of investigators. These researches were originally begun under the direction of Biot; the best known among them are the discovery and definition of the dispersions in the monoclinic system, and the remarkable study of the variations introduced into the optical characters of crystals by change of temperature. Des Cloizeaux was the first to determine these characters and their variations for a very large number of substances, among which the most important were the felspars.

It is difficult now to realise how novel were the investigations which have since become familiar in all text-books of Mineralogy; to appreciate the profound influence which Des Cloizeaux's work exerted upon the science one must read again the text-books anterior to the date of his classic memoir on the use of the polarising microscope, and see how meagre were those optical data, without which no mineral description is now complete.

Among the more purely crystallographic memoirs the monograph on the form and structure of quartz stands as one of his most masterly works, and represents a vast amount of research. Among other contributions to Mineralogy, perhaps the best known and those which have exerted most influence on the science are the studies of the chondrodites, of microcline, of zoisite, and of the rhombic pyroxenes and amphiboles.

Des Cloizeaux was in 1870 first President of the Mineralogical Society of France, of which he was one of the founders; he was elected Member of the Institute in 1869, and President of the Academy of Sciences in 1889. He was a Foreign Member of this Society from the time of its formation.

His life was devoted with extraordinary assiduity to the study of minerals almost up to the day of his death, which took place on May 7th, 1897. H. A. M.

Emeritus-Professor M. Forster Heddle, M.D., F.R.S.E.

Matthew Forster Heddle was the younger son of Robert Heddle, of Melsettar, Hoy, Orkney, and was born there in 1828. The family were of Scandinavian descent, and it is doubtless to this strain that we may attribute much of the self-reliance, hardihood, energy and love of adventure which characterised Heddle in after life. These qualities were further developed by an out-door life, largely spent in clambering amongst the dangerous cliffs, or in boating alone amongst the geos, stacks and wild sea inlets, around his native island.

He was sent to Edinburgh to be educated, and he went first to the

Academy, and subsequently to Merchiston Castle, in connection with which schools there exist records of his stay in 1840-4. Many stories are told of him by his former schoolfellows. Most of these show that Heddle's well-known characteristics had begun to manifest themselves at an early period. One story illustrates his readiness to take up the cudgels in defence of any of the weaker of the boys who happened to be bullied by another, a congenial occupation in which Heddle's bodily strength and pluck were usually turned to good account. Others bring Heddle's histrionic talent into prominence, and tell us of his wonderful gifts as a romancer. Some of the anecdotes clearly show that, even as a lad, one of his most strongly-marked characteristics was that of a collector. It was this propensity which led to his becoming one of the founders of a School Natural History Society, whose chief business seems to have been, as usual in such cases, the making of collections of butterflies, birds'-eggs, shells and plants. It is said that young Heddle made a very good collection of Scottish plants, among which those of the mountains figured prominently. He gained a school prize for this herbarium, and it would appear from what can be gathered of this part of his early history, that he seemed at this period to be in a fair way of passing from the grade of a mere collector of plants to the higher stage of a student of botany. But an untoward accident occurred, which led to his energies being diverted from this into another channel. Heddle tells us that he lent the herbarium to a friend, who, when travelling across a stream with it, accidently let it fall into the water, whereby the collection became irretrievably ruined. He resolved, after this incident, to devote his energies to collecting something that could not be so easily spoiled, and henceforth became a collector of minerals. From that day forth to the end of his life nearly the whole of the time and energy at his command, and almost all the money he could obtain, were devoted to the one single object of collecting great quantities of the largest and finest specimens of minerals that were anywhere to be got. This eventually led to his amassing a remarkably fine general collection of minerals, comprising many specimens of unusually large size, and also to his getting together from the mountains, coasts and mines of Scotland, what is certainly the very finest local collection of minerals obtained from a single district by any one man. This Scottish mineral collection, which may be regarded as the crowning work of Dr. Heddle's life, eventually became, partly by purchase, and partly by gift, the property of the nation; and it is now fittingly displayed in the Gallery of Scottish Geology and Mineralogy in the Edinburgh Museum of Science and Art, where it was arranged chiefly under the direction of Dr. Heddle himself.

Returning to the chief events of Dr. Heddle's early life, it may be mentioned that from school he passed to the Edinburgh University, where he entered as a medical student, and where he obtained what was then, and still is, that best of all forms of education for a scientific career which training as a medical man confers upon a student. After going through the prescribed course of instruction, he went for a time to Clausthal, and then to Freiberg, where he studied chemistry, and extended his knowledge of mineralogy. Those who carefully study Dr. Heddle's scientific writings, and especially such as deal with geological topics, cannot fail to perceive in them many evidences of the extent to which his modes of thought were impressed by the German school of teaching of that period.

Returning to Edinburgh in 1851, he graduated M.D., taking as his thesis "The Ores of the Metals." After graduation he commenced medical practice in one of the poorer parts of Edinburgh. Those who knew Dr. Heddle are well aware that Nature had been bountiful to him in many ways. He might have done well as a lawyer, or as an actor, or as a novelist; he certainly was a born collector; and it is equally certain that he took the keenest possible interest in everything that related to Mineralogy; but assuredly he lacked some of those special gifts and acquirements whose possession leads to eminence in the medical profession. As this medical work proved entirely uncongenial to his tastes, he took the first possible opportunity of abandoning it, and of taking to work in its stead which was more to his mind.

It was soon after this (1856) that he went to Faroe, where he collected a large quantity of the fine zeolites which occur in the vapour cavities of the tertiary volcanic rocks there. These formed an important part of the basis of his general collection just referred to, and it was from the numerous duplicates then obtained that he afterwards drew a large supply of the materials used in acquiring other minerals by exchange. In 1858 he took an important share in bringing out a new Edition of Greg and Lettsom's *British Mineralogy*. In 1856 the Professor of Chemistry at the University of St. Andrew's became unable to carry on his teaching work, whereupon Dr. Heddle became his assistant, and in 1862 succeeded to the Professorship. While there he made, or had made, a large number of analyses of minerals, of which nearly 600 are exhibited in the Edinburgh Museum, alongside of the Scottish minerals to which they refer. He held the post at St. Andrew's, from first to last, for a period of 23 years.

Near the close of 1883 he was persuaded by a well-known financier to leave his professional duties and go to South Africa in connection with

some mines there. After taking due precautions in regard to possibilities in the future in connection with this new move—a proceeding in which Dr. Heddle's legal acumen stood him in very good stead—he relinquished his professorship, and went to South Africa. On his arrival, however, he found himself unable to endorse some of the statements which had been made regarding the prospects of the mines, and accordingly he left the country and returned home. Having proved successful in the lawsuit which ensued, he settled down again at St. Andrew's for the remainder of his life, devoting himself to his work amongst the Minerals of Scotland, and to the preparation of his long-promised book dealing with them.

Dr. Heddle's name is well known to the readers of the *Mineralogical Magazine* as the author of an extensive series of papers on the "Geognosy of Scotland." He also contributed to the *Proceedings of the Royal Society of Edinburgh* several other papers equally valuable, which were entitled "Chapters on the Mineralogy of Scotland." For one of these, dealing with the Rhombohedral Carbonates, he was awarded the Keith Medal in 1878. He was the author also of a large number of other papers dealing with Mineralogy and Geognosy; and he produced single-handed a geological map of Sutherland, which was for a long time the standard map of its kind, and upon which many subsequent writers have drawn for large supplies of both facts and ideas.

Dr. Heddle was at one time President of the Geological Society of Edinburgh. It was while he occupied this post that he was chiefly instrumental in urging the Government of the day to commence a Geological Survey of Scotland. He was the second President, and one of the founders, of the Mineralogical Society of Great Britain.

Probably the two chief works in connection with which Dr. Heddle's name will be best known to posterity will be his grand collection of Scottish Minerals in the Edinburgh Museum, and his book on the *Mineralogy of Scotland*, which he worked at for many years, and of which the manuscript and the drawings of crystals were nearly completed before his death. Dr. Heddle requested his friends, Mr. Alexander Thoms and the writer of this notice, to co-operate in completing the book, and in getting it published. This is being done, and by the end of the present year (1898) it will appear as a royal octavo volume of about 400 pages of letterpress, and illustrated with about one hundred and twenty plates of eight figures each, representing Scottish minerals, which were drawn almost entirely by the doctor's own hands.

Dr. Heddle died on the 19th November, 1897, and was buried in the grounds of the fine old Cathedral of St. Andrew's. J. G. Goodchild.