

GEORGE SALMON.* 1819—1904.

GEORGE SALMON was born in Dublin on September 25, 1819. He came of a respectable Cork family, and received his school education in his own county. He matriculated at Trinity College, Dublin, when only fourteen, and graduated in the year 1838. He was elected to a scholarship in classics in 1837, and at the honour degree examination in 1838 he obtained the first Senior Moderatorship in Mathematics. In 1840 he was awarded the Madden's premium on the results of the Fellowship examination having, in the opinion of the examiners, "best deserved to succeed if another Fellowship had been vacant." In the following year he was elected to a fellowship, and to the end of his long life he remained in the closest contact with Trinity College. He died in the Provost's House on January 22, 1904.

A Fellow of Trinity College receives the nominal salary of £40 a year, Irish currency. He is, however, elected, as a matter of course, to a tutorship, generally immediately after obtaining his Fellowship, although he may have to wait some little time for a vacancy. Furthermore, the Board, which is the supreme governing body of the University, is composed of the Provost and seven Senior Fellows. The Provost is appointed by the Crown. The Senior Fellows attain their positions in virtue of seniority.

A tutor is required to lecture twice a day during term, to assist at the ordinary examinations and to advise and direct his pupils. As a rule, the tutorial lectures are delivered to classes of from fifteen to twenty-five pass-men. Frequently a tutor, especially a man of marked ability, is appointed honour-lecturer, and he may be re-appointed year after year. An honour-lecturer is relieved of one of his classes of pass-men. Such was Salmon's tutorial work until he received the Regius Professorship of Divinity in 1866.

In accordance with the old rule which required Fellows of Trinity College to take Holy Orders, Salmon was ordained in 1844. He began at once to take part in the work of the Divinity School, as an assistant to the Regius Professor of Divinity, a post he held for twenty years. "His duties in this department were not very exacting, but they kept alive his interest in ecclesiastical questions. He was early recognised as a preacher of ability. His sermons were marked by originality of conception, vigorous common sense in the treatment, and a bold and striking, though unadorned style."† In 1852 Archbishop Whately

* The notices in the *Times* and in "Nature" have been of great assistance in drawing up this account of Dr. Salmon's life and work.

† The *Times*' obituary notice.

made him one of his examining chaplains. In 1858 he was appointed Donegal Lecturer in Mathematics, and he taught engineering students the elements of the calculus. In 1859 he proceeded to the degrees of B.D. and D.D., and he published in 1861 his first series of sermons preached in the Chapel of Trinity College.

It is evident, from what has been said, that Salmon's duties as tutor and lecturer were not of the highest order. There was much routine work in his lecturing, and much vexatious waste of time in supervising a large chamber of pupils. There was little scope in his subordinate position for the exercise of his strong personality in effecting direct improvement in the Mathematical or in the Divinity School. And owing to the method of appointing honour-lecturers, he had but little chance of permanently influencing the abler mathematical undergraduates with whom he came in contact. During these years, however, he produced indirectly in the teaching of mathematics an enormous change which extended far beyond his own university. He published his four great text-books—the "Conic Sections" in 1847, the "Higher Plane Curves" in 1852, the "Lessons Introductory to the Study of the Modern Higher Algebra" in 1859, and the "Geometry of Three Dimensions" in 1862. To a great extent those books remain the standard works on their respective subjects. They have been widely translated, and they have passed through numerous editions in the translations as well as in the original. Moreover, during his tutorship, Salmon published most of his original papers.

It was natural that a man of Salmon's originality and versatility should have desired a post of greater responsibility and of wider scope for initiation, as well as freedom from the irksome duties of a tutorship. In 1862 Salmon was regarded as the fitting successor to Graves in the chair of mathematics. Hamilton, who was working with the greatest vigour on his "Elements of Quaternions," was ineligible even had he desired to exchange the chair of astronomy for that of mathematics. At that time an examiner for Fellowship was of necessity a Fellow, but Hamilton had never sat for Fellowship. Acting on the advice of his friends, Hamilton had notified to the Board that he was a candidate for the Professorship of Mathematics when it was vacant in 1843. "Their answer through the Registrar, Dr. Wall, was an inquiry whether he intended to present himself as a candidate at the next Fellowship examination, and an intimation that in that case it would be requisite for him 'to get into full orders.' This reply concluded the negotiation."* Salmon laboured under no such disability. Next to Hamilton he was the most distinguished mathematician in the University. "He was an admirable teacher," says Sir Robert Ball, who

* Graves' "Life of Hamilton." Vol. ii, p. 423.

attended his lectures on conics and on elementary theoretical dynamics.*

Thus his qualifications were such that his election to the Professorship of Mathematics was a foregone conclusion had he become a candidate. However, about the same time the Archbishop King's Lectureship in Divinity fell vacant, and understanding that a junior Fellow who was his senior by two years would not apply, Salmon relinquished his claims on the Professorship, as he believed he would certainly obtain the Lectureship. The junior Fellow changed his mind after the chair of mathematics had been filled up, and the less distinguished but more senior man succeeded to the Lectureship. To Salmon's bitter and lasting disappointment he was forced to remain a tutor. At last, in 1866, after twenty-five years of tutorial drudgery, Salmon was made *Regius Professor of Divinity*, and consequent on his appointment he resigned his Fellowship.

It may be asked how such a state of affairs could have been tolerated: why did Salmon's university abuse his keen intellect by compelling him to deliver elementary lectures to small classes in mathematics, or, as it may have been, in logics or in classics? Why was the initiative of a strong man cramped and dwarfed by twenty-five years service in subordinate positions? The answer is that just before Salmon's election to Fellowship great changes had taken place which retarded enormously the rate of promotion in the university. The rate of promotion may be most conveniently measured by the reciprocal of the period elapsed from election to Fellowship to co-optation on the Board. At present the period averages 39 years. In Salmon's case, had he been able to retain his Fellowship, it would have been slightly shorter, and after 35 years' service he would have attained a place on the governing body. At the time of Salmon's election to Fellowship, the average period was about half its present amount, and not very long before it was much shorter still. The causes of this startling growth of stagnation are due to the cessation of church preferments, to the abolition of the celibacy statute, and to a levelling-up process in the method of paying the tutors. The salary of a tutor used to depend very largely on the number of his pupils. A tutor lectured his own pupils, and no limit was imposed on their number. Doubtless this arrangement was in many ways defective, and it was discarded for the present plan, on which a tutor does not derive any very great pecuniary advantage from a large chamber of pupils, does not necessarily teach his own pupils, and cannot accept more than a definite proportion of the matriculating students. On the other hand, an unsuccessful tutor in the olden times had little inducement to remain in College unless he

* "Proc. London Mathematical Society." Ser. 2, vol. i, p. 23.

happened to be engaged in some scholarly work. In that even he would soon obtain a professorship. Otherwise he would retire on one of the numerous college livings. Further, any member of the University of note had a good chance of a bishopric. Hamilton's predecessor at the Observatory left it for a bishop's palace just ten years before Salmon entered college. The number and the value of ecclesiastical offices steadily declined, and the college patronage was abolished by the Disestablishment of the Church of Ireland in 1869. Lastly, the celibacy statute was repealed absolutely the year preceding Salmon's election to Fellowship, and, although dispensations permitting the marriage of certain Fellows used occasionally to be procured, this repeal of the statute must have tended to increase the stagnation.

In 1866 Salmon became Regius Professor of Divinity in succession to Dr. Butcher, who had been consecrated Bishop of Meath. From this time he ceased to work at mathematics save at the Theory of Numbers, and the later editions of his mathematical works were brought out under the supervision of Mr. Cathcart, Fellow and Tutor of Trinity College. It is given to few men to attain to the first rank of investigators in two distinct provinces; but, great as was Salmon's reputation as a mathematician, it was probably equalled in later years by his fame as a theologian. His masterly "Introduction to the New Testament" is probably the most powerful polemic in the English language against the Tübingen school of critics. For the "Dictionary of Christian Biography" he wrote many of the most important articles, chiefly on the Christian writers of the second century, a period of which he made himself complete master. As lately as 1897 he published a powerful essay on the criticism of the text of the New Testament. Although he was never offered a Bishopric, no man has commanded such influence in the Church of Ireland since Disestablishment as did Dr. Salmon. In politics he was a strong Conservative.

The Disestablishment of the Church of Ireland, the reconstruction of its finances, and the revision of its formularies brought new demands upon Dr. Salmon. The Bishop of Derry said in the memorial sermon preached in the Chapel of Trinity College—"In our synods he was a most formidable debater, a most persuasive advocate. If the true function of eloquence be to win an audience, he was among the greatest speakers I ever heard; nor do I for a moment believe that his artless methods were unconscious, or wanting in the highest art." And again—"In the Councils of the Disestablished Church with what confidence they followed him. When old age had reduced his voice almost to a whisper, how the whole Synod hushed itself, and settled down to catch every word he murmured. There was a homage more exquisite than applause could give; admiration was in it, and desire for that low-

voiced wisdom ; but there was also the gratitude of men who owed him much."

While he had a fairly free hand in the control of the Divinity School, the loss of his Fellowship apparently had debarred him from having any more important share in the management of the University. This he resented, and he is said to have annoyed the members of the Board by declaring in the Synod that the only difference between Junior and Senior Fellows is that the latter are the longest livers. In 1874 he was chiefly instrumental in the origination of the Academic Council—"to co-operate with the Board and have a share in the regulation of the Studies, Lectures, and Examinations, and in the appointment and election of Professors." By a strange irony, when he became Provost, he did everything in his power to render this Council impotent.

In 1888, on the death of Jellett, Salmon was admitted Provost of Trinity College. He was then in his sixty-ninth year, and he held the office longer than any Provost since the Right Hon. Hely Hutchinson, who died in 1794. He was also the first Provost since Hutchinson who was not a Fellow at the time of his election. It was no light task to which he was called. The governing body of the University of Dublin consists, as has been said, of the Provost and the seven Senior Fellows, the Provost being appointed by the Crown, and the Senior Fellows attaining their position by virtue of seniority. This board transacts practically all the business of the University. Its members hold the offices of vice-provost, registrar, bursar, senior lecturer, senior dean, catechist, auditor, and senior proctor. In addition, it not unfrequently happens that a member of the board is librarian, or that he takes part in the examination for fellowship, or in some other important examination. There is nothing to correspond to the Cambridge syndicates, unless it be the medical school committee or the academic council, and of the former a member of the board is chairman, while at least three senior fellows and the provost have belonged to the latter since its inception, the provost being the *ex officio* chairman. Enough has been said to show the difficulty of Dr. Salmon's office as the head of a responsible board overloaded with duties of the most multifarious kind—a board composed of eight men whose united ages at one time approached, if they did not exceed, the magnificent total of five hundred and eighty years. "There is, said Salmon, one thing worse than an incompetent Bursar, and that is an indispensable one," when only one member of the board was fit to undertake the arduous office.

The period of Salmon's Provostship was in many respects a critical time in the history of Trinity College. The evils spoken of had

grown to a head. The Senior Fellows were not what they had been—men co-opted in the prime of life, who had escaped the allurements of matrimony and the seductions of great ecclesiastical positions. They were the survivors of a set of men whose constitutions had been most thoroughly tested by the rigours of an appalling examination. Since Dr. Salmon obtained Fellowship, the number of professorships and lectureships has been doubled. Many of the professorships then held by Fellows or by ex-Fellows are held by Fellows no longer. A new and most important body of men has come into existence—the non-Fellow professors—men hardly thought of in the days when all power and all authority was vested in the Provost and the seven Senior Fellows. One might have anticipated that he who had done so much in founding the Academic Council, and who had felt so keenly the subordination of his former positions, would have been instrumental in drawing closer together the members of the teaching staff. It may have been that his initiative was blunted by his twenty-five years of tutorial duties. It may have been that his duties as Provost—for many years the one really strong man on the Board—were so laborious that he had little time to consider matters which did not claim his immediate attention. There can, however, be no doubt that in later years his sympathies did not lie with the development of science. As a member of the Board of Intermediate Education, he did not take part with those who tried to foster the study of science in the secondary schools in Ireland.

While it may be questioned whether he did all that was possible to widen the scope of her usefulness, Trinity College must ever be grateful to her late Provost for the noble conservatism with which he defended her independence. He was willing to afford Roman Catholics every facility for religious exercises within the walls of Trinity College, but he would suffer no clerical interference, whether from the Church of Ireland or from the Church of Rome. The University which gave Sylvester the B.A. degree, which his own University refused because he would not subscribe to the Thirty-nine Articles, retains its old spirit of tolerance. The remaining tests were swept away by the Tests Act of 1873.

Salmon's power and influence were such that it was difficult, if not impossible, to carry out any change of which he disapproved. It is true he did not favour rendering Greek an optional subject, or admitting women to the University of Dublin. But these changes were made in his extreme old age, when he had grown weary of prolonged controversy. He appeared to take the keenest delight in fighting a case. However carefully prepared his opponent might be, Salmon generally found a weak part in his armour. He would not always attack an obvious defect in a proposal; he would employ the

most fantastic and ingenious reasoning to show that under certain circumstances the plan would not work, and he would not be satisfied until he got the worst of the argument ; or he would use his inimitable powers of ridicule to make the thing appear absurd. Yet no one could be more direct in his conversation, in his writings, even in his funeral sermons.

Salmon's generosity was as unbounded as it was unostentatious and disinterested. His hospitality was splendid, and of the kindest nature. He shone pre-eminent in whatever company he might be found. His after-dinner speeches were deservedly reckoned among the chief attractions of public dinners in Ireland, and those who had the good fortune to breakfast quietly with him have not been able to forget the charm of his simplicity, of his humour, and of his kindness.

His figure was well known in Dublin—nearly every afternoon he might be seen wandering through the streets. He was a great lover of music, a great chess-player, an omnivorous reader of novels. His fund of amusing stories was inexhaustible. His jokes were circulated through the clubs. Men of all classes and creeds read his theological works and talked of them. They "were no sooner published than the learned men of two continents acclaimed them ; and their men of letters smiled over controversies more witty than anything since Pascal, and of a humour more benign than his."* He had no taste for metaphysics ; he despised rhetoric ; he cared little for painting or architecture, and for poetry he did not care at all. Salmon's constructive faculty was not remarkable when judged by the exceptionally high standard of his other brilliant gifts. His destructive power, for example, was immense, and it is known that in his later years he satisfied himself he had demolished some of the intellectual edifices he himself had raised. He had a marvellous capacity for separating the grain from the chaff of a mathematical or of a theological argument, and what he retained he generally adorned. He excelled in the use of happy illustrations of the simplest but of the most telling nature. No less wonderful was the rapidity with which he grasped an argument and the readiness with which he replied. A stranger in the synod hall might, during the course of a debate, have looked pityingly and half contemptuously at an ungainly and rather untidy old clergyman, scribbling hastily and without interruption on little scraps of paper. He might have seen that the writer was not taking notes of the speeches, but was working arithmetic, searching for primes or finding the recurring periods in their reciprocals. He would be surprised when he saw this strange figure struggling to his feet and proceeding to talk to the synod. His surprise would give place to astonishment

* The Bishop of Derry, *loc. cit.*

and admiration when he found that Salmon had missed no point in the long debate, had assimilated everything, and was explaining his views with an incredible wealth of homely illustration, with abundant wit, and with matured common sense.

For many years Salmon was greatly attracted by the theory of numbers. He said it almost amounted to a disease with him, and he regarded his work on it as frivolous or useless. Having nearly completed a book on the subject, he burned it for some unknown reason. In addition to the intrinsic fascination of the subject, he may have found that this work relieved him of boredom, or it may have served as an anodyne; and one may hazard the suggestion that the destruction of his book was a kind of penance. In his latest years he ceased working on the theory.

Salmon's first paper was published in 1844, 'On the Properties of Surfaces of the Second Degree which correspond to the Theorems of Pascal and Brianchon on Conic Sections' ("Phil. Mag.," 24); the last of his forty-one mathematical papers was 'On Periods in the Reciprocals of Primes' ("Messenger of Mathematics," 1873, pp. 49-51). The majority of his papers have reference to numerical characteristics relating to curves and surfaces, and many of these results are summarised in the great chapter "On the Order of Restricted Systems of Equations" in his "Modern Higher Algebra." It would be most unfair to Salmon to judge of his contributions to mathematics by his papers alone. He had a great dislike to the physical trouble of writing; he modestly communicated his discoveries to friends, or reserved them for incorporation in his books, so that it is a matter of extreme difficulty to say how much is his. Apart from the discovery of new facts, the methods employed in his books must have been of tremendous service in promoting the advance of mathematics. His style was characterised by complete absence of pedantry and by profound common sense. By a few words, by some geometrical illustration, he dispensed with pages of troublesome analysis. At times the great condensation of his diction may conceal from the casual student the width and the depth of his conclusions, but on referring to an original memoir from which he quotes one is amazed to find that every essential point is reproduced, and that frequently some brilliant addition has been made and left unclaimed by him.

It must not be supposed that Salmon shared the characteristic attributed to MacCullagh of shirking analysis and trusting to his great geometrical insight. On the contrary, he seemed to revel in analysis so tedious and so intricate that it would be distasteful to most mathematicians. He says: * "By means of the differential equation I

* "Treatise on Modern Higher Algebra," Art. 260.

calculated the invariant E. Its value was given at length in the second edition, where it occupied thirteen pages, but I have not thought it worth while to reprint so long a formula." To the volume which contained this elaborate investigation, and many others involving equal skill and almost equal labour, he prefixed the words: "To A. Cayley, Esq., and J. J. Sylvester, Esq., I beg to inscribe this attempt to render some of their discoveries better known, in acknowledgment of the obligations I am under, not only to their published writings, but also to their instructive correspondence." It is, however, curious that the fascination of arithmetical work should have detained Salmon on calculations such as that of E at a time when Boole's great conception was pushing on the mathematical world to feverish haste in new discovery. Salmon's treatises contain a lucid and comprehensive survey of the subjects with which they deal, so that they are almost indispensable to the advanced mathematician. They still retain a commanding position among the best of text-books for beginners. But there is wanting in them the indescribable aroma of a great classic, and something of the suggestiveness and of the poetry. They lead by the shortest way to the solution of each individual problem, and well did Cremona describe Salmon as "*il più popolare de' matematici in tutto il mondo.*"

Of Salmon's original contributions to science, the most worthy of notice are his solutions of the problem of the degree of a surface reciprocal to a given surface; his researches in connection with surfaces subject to given conditions, analogous to those of Chasles in plane curves; his classification of curves of double curvature; his conditions for repeated roots of an equation; and his theorem of the constant anharmonic ratio of the four tangents from a point on a cubic curve.

He was awarded a Royal Medal in 1868, and the Copley in 1889. He was elected into the Society in 1863. He received the honorary degrees of D.C.L. Oxford, 1868; LL.D. Cambridge, 1874; D.D. Edinburgh, 1884; D.Math. Christiania, 1902. He was an honorary member of the Academies of Berlin, Göttingen, and Copenhagen; a Fellow of the Academy of the Lincei and of the British Academy.

C. J. J.
