Sir Michael Francis Atiyah, O.M.

22 April 1929 – 11 January 2019

President of The Mathematical Association 1981-82, Honorary Member 2016

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The past Presidents of The Mathematical Association appear to have fallen into two classes: those who have been honoured by the Association for the work they have done within mathematics education and those, fewer in recent years, who were outstanding mathematicians and, it might be said, honoured the Association for its work in mathematics education by accepting the duties associated with being its President. Michael Atiyah, arguably Britain's greatest 20th century Pure Mathematician fell into this second group. This did not mean that Michael had paid scant attention to the problems of mathematics education for, to give examples, he served on the Committee which gave rise to the Cockcroft Report and also was, for a time, a Trustee of the School Mathematics Project. Yet it is for his great contributions to the advancement of mathematics that he will always be remembered.

Michael was born in London, the son of a Lebanese father and a Scottish mother who had met when students at Oxford. At the time of Michael's birth his father was a civil servant in Khartoum and it was there he spent his childhood, although to avoid the summer heat the family often spent their summers in London. Aged five, Michael entered the Diocesan School in Khartoum and after leaving that in 1941 he studied at Victoria College, Alexandria, a boarding school run on English public school lines and one which his father had attended. His great talents were already to be seen and he found himself in a class in which most boys were two years older – a problem he survived by helping the bigger and older boys with their homework. When the war ended in 1945 the family left Khartoum to live permanently in England. However, because of his advancement Michael, then 16, had already obtained his Higher School Certificate (the equivalent of today's A-levels). It was decided that he should spend the two years before a hoped-for entry to Cambridge to read mathematics attending

a school that had an outstanding reputation for preparing boys for that university's entrance examinations, Manchester Grammar School. In 1947 it was from there that he won a scholarship to Trinity College.

This was, however, in the days of National Service and Michael opted to get that out of the way before taking up his scholarship. He then showed another streak of natural ability by gaining permission to cut this short in order to spend time preparing to enter Trinity College in 1949, from where he graduated in 1952. He then began research for his PhD under the supervision of William Hodge (M.A. President in 1954-55). Already he had published papers as a sole author but now he also produced joint papers with Hodge. In 1954, a year before he obtained his PhD, he became a Fellow of Trinity College. The year 1955 saw his marriage to Lily Brown a fellow mathematician who had obtained a Cambridge PhD under the supervision of Mary Cartwright (M.A. President 1951-52) and the award of a scholarship which enabled him to spend two years at the Institute for Advanced Study at Princeton. On his return to England he was made a College Lecturer and in 1958 he became a Fellow at Pembroke College. In 1960 he moved to Oxford University, initially as a Reader, but in 1963, a year after he was elected an FRS, he became the Savilian Professor there. Already his work was becoming internationally recognised and at the 1966 International Congress of Mathematicians, held in Moscow, he was awarded a Fields Medal (the greatest accolade for a young mathematician to receive) for his work on developing a new and powerful technique in topology − K-theory (the title of his first book which appeared the following year). In 1969 he returned to Princeton, as a Professor there, before returning to Oxford in 1972 as a Royal Society Research Professor. He remained at Oxford until 1990 when he returned to Cambridge as Master of Trinity College and the first Director of the Isaac Newton Institute for Mathematical Sciences. From 1990 to 1995 he was also President of the Royal Society.

During his career he published a further nine books on various aspects of mathematics and later seven volumes of his Collected Works appeared. He was the recipient of numerous medals, including two from The Royal Society, and awards from countries around the world including elections to numerous scientific societies, along with well over thirty honorary degrees. He was knighted in 1983 and in 1992 became a member of the Order of Merit.

In 2004, jointly with Isadore Singer, he was awarded the influential Niels Abel Prize 'For their discovery and proof of the Index Theorem and their outstanding role in building the bridges between mathematics and physics'. This was achieved by the way in which they brought together topology, geometry and analysis. The manner in which, from his great knowledge of mathematics, he 'brought together' different branches of mathematics was probably his greatest contribution to scientific research.

These reflections go some way towards describing Sir Michael as a mathematician but what was he like as a man? In [1], Nigel Hitchin, one of

the many distinguished mathematicians whose PhD studies he supervised, wrote:

> 'With a naturally effervescent personality he possessed, in Singer's words, 'speed, depth, power and energy'. His strong voice could be heard across many a departmental common room explaining some crucial point. Collaborations were all-important, bouncing ideas around, two or three people in front of the blackboard, exploring ideas, erasing them, sudden insights. This also held for his students – he needed continuous feedback and challenges. He had a natural talent for lecturing: leaving the lecture theatre you always had the feeling you had understood things, though trying to reproduce them later was a different matter. Beauty in mathematics was a feature he took seriously. It was in evidence in so many of his ideas and proofs and in his later years he actually instigated a neurological experiment to detect its presence.'

For *Gazette* readers this was exemplified in the paper he wrote for its centenary issue [2]. In his Presidential Address [3] Michael had spoken about geometry, its teaching in schools and how it had been viewed by mathematicians over the years. In his second paper he considered the interrelation of geometry and physics. Two fine examples of his knowledge, thought and style. The Association must be proud of its attachment to him.

After retiring as Master of Trinity College in 1997, Michael moved to Scotland, the homeland of his wife Lily. Even there his work did not end for he became an Honorary Professor at Edinburgh University and, in 2003, President of the Royal Society of Edinburgh, having been elected to that body in 1985 and already recipient of two of its medals. There he became very much engaged on focusing attention on the work of that great Scottish scientist, James Clerk Maxwell – efforts which were rewarded by the erection of a statue of him in George Street, Edinburgh. The statue was unveiled in November 2008, shortly after Sir Michael had completed his three-year term as president of the RSE. In the years that followed he was still active but perhaps less so. In July 2018, Lily died and he followed not long after.

References
1. Nigel Hitchin, *Sir Michael Atiyah* (1929-2019), IMU-Net 93: January 2019, A Bimonthly Email Newsletter from the International Mathematical Union. Available online at: http://www.borovik.net/selecta/uncategorized/sir-michael-atiyah-obituaries/
2. Michael Atiyah, Geometry and Physics, *Math. Gaz.* **80** (March 1996) pp. 78-82. Accessed March 2019 at https://www.jstor.org/stable/3620334
3. Michael Atiyah, What is geometry? *Math. Gaz.* **66** (October 1982) pp. 179-184.

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