress of chemical science. The account of their labours appeared in two volumes in 1811. The following are some of the more important subjects discussed in this work. The discovery of a purely chemical process of preparing in considerable quantities the metals of the alkalies by decomposing potash and soda by contact with iron at a high temperature, immediately after Davy had obtained them in minute quantities by the action of a voltaic current; the discovery of boron, of fluoboracic acid, and of hydrofluoric acid; researches on muriatic acid and oxygenated muriatic acid, since known as hydrochloric acid and chlorine; and lastly, a discovery which ranks among those that have had the greatest influence on the progress of chemistry, two methods of analysing organic compounds, with an application of one of these methods to the analysis of fifteen different organic substances. So highly was this work esteemed, that in 1810 M. Thénard was unanimously elected Member of the Institute in the place of Fourcroy.

About this time a third Professorship was bestowed upon him, that of Chemistry at the Faculté des Sciences de Paris. The discharge of his new duties was followed by the same brilliant success that had attended his lectures at the E'cole Polytechnique and the Collége de France. The three Professorships which he held at the same time, and the duties of which he discharged without apparent effort, seemed hardly sufficient to satisfy the extraordinary activity of his mind. The attractive richness of his teaching, combined with his beautiful discoveries, spread his reputation over the whole scientific world. It became requisite to build larger lecture-rooms for him, and during twenty years he lectured to a class of more than a thousand hearers. In 1812 appeared his 'Traité E'lémentaire de Chimie Théorique et Pratique.' It went through six editions, and made the fortune of the publisher. This treatise, equally remarkable for lucidity of exposition and completeness of matter, was translated into many different languages, promoted a knowledge of chemistry, and rendered the name of Thénard popular in every country into which science has penetrated.

The most remarkable of his discoveries was that of the peroxide of

hydrogen in 1818. This was followed by the discovery of the peroxides of calcium and strontium. M. Pelouze, in his address to the Academy on the occasion of the death of Thénard, from which, and that of M. Ch. Giraud, the greater part of this notice is taken, observes that no person has so largely contributed to spread a taste for chemistry by his books and lectures, and especially through the medium of his numerous pupils, as Thénard. In 1827 he was elected a Member of the Chamber of Deputies, in which he joined the liberal and moderate party.

After the Revolution of 1830, he became a Member of the Council of Public Instruction, and soon afterwards, in company with Gay-Lussac, was called to the Chamber of Peers. In the capacity of Administrator of the Collége de France, and of the Faculté des Sciences, as Member, and afterwards Vice-President, for a great number of years, of the Conseil supérieur de l'Instruction publique, he contributed, more than any person since Cuvier, to the development and progress of the principal scientific institutions of France.

He was three times President of the Jury of the Exposition; he took an active part in the administration of railroads, and was President of the Société d'Encouragement after the death of Chaptal in 1832.

To the end of his life he took an active share in the labours of the Academy. He was elected a Foreign Member of the Royal Society in 1824.

He married the daughter of M. Humblot Conté. She was the granddaughter of Conté, Member of the Institute of Egypt. Her death, after a union of forty years, was soon followed by that of one of his sons.

During the last years of his laborious life, he published some interesting researches on the waters of Mont Dore, and, conjointly with his son, M. Paul Thénard, commenced researches on decompositions by contact, the first part of which has been read before the Academy. A few months before his death, he undertook the formation of a charitable institution, called "La Société de Secours des Amis des Sciences." M. Thénard came from his estate of La Ferte-sur-Crosne, near Châlon-sur-Saone, to his house in the Place Saint-Sulpice in Paris, in order to undergo a slight surgical operation, the removal of an encysted tumour. The operation was successfully performed by

M. Velpeau. The wound healed rapidly, and there seemed no doubt of a complete cure, when he was attacked by a catarrhal affection, which, during the last fifteen years of his life, had often obliged him to keep his bed. On Thursday, the 18th of June, 1857, the mildness of the air tempted him to drive in the Bois de Boulogne. On returning to his house about six in the evening, fever had increased, and the organs of respiration were more and more oppressed, without, however, causing any serious alarm. On the night of Friday he grew worse. His son, M. Paul Thénard, who had been sent for, arrived on Sunday morning, while M. Thénard was still conscious, and able to converse. About 2 P.M. his speech failed. He died between 5 and 6 P.M., on Sunday, the 21st of June.

The following Table shows the progress and present state of the Society with respect to the number of Fellows:—

	Patron and Honorary.	Foreign.	Having compounded.	Paying £2 12*s.* Annually.	Paying £4 Annually.	Total.
December 1, 1856..	9	50	376	10	275	720
Since elected.....	.....	.....	+9	.....	+6	+15
Re-admitted	.....	.....	.....	.....	.....	....
Since compounded..	.....	.....	+1	.....	−1	....
Withdrawn	.....	.....	.....	.....	−1	− 1
Since deceased	.....	−2	−12	−2	−3	−19
November 30, 1857	9	48	374	8	276	715