OBITUARY NOTICES OF FELLOWS DECEASED.

Amongst the men who have laboured earnestly and successfully to place on a sound scientific basis the practice of engineering, the late accomplished occupant of the Chair of Engineering at the University of Edinburgh, HENRY CHARLES FLEEMING JENKIN, will hold a distinguished place. Born in Kent on the 25th March, 1833, the only son of Captain Charles Jenkin, R.N., he was sent to school in Scotland at the early age of seven years, where, under Dr. Burnett, of Jedburgh, for three years, and after that for three years in the Edinburgh Academy, the first six years of his school life were spent. In 1846 he was placed at a school in Frankfort; in 1847 he was for a time in Paris; and, finally, in 1850, he graduated as a Master of Arts at the University of Genoa.

He began his training as an engineer in a locomotive workshop at Genoa, under Philip Taylor, of Marseilles, where he remained for about a year. He returned to England in 1851, and served a three years' apprenticeship in the works of the Fairbairns, of Manchester. After a varied experience of practical work, Mr. Jenkin, in 1857, entered the service of Messrs. Newall, in their submarine cable factory at Birkenhead, where they were then engaged in the manufacture of a part of the first Atlantic cable, and afterwards of cables for the Mediterranean and the Red Sea. His energy and talents very soon obtained for him the position of chief of the engineering and electrical staff. In this connexion Jenkin was brought into close relation with the able engineers and electricians who were then working out to a practical result the great problem of submarine telegraphy. These circumstances determined the direction in which his energies were more especially to be applied, and he became early known as an electrical engineer of high standing.

At the beginning of 1859 he became known to Sir William Thomson, and entered into constant correspondence with him in connexion with the testing of conductivity and insulation of submarine cables, and the speed of signalling through them. After Faraday's discovery of the *existence of specific inductive capacity*, and his now celebrated, though then ignored, determinations of it for flint glass, shell-lac, and sulphur, the first correct determination of the specific inductive capacity of any substance was made by Jenkin by means of observations arranged for the purpose on some of the submarine cables in the factory at Birkenhead.

In 1861 Mr. Jenkin joined Mr. H. C. Ford as partner, and with him for seven years he carried on an extensive practice in telegraphic and general engineering. During the last two years of this partnership Jenkin held the post of Professor of Engineering at University College, London, and in 1868 the partnership was dissolved on account of his appointment to fill the Chair of Engineering in the University of Edinburgh, which he occupied till his death, teaching with much success.

In 1859 he began to write upon scientific subjects, encouraged to do so, as he has himself remarked, by Sir William Thomson. His published papers are in all about forty in number. Of these a large proportion deal with questions arising from the science and practice of submarine electrical engineering, and were published within the ten years 1859 to 1869—a period of the greatest progress in submarine telegraphy.

Professor Fleeming Jenkin took a very important part in the work of the British Association Committee on Electrical Standards, appointed on the suggestion of Sir William Thomson at the Manchester meeting of 1861, for the purpose of promoting the practical use of Gauss and Weber's system of absolute measurement, by which lasting benefit has been conferred on electric and magnetic science. Jenkin was made Secretary of this Committee; and, in conjunction with Professor Clerk Maxwell, carried out the most important of the experiments instituted by the Committee.

Through having been so intimately concerned in the beginnings of ocean telegraphy, Jenkin became associated with Sir William Thomson and Mr. C. F. Varley in the development of the instruments by which the transmission of messages over long submarine cables was for the first time made practicable. During later years he and Sir William Thomson acted as joint engineers for various cable companies, their latest work in that capacity being the Atlantic and other cables of the Commercial Cable Company.

For the last two years he was much occupied with a new mode of electric locomotion, a very remarkable invention of his own, to which he gave the name of "Telpherage." He persevered with endless ingenuity in carrying out the numerous and difficult mechanical arrangements essential to the project, up to the very last days of his work in life. He had completed almost every detail of the realisation of the system which was recently opened for practical working at Glynde, in Sussex, four months after his death.

His book on "Magnetism and Electricity," published as one of Longman's elementary series in 1873, marked a new departure in the exposition of electricity, as the first text-book containing a systematic application of the quantitative methods inaugurated by the British Association Committee on Electrical Standards. In 1883 the seventh

edition was published, after there had already appeared two foreign editions, one in Italian and the other in German.

His papers on purely engineering subjects, though not numerous, are interesting and valuable. Amongst these may be mentioned the article "Bridges," written by him for the ninth edition of the "Encyclopædia Britannica," and afterwards republished as a separate treatise in 1876; and a paper "On the Practical Application of Reciprocal Figures to the Calculation of Strains in Framework," read before the Royal Society of Edinburgh, and published in the "Transactions" of that Society in 1869. But perhaps the most important of all is his paper "On the Application of Graphic Methods to the Determination of the Efficiency of Machinery," read before the Royal Society of Edinburgh, and published in the "Transactions," vol. xxviii (1876–78), for which he was awarded the Keith Gold Medal. This paper was a continuation of the subject treated in "Reulaux's Mechanism," and, recognising the value of that work, supplied the elements required to constitute from Reulaux's kinematic system a full machine receiving energy and doing work.

Professor Jenkin's activity was not, however, confined to purely scientific pursuits. The very important practical subject of healthy houses largely engaged his attention during the last eight or ten years of his life, and he succeeded so well in impressing its importance on public opinion, that he obtained the establishment in many large towns of Sanitary Protection Associations. He also took great interest in technical education, and was always ready in word and deed to aid in its promotion. His literary abilities were of no mean order, and as a critic he made several marked successes, among which his reviews of Darwin's "Origin of Species" and of Munro's "Lucretius" (the atomic theory) may be referred to as of high scientific merit.

He was elected a Fellow of this Society in 1865; he was also a Vice-President of the Royal Society of Edinburgh, a Member of the Institution of Civil Engineers, and of the Institution of Mechanical Engineers, and in 1883 he received the honorary degree of LL.D from the University of Glasgow. He died on the 12th of June, 1885, after a few days' illness, due to a slight surgical operation. W. T.

F. G. J. Henle. Of the great anatomists and physiologists whose discoveries made the middle of the present century a never-to-be-forgotten epoch in the history of biology, one of the greatest died on the 13th of last May at Göttingen. Frederick Gustavus Jacob Henle was, in the earlier years of his career, the most distinguished of living pathologists, and, indeed, founded the Science of Pathology as we now understand it. The "Manual of Rational Pathology," published in 1846, was the first important work in which the observed clinical and anatomical facts of disease were classified and brought

together into a system, based on their physiological relations. He had already prepared the way for his reform of Pathology by his larger work on General Anatomy, in which he, for the first time, distinguished the tissues which make up the framework of the body from each other, according to their chemical and anatomical characters, availing himself, as regards the latter, of the new light which the discoveries of Schwann had thrown upon the nature of animal and plant organisation, and of the methods of investigation rendered possible by the sudden advance which had taken place in the construction of the microscope.

As a pathologist, Henle soon relinquished the lead he had at first taken to Virchow, who, by his personal work or by that of his pupils, has since retained it. As years went on, Henle became more and more a descriptive anatomist and histologist. The publication of the greatest work of his incredibly laborious life, the "Handbuch der Systematischen Anatomie des Menschen," began in 1855. In it the student was furnished with an anatomical description of the human body, which, at the time, surpassed all others—not even excepting Dr. Sharpey's edition of Quain's Anatomy—in the quantity of information, new and old, it contained, in the abundance and excellence of the illustrations; and it was not less remarkable for the clearness of the author's style, and the power which he possessed of so presenting the forms and anatomical relations of the organs or parts described, as to leave behind a vivid picture in the imagination of the reader—for Henle's descriptions are so real and true to nature, that in reading them one seems to have seen what is described.

Any one of the three great works which have been mentioned would have been sufficient to entitle its author to a permanent position among the founders of modern medical science. Taken together they afford good ground for assigning to Henle a place scarcely inferior to that of his master, Johannes Müller, or of his contemporary, Theodore Schwann.

Henle began his career as an anatomical investigator by spending the year which intervened between his examination for the doctorate and the taking of his degree in the preparation of his thesis on the Anatomy of the Eye, and in other anatomical researches, of which the fruits appeared later, and which he undertook, under the direction and with the co-operation of J. Müller, who was still at Bonn. When Müller, a year later, was called to the University of Berlin, Henle became his Prosector. He held this office for six years, during which he was associated with Müller in his multifarious professorial duties; these comprising, according to the custom of the time, not only the teaching of anatomy and physiology, but also pathology and pathological anatomy. It was for Henle a time of extraordinary activity. During his tenure of this Prosectorship he published three

anatomical monographs on previously undescribed species of animals (Narcine, Bronchiobdella, Enchytræus), one or two contributions to descriptive human anatomy, and (in addition to the Latin dissertation already referred to) four of those investigations into the minute structure of the animal body, which afford the best justification for placing him, as we have done, side by side with Theodore Schwann, as one of the founders of the Science of Histology—namely, the Essay on the Structure of the Lacteal System, which served for his "Habilitation" Thesis, and three other papers on the Distribution of the Epithelium in the Human Body, on the Formation of Mucus and Pus, and on the Structure and Development of Human Hair.

In 1840, when Henle was thirty years old, he received a call to the Chair of Anatomy at Zürich, where he remained until, in 1844, he became the colleague of Tiedemann, at Heidelberg. The year after his Zürich appointment he published his "General Anatomy," already referred to; and about the same time, in co-operation with Professor J. Müller, he published a zoological work on Sharks and Rays, for which the collection of the British Museum afforded part, at all events, of the material.

In Heidelberg, Henle, like Müller, taught both anatomy and physiology, as well as pathology. Almost immediately after his settlement in that university, he began with Pfeiffer, who had accompanied him from Zürich, the "Zeitschrift für rationelle Medicin," which, after sharing the first place with "Virchow's Archiv" in medical periodical literature for a quarter of a century, gave place to the new order in 1872. During the last sixteen years of its existence the Journal was enriched by the publication in it of Henle's own annual account of the progress of anatomical and physiological science—a fact which, irrespectively of its other contents, will give its fifty-four volumes a permanent place in medical literature. As all who were then engaged in the study of biology know, Henle's "Berichte" had no analogy to the half reliable and unappreciative abstracts which the enormous growth of periodical literature have now made a necessary evil. They consisted rather of records by a master hand of all that was worthy of being remembered, and critical reviews of all that was worthy of being discussed in its bearing on the development of the branches of science to which they related. So that whoever undertakes the Herculean task of writing the history of that time of rapid progress in biology which began about the time of Henle's removal from Berlin to Zürich, will find the chief events of those thirty years continuously chronicled (first in "Müller's Archiv," then in "Canstalt's Jahresberichte," and finally, as above stated, in the "Zeitschrift") by one who himself took a prominent part in them.

In 1852 Henle was called from Heidelberg to Göttingen, and it was here that the chief work of his life, the preparation of the Descriptive

Anatomy, was accomplished. It resembles the contemporary edition of Quain and Sharpey in including both general and special anatomy, and in the way in which the illustrations are interwoven with the text; but exceeded it in their number and quantity. To the most difficult part of descriptive anatomy, that which relates to the central organs of the nervous system and to the viscera, Henle devoted many years of labour, and produced a result which had never before been approached. The *magnum opus* was brought to a conclusion in 1873, but inasmuch as by the time the first editiou was completed, the third was already in progress, it continued to the end to be an increasing occupation, the labour of which was further enhanced by the obligation to which the requirements of medical education forced upon him, of publishing a text-book and copious atlas for students—a compendium of the larger work.

The "Handbook" did not of course profess to contain a record of researches. It was in its end and construction a system. But during the whole course of its publication, the author was continuously engaged in the work of investigation. The research on the anatomy of the kidneys, in connexion with which subject his name is most familiar to English students of medicine, appeared in 1862 in the Transactions of the Göttingen Academy; those on the histology of the central nervous system in 1867–68. More recently he published two important researches on his old subject, the minute anatomy of the eye (1878 and 1882); and finally in November, 1884, his last anatomical research, "Das Wachsthum des Menschlichen Nagel und des Pferdehufes."

To judge of Henle as a pathologist, reference must be made to his systematic work on that subject already mentioned, the fundamental idea of which is, that disease consists essentially in the reaction of the living material against "abnormal external action," and that the nature of this reaction differs in no respect, excepting the circumstances under which it is evoked or induced, from those which exhibit themselves in the healthy body in its relation to its normal environment, so that, as Henle expressed it, "physiology and pathology are branches of the same science." The notion expressed in these words, incontrovertible as it may appear now, was opposed to the teaching of the time, which in physiology preferred to inquire into the purpose rather than the cause of vital phenomena, and resented as a desecration every attempt to refer them to chemical or physical actions; and in pathology spoke of diseases as if they were mischievous personalities whose intentions it was the business of the physician to aid the "Schützender Geist" in discovering and frustrating. Against all such notions Henle made uncompromising war, by showing even with the imperfect knowledge and means possessed in 1840, that it was possible to discover the causes of many diseases, not in intestine

strivings between rival destructive and preservative tendencies supposed to be resident in the body itself, but in the existence in its environment of elements injurious to its welfare.

At an earlier period, the absence of physical and chemical knowledge would have rendered the success of any such attempt impossible. As it was it was imperfect, and was recognised as such by its author; but it was so unquestionably the beginning of that rapid development, by which, under the influence of Virchow and his pupils, what we now recognise as the science of pathology has come into existence, that of this science Henle must be regarded as the founder.

In certain directions, indeed, Henle was in advance of his successors. If, for example, we take the opening chapter of the "Untersuchungen," which deals with the etiology of contagious diseases, we find in it a most remarkable anticipation of the discoveries in this field of inquiry of the last fifteen years. He sets forth in the clearest language that the material of contagium must necessarily be not only organic but living and organised, and that it must consist of "parasitical beings which are certainly among the lowliest, smallest, but at the same time most productive which are known."

The consideration of the reasoning which led Henle to this conclusion, affords a striking illustration of the way in which discoveries made in other departments of natural science influence medicine. Henle's grounds were* (1) the evidence of experiments that contagion acts in infinitesimal quantities, and must therefore be self-multiplying; (2) the proof then shortly before given by Schwann that the analogous processes of fermentation and putrefaction are dependent on minute organisms; (3) the proof recently given by Bassett Audouin that the muscardin of silkworms, a disease communicable through the air, was due to a *contagium vivum;* and finally (4), the consideration that the development of contagious diseases could be best explained by attributing them to a living cause.

That Henle did not himself follow these indications may probably be attributed to his being engrossed by other researches. It seems at first sight difficult to account for the fact that the seed sown by him did not fructify in the minds of some of his readers; for when in 1868 the investigations of Chauveau again brought the subject of *contagium vivum* to the front, it was approached from an entirely different point of view.

A sketch must be given, in conclusion, of the views which Henle entertained and taught as to the psychological side of biology. Mention has already been made of his having lectured at Heidelberg on anthropology. These lectures were given to a mixed academical

* See his "Pathologische Untersuchungen," Berlin, 1840, pp. 17—20, and 36—41. The publication of this work was preparatory to that of the "Rationelle Pathologie."

audience in 1847–52, and published thirty years afterwards under the title of "Anthropologische Vorträge." That they dealt with subjects very far apart from what we now understand by anthropology may be gathered from the titles—Faith and Materialism; Taste and Conscience; The Physiology of Emotion; The Will; Teleology and Darwinism; Medical and Religious Dualism; &c. Among the most interesting are the two last enumerated. Like many other biologists of the former generation, Henle, while cordially accepting the doctrine of descent, strenuously opposed the monistic view, which in the minds of most persons is associated with it, and which refuses to find anything in the phenomena of life which cannot be accounted for as resulting from the play of the molecular forces of the chemical elements which take part in them. He regarded the organism, whether plant or animal, not as the inevitable product of the conditions under which it originated and was developed, but as having independent powers of its own, which the environment is capable of modifying or even controlling, but not of originating. The constancy as well as the variability of organic structure, he said, are alike manifestations of the existence of an *agent* attached to matter, but not material, and endowed with the function of "presiding over the metabolism of the body capable of reproducing the typical form, and of endless partition without diminution of intensity," in a way which has no counterpart in the inorganic world. It is this infinity of the faculty which the organism possesses of "making the material which composes it its own, and impressing upon it its stamp," which separates it from the recognised forces of inorganic nature. Every kind of organism has its "räumliches" as well as its "zeitliches Ziel,"* which serves as the law of its existence, and the fulfilment of which in no way interferes with its taking its legitimate part in the order of nature. J. B. S.

Thomas Davidson, LL.D., whose death took place at his residence in Brighton on Wednesday, October 14th, was born in Edinburgh, May 17th, 1817; his ancestral home being at Muir House, near Edinburgh. Mr. Davidson's family possessed considerable landed property in the county of Midlothian.

At the early age of six years he was taken to the Continent and entirely educated in France, Italy, and Switzerland under the tuition of French and Italian masters. Even at eleven years of age he exhibited a marked predilection for natural history, as well as the fine arts, especially painting, and every facility was afforded him to secure the great advantage which Paris then offered to the artistic and scientific student.

* "Teleologie und Darwinismus," p. 92.

Young Mr. Davidson attended the courses of lectures delivered at the Sorbonne, Jardin des Plants, École des Mines, and Collége de France. These courses were given by Cordier, Elie de Beaumont, Constant Prevost, Dufrenoy, Geoffroy Saint Hilaire, Dumeril, Valenceinnes, de Blainville, Milne Edwards, Audouin, Brongniart, Pouillet, &c.

In 1832 Sir Charles Lyell's "Principles of Geology," and his intimacy with Constant Prevost, led him to give much attention to geology and palæontology, and at fifteen years of age he had already, under the guidance of Prevost, explored the greater part of the Paris basin, securing a good collection of its rocks and typical fossils.

In 1835 he matriculated at the University of Edinburgh, studied mineralogy under Professor Jamieson, chemistry under Dr. Reid, and assisted Mr. R. Cunningham in his geological survey of the Lothians.

In 1836 he returned to the Continent and explored a considerable portion of France, Belgium, Switzerland, Germany, and Italy; his acquaintance in 1837 with the distinguished Prussian geologist, Von Buch, led to his undertaking the special study of the then little understood recent and fossil Brachiopoda, the elaboration of which or any other group of Mollusca has never been surpassed; the elucidation of their characters, classification, and history, as well as of their geological and geographical distribution, being now complete through his labours. From that year up to a short period prior to his death, Mr. Davidson unceasingly laboured to advance this special branch of Palæontology.

For some years Mr. Davidson was an attentive and distinguished pupil of Paul Delaroche, and studied under Horace Vernet and other French Academicians at the École des Beaux Arts. He spent the winter of 1841 in Rome, devoting himself to the art of painting, but his love for scientific research predominated, and he subsequently brought his artistic knowledge to bear upon his favourite scientific branch of study.

In 1846–47 Mr. Davidson made a careful examination of the Silurian districts for the purpose of his palæontological researches, and in 1850 he commenced that grand series of memoirs in the "Palæontographical Society's Transactions," which mainly terminated in 1871 (extensive supplements following). This distinguished naturalist has published or written for the Palæontographical Society five large quarto volumes, containing nearly 3000 pages of text, and 250 plates, all the figures of which have been executed by himself and presented to the Society free of all expense, and this on one subject only.*

* The monographs extend from the year 1851 to the present time, the final portion of the fifth volume being now in the press, and completing his great and laborious life-work. His posthumous papers will shortly be published in the "Transactions of the Linnean Society," his last contribution being a complete and finely illustrated monograph upon the "Recent Brachiopoda," in three parts.

Mr. Davidson prepared the article Brachiopoda for the "Encyclopedia Britannica," and has monographed the entire series of Brachiopoda collected during the exploration of H.M. ship "Challenger."

Thirty years have passed since the publication of his general introduction to the *first* volume of his extensive monographs, and well may it be said that seldom has fortune more completely equipped a student for his life-work than in the present case, in which more than ordinary artistic talent, liberal education, and independent means were joined to unsurpassed devotion in the pursuit of knowledge, with just impartiality in the recognition of the labours of others in the same field of research. Mr. Davidson was one of the most unselfish of men, ready to aid all who worked and sought his advice and opinion upon the intricacies of the intimate structure of the Brachiopoda. Few more enthusiastic students ever enriched the pages of scientific literature, or probably committed fewer errors in the description and delineation of the voluminous mass of species that enrich the 3000 pages and 250 plates left as a lasting memorial of industry and learning. Unhappily Mr. Davidson has not lived to see the proofs of his final monograph on the recent species of Brachiopoda about to be issued by the Linnean Society.*

Beyond the monographs in the palæontographical volumes, most of Mr. Davidson's investigations have been published in the "Quarterly Journal of the Geological Society," the "Bulletin de la Société Géologique de France," the "Annals and Magazine of Natural History," the "Geological Magazine," "Proceedings" of the Linnean Society of Normandy and of the Zoological Society of London, "Transactions" of the Geological Society of Glasgow and of the Royal Society of Liège.

In 1880 Mr. Davidson was deputed by the President and Council of the Geological Society of London to represent the Society at the celebration of the fiftieth Anniversary of the foundation of the French Geological Society; he was received in Paris with great distinction. The Councils of the Royal Society of London, the Linnean Society, the Zoological Society, the Royal Society of Edinburgh, the Geological Society of Edinburgh, the Geological Society of Glasgow, the Royal Academy of Ireland, the Royal Geological Society of Ireland, and the Palæontological Society of London all commissioned Mr. Davidson

* Less than one-third of the known species (1000) of Brachiopoda were unknown when Mr. Davidson published the introduction to his great work in 1850. To this volume the late Dr. W. B. Carpenter appended an elaborate description of the "Intimate Structure of the Shells of Brachiopoda," and Sir Richard Owen a learned contribution on the "Anatomy of Terebratula." The number of British species, which in 1850 comprised 13 genera and 450 species, have now expanded to 74 genera and 1000 species and varieties, these results being almost entirely due to the researches of Mr. Davidson.

to felicitate the Council of the Geological Society of France on its prosperous condition on attaining its fiftieth Anniversary.

Mr. Davidson was member or honorary member of most of the distinguished societies of Europe and America. He was elected Fellow of the Royal Society in 1857, was Fellow of the Linnean Society, the Geological Societies of London, France, Edinburgh, and Glasgow, Vice-President of the Palæontographical Society, Member Étranger de l'Institute des Provinces, France, and Linnean Society of Normandy, the Imperial Society of Naturalists of Moscow, Imperial Mineralogical Society of St. Petersburgh, Member of the Royal Academies of Belgium and Bavaria, Société Royale Hollandaise des Sciences, Haarlem, Royal Society of Liège, Academy of St. Louis, the American Philosophical Society, Philadelphia, Palæontological Societies of Belgium and Switzerland, the Zoological Society of Vienna, and many of the local societies of Britain.

In December, 1870, he was awarded one of the Royal medals in recognition of his valuable contributions to palæontology.

In July, 1865, he received from the Council of the Geological Society the Wollaston medal, its highest award for distinguished merit.

In 1882 the University of St. Andrews conferred on him the honorary degree of LL.D.

The Free Library and Museum at Brighton chiefly owed its foundation and success to Mr. Davidson's energy and perseverance. He was permanent chairman of the Museum Committee at the time of his death. Mr. Davidson has generously bequeathed to the nation his magnificent and unique collection of recent and fossil Brachiopoda largely enriched with types, together with his fine collection of books and original drawings. These will all be preserved in the Department of Palæontology in the British Museum of Natural History, Cromwell Road, South Kensington. R. E.