John Sturgeon Mackay, M.A., LL.D.   By **George Philip**, M.A., D.Sc.

(Read July 6, 1914.)

THE task which the Society has entrusted to me of putting on record some suitable memorial of the life and work of Dr John S. Mackay is one which I feel honoured in undertaking.   At the same time I am conscious of my own limitations in attempting to give to the scientific world a biographical notice of one who was rightly looked on as one of the most learned men of the day, and who possessed all the graces which a well-stored mind can bestow, along with those subtle and ingratiating qualities of the heart which cast such a magnetic influence on all who were privileged to know him.   Dr Mackay was, in very truth, the *beau ideal* of a scholar and a gentleman, and death has removed from the circle of his friends one who will long be missed.   His death took place at his residence, 69 Northumberland Street, Edinburgh, on March 25 of this year.

John Sturgeon Mackay was born at the village of Auchencairn, Kirkcudbrightshire, on October 22, 1843, so that at the time of his death he was in his seventy-first year.   While he was yet an infant, his parents removed to Perth, and there he spent his boyhood and received his early education. At Perth Academy he showed that aptitude for learning which later brought him great distinction, and it is well to note here that his preliminary education laid the foundation of both his linguistic and mathematical studies.   The biographer of the late Professor·Chrystal in the Society's *Proceedings* makes a similar remark; so that we have these two conspicuous instances at least of men who combined mathematical with classical or linguistic talent.   One would fain recall here the advice given by Lagrange to Cauchy's father when consulted by him as to the proper education for his boy: "Do not allow your son to open a mathematical book nor to touch a single diagram until he has finished his classical studies."   To the end Dr Mackay was a strenuous supporter of the old-fashioned classical education, and never ceased to deplore the modern trend of early specialisation, holding that preliminary education ought to be devoted to the cultivation of all the faculties, and not to the development of any one at the expense of the others.

After a school career that gave great promise of later distinction, Dr Mackay proceeded to St Andrews University, where he followed the

usual course at that time imposed on aspirants to a degree. The highest honours in mathematics and classics were won by him, and one of his fellow-students, himself a man of eminence, has told me that he was looked upon as the ablest man of his year. His original intention on leaving the University was to enter the ministry of the United Presbyterian Church, and with that in view he attended the Theological Hall in connection with that body in Edinburgh. Theology, as it was presented to him fifty years ago, was not to his taste, and he decided to renounce his intention of qualifying for admission to the Church, and to take up teaching as a profession. His first situation was on the mathematical staff of his old school, Perth Academy, so that, as he was fond of relating, he had as a predecessor William Wallace, afterwards the eminent occupant of the Chair of Mathematics in Edinburgh University. His stay in Perth was short—two years, I think,—and in 1866 he received an appointment as mathematical master in Edinburgh Academy, an institution which retained his services until he retired in 1904. His long connection with this well-known school had far-reaching effects both on the school and on Dr Mackay himself. To the very last he took unabated interest in all that pertained to the life of the school, and showed the most unswerving loyalty to everything connected with it. Indeed, at the beginning of the present year, when his eyesight failed him, he was engaged in compiling a register of pupils who attended the Academy since its establishment in 1824. Many of his pupils have risen to great eminence in various walks of life, both at home and abroad, and few of them revisited Edinburgh without spending some hours with their old master, whom they were proud to reckon among their friends. His affection for his pupils was real and genuine, and he followed their careers with a truly paternal interest.

Dr Mackay was singularly well suited for a teacher. His ready sympathy and kindly disposition immediately secured for him the goodwill of his pupils, while his great learning and nobility of character were so evident that they must have exercised a very powerful influence for good on the whole school. His well-stored mind was ever ready to give of its contents; and, while some men in such circumstances look on their learning as wasted, Dr Mackay, quite otherwise, thought nothing too good for his boys. A pupil of his own, a distinguished man of letters of this city, has put on record the following appreciation, and I cannot do better than quote his words: " In reviewing the list of those with whom he happens to have been brought into contact, the present writer can think of few more richly endowed than he with the qualities which really matter. He was eminently straight, he was eminently loyal, and he was eminently magnanimous. It

is of less consequence, yet not to be recalled without a pang, that he had a delightful sense of humour, which, coupled with the control he possessed over his vast stores of learning, rendered him the most charming of companions. A school may reckon itself fortunate which has inscribed on the roll of its masters the name of so learned, so accomplished, and so good a man as was John Sturgeon Mackay." *

His retirement from active duty dates from 1904, and as he was comparatively vigorous he looked forward to a period of great usefulness. He still spent two months or so of the year on the Continent, and also continued his mathematical researches. But latterly his intimate friends noticed a diminishing vitality, and although he came back every year refreshed and invigorated by the change, it was evident that the heavy self-imposed strain of many years was now beginning to tell on him. In January of this year, failing eyesight was the first indication that things were not right; and as this condition grew steadily worse, it became evident that it was symptomatic of very serious weakness, and after lingering for a few weeks he passed peacefully away on Wednesday, March 25. Having his time so fully taken up with more congenial pursuits, Dr Mackay took little or no interest in those affairs that bring men prominently into the public eye. To his friends he showed a warm and affectionate disposition; stimulating in his criticism but never censorious, he had the happy faculty of saying the right thing and doing the right thing at the right time. Anything in the nature of sham, morally or intellectually, was specially abhorrent to him, and he very readily detected it. But those who showed even in a small degree an inclination to do something more than merely "put in the day" found in him a staunch friend, willing to do his utmost in assisting them in their work, and by his kindly and well-directed counsel enabling them to bring their labours to a happy issue. His reputation for accurate scholarship extended beyond the confines of his own country, and he was frequently appealed to for information by savants all over the world. Included among his intimate friends were such well-known men in the domain of mathematical science as Neuberg, d'Ocagne, Laisant, and Aubert in Belgium and France, Moritz Cantor in Germany, and Robert Tucker in our own country.

The Royal Society did him the honour of electing him to a Fellowship in the year 1882; and although he admitted the prior claims of the Edinburgh Mathematical Society for his support in the matter of original papers, he did useful work as a member of the Council and also as a member of its Library Committee. By making him an Honorary Fellow

* See *Edinburgh Academy Chronicle* for May of this year.

ten years ago, the Society showed its appreciation of the great service Dr Mackay rendered to scientific learning. His extensive knowledge of books was recognised by his appointment as a member of the Permanent International Bibliographical Association. His *alma mater*, the University of St Andrews, readily granted him the highest distinction she could offer and in 1884 conferred on him the degree of LL.D. He served two periods as Examiner in Mathematics in St Andrews, and for many years he occupied a similar position on the Examining Board of the Chartered Accountants' Society of Scotland. He was elected by the Edinburgh Mathematical Society as its first President, and it is not the least of his claims to our remembrance that he gave such whole-hearted support to its affairs that it was a constant pleasure to him to see it grow from a small beginning, with a membership of two score, to its present position of influence, with a membership of two hundred and fifty scattered over the four quarters of the globe. His zeal for the welfare of the Society never diminished, and until within the last few years, when his health began to decline, he was seldom absent from its meetings. As was to be expected from such an accomplished French scholar as he was, he took a very prominent part in the work of the Franco-Scottish Society, and attended several of its excursions through France.

In giving an account of the scientific work of the late Dr Mackay, it will be simplest to deal with it in the historical order of its development. At the outset, it is no exaggeration to say that the whole domain of pure geometry, in so far as it deals with plane figures, came under his notice, and a list of his published papers will show that he enriched almost every part of the subject by discoveries of more or less importance. A very prominent place must be assigned to his knowledge of Greek geometry. His great command over Latin and Greek made him singularly well qualified to deal with this fascinating subject, and only a mere chapter of accidents prevented him from obtaining the full honour to which his labours entitled him. The seventeenth- and eighteenth-century geometers like Commandinus, Edmund Halley, and Robert Simson had studied and edited, as far as they could, the works of Archimedes, Apollonius, Euclid, and Diophantos, and fairly complete collections of the works of these mathematicians were available; but very little attention had been paid to the writings of Pappus, one of the latest of the Alexandrian school of mathematicians. Dr Mackay made up his mind to supply the defect, and for many years he spent his vacations working patiently and laboriously at the MSS. of Pappus in the British Museum and in the Continental libraries, collating and translating them. He had practically finished his task, when Hultsch, the celebrated

German commentator, published his three-volume edition of Pappus, and Dr Mackay took no further steps to bring his out. This is all the more regrettable as British scholarship could well have stood a native edition of Pappus; and although Dr Mackay very magnanimously admitted that his Pappus was in no way superior to that of Hultsch, it is not to be doubted but that mathematical literature would have been greatly richer to-day if his book had been published. I understand that Sir T. L. Heath is soon to add Pappus' "Mathematical Collections" to his excellent editions of Archimedes, Apollonius, Diophantos, and Euclid, and so remove the stigma that English mathematicians are no longer interested in Greek mathematics. Dr Mackay was unfortunate, too, in coming so soon after Allman, whose researches in Greek geometry appeared first in *Hermathena* and afterwards in book form. These circumstances to a certain extent robbed him of the full honour due to his original work, but, nevertheless, he was looked upon as one of the foremost living authorities on Greek mathematics. His reviews of Heath's *Diophantos* and of Gow's *History of Greek Mathematics* in the *Academy* give us an insight into his grasp of the subject, and make us regret all the more that we have not a work from his own pen dealing with the early history of geometry. He was *par excellence* the man to have done it.

These studies naturally led on to the work of the Scottish geometers, Robert Simson and Matthew Stewart, who were more Euclid than Euclid himself in their methods of geometrical analysis, and Dr Mackay subjected their works to a most exhaustive examination. To mention only one of the results that followed from this, I might note that he finally settled the question as to who was the original discoverer of the so-called Simson Line, and he showed that Robert Simson has no claim to that honour, but that the theorem in question is due to William Wallace, who published it under a *nom de plume* in the *Mathematical Repository* (old series), ii, 111.* Popular periodicals of the type of the *Repository*, the *Lady's and Gentleman's Diary*, etc., were forms of mathematical literature that flourished in our country from the middle of the eighteenth to the middle of the nineteenth century, and were supported very greatly by non-academic mathematicians. These journals gave incontestable proof that mathematical science, and particularly geometry, was very widely studied in our country, and was a source of pleasure and amusement to many whose daily avocations required physical rather than intellectual energy. Many of the problems dealt with were of a high order, and afterwards formed a prominent part of geometrical science. The existence of the nine-point

* See Dr Mackay's paper in *Edin. Math. Soc. Proc.*, vol. ix.

circle, properties of symmedians and symmedian points, etc., were early discussed in the diaries. Dr Mackay made a close study of these journals, and the results of his labours were communicated to the French Association for the Advancement of Science at their Congress at Besançon in 1893, in a paper entitled " Notice sur le journalisme mathématique en Angleterre."

Dr Mackay's original papers were practically all published in the *Proceedings* of the Edinburgh Mathematical Society, and they constitute the most valuable record in our language of the geometry of the triangle. It is quite impossible to give here even the titles of all his papers, but it may be stated that no earnest student of any branch of plane geometry can afford to neglect his writings.* They deal with the nine-point circle, the six scribed circles of a triangle, isogonals, symmedians, and isogonic centres of a triangle. Perhaps his most valuable contributions are " The Triangle and its Six Scribed Circles," published in vol. i, vol. ii, and vol. xi of the above *Proceedings*, and " The Symmedians of a Triangle and their Concomitant Circles," in vol. xiv. The first of these two occupied several years of his leisure, and to make it as complete as possible he enlisted the services of such well-known geometers as Tucker, Neuberg, Fuhrmann, and d'Ocagne. We may judge of the completeness of the work when we know that it occupied 1600 quarto pages of MS. His paper on the " Symmedians of a Triangle " made known for the first time in an English journal the remarkable properties of the K points and of the Tucker group of circles which have as particular cases the first and second Lemoine circles, the Taylor circle, and the Adams's circle.

Dr Mackay was also the author of the articles " Calendar " and " Geometry " in *Chambers's Encyclopædia*, and " Euclid " in *Encyclopædia Britannica*. The interesting and learned article on " Numeration " in the jubilee volume of the Chartered Accountants' Association of Scotland is also from his pen.

Of his books the most important is his *Elements of Euclid* (W. & R. Chambers, Edinburgh, 1884). Like many others, it is based on the well-known edition of Robert Simson, but it shows a vast improvement on any previous text-book. Every page of it shows evidence of ripe scholarship, and it possesses what no other text-book we know possesses, viz. references to original memoirs and authorities and full historical notes. Writers of mathematical text-books in general carefully avoid introducing such personal elements, and thereby in our view make a very great

* A list of these papers will be found in the index volume of the Edinburgh Mathematical Society.

mistake.   The idea that the subject has reached its present condition by the labours of many workers, largely obscure, is very helpful to learners, and gives a humanistic trend to the study of geometry.   A Key to the *Elements* was published in 1885.

It is almost needless to say that Dr Mackay did not view with favour the departure from the Euclidean sequence.   He held that some logical sequence is necessary, and that Euclid's is superior to any more recent innovations.   Signs are not wanting that his views are now being shared by a growing number of mathematicians, who detect in our present system too much looseness and slovenliness.   He was requested to write a text-book of geometry in accordance with the recent movement; and although he complied with the request and produced his *Plane Geometry*, books i–iii in 1904, and books iv–v in 1905, they naturally have not the characteristic features of the earlier work.   His *Arithmetic Theoretical and Practical* appeared in 1899, and forms one of the soundest and most illuminating books we have on the subject.

This short account of his work will show the great service Dr Mackay rendered to mathematical learning, and the loss the scientific world has sustained by his death.