Sir Andrew Huxley celebrated his ninetieth birthday on 22 November 2007

SIR ANDREW HUXLEY

You no doubt have deduced that I was born during the First World War. I was born in Hampstead, and when I was a few years old I remember being terrified when searchlights illuminated the clouds, no doubt because of unconscious memories of being hurried down to the ground floor when searchlights indicated that a German air raid was in progress.

My father was Leonard Huxley (1860–1933), one of the sons of Thomas Henry Huxley who had died in 1895. He was first a master at Charterhouse School, near Godalming in Surrey, but then wrote the *Life and Letters* of his father and also of Joseph Hooker, botanist and close friend of T.H.H., and of Charles Darwin. After that he worked for the publishers Smith Elder, first as a reader and later as editor of the *Cornhill*, a literary magazine. His first wife was Julia Arnold, a grand-daughter of the famous Thomas Arnold, Headmaster of Rugby School, and a sister of the novelist Mrs Humphry Ward. They had four children, including the biologist Julian and the novelist Aldous. Julia died in 1908, and in 1912 my father married my mother, Rosalind Bruce, who was thirty years his junior. They had two sons, David born in 1915 and myself two years later. Julian and Aldous were thus my half-brothers, but Julian was thirty years older than me and Aldous twenty-three years, so they were more like uncles than brothers.

My parents were careful to avoid making us feel that we had to live up to the Huxley name. I remember being puzzled why boys at my prep school asked whether I was related to Julian or Aldous. That school was the junior branch of University College School, and then I had one year in the Senior School in Frognal. Both of these were within walking distance of our home. I started working at Latin and Greek, which continued at Westminster School to which I was transferred in 1930. In those days I had to wear a top hat when travelling by bus to school, with Eton jacket until I reached a certain height and then a morning suit. After one year I was elected to a non-resident King's Scholarship, and when I arrived at the school I had to put on a gown and change my tie for a white bow tie.

Two years later, my grandmother took us on a Hellenic Cruise. This started at Venice, and we were then taken down the Dalmatian coast to Greece, where we saw all the proper things, including the Parthenon, and also the ruins at Tiryns, represented in the huge painting by Edward Lear in the Parlour.

My mother was very good with her hands, and encouraged us in woodwork. My boyhood interests were all mechanical, and when I was fourteen she gave us a metal-turning, screw-cutting lathe. With it we made a 6 cc. two-stroke internal combustion engine that worked beautifully. I also turned wood with it, and I made a pair of candlesticks which are now on the mantelpiece of our dining room. I had this lathe in the basement of the Lodge while I was Master, and it is now in the garage of our home in Grantchester.

My mother therefore felt, rightly, that I ought to switch from Classics to Physics. This was resisted by our Headmaster, Dr Harold Costley-White, who said that I would be 'forsaking virtue for pleasure'. However, I did switch, and I was taught Physics extremely well by J.S. Rudwick, father of the geologist Martin Rudwick whom the older ones among you will remember as a Title A Fellow.

Westminster School has long-standing links with Christ Church at Oxford and with Trinity at Cambridge. I won a major Entrance Scholarship to Trinity and came

up in 1935 to read Natural Sciences. For Part I of the Tripos I had to choose three sciences. Physics and chemistry were obvious choices, and for my third a friend a few years older than myself recommended physiology, on the ground that, even in the first year, I would be taught things that were still controversial, unlike physics and chemistry that were all cut-and-dried. I had excellent supervisions in physiology from William Rushton and chose it for my Part II. E.D. Adrian (later Master) told me that, if I wanted to make a career in physiology I ought to qualify in medicine because, in those days, all teaching appointments in physiology went to persons with a medical qualification. So I registered as a medical student and spent my third year doing the necessary anatomy, mostly dissecting the human body. I therefore postponed my Part II to my fourth year (1938–39).

This turned out to be one of the best years of my life. There were only twelve of us in the class, including three who became Fellows of the Royal Society, and two very nice girls. One of these later married one of the sons of the writer Naomi Mitchison. The other was Beridge, the second daughter of George Mallory, who lost his life on Mount Everest in 1924; sadly she died soon after the war. I also knew slightly Clare, the eldest daughter of George Mallory. She married Glenn Millikan, son of the famous American physicist R.A. Millikan who had measured the electric charge on the electron. Glenn was then a Lecturer in Physiology. He was a most entertaining person, and was extremely good to many undergraduates including myself, taking us out in his car on Sundays for walks around Cambridge. He also involved me in some of his experimental work and in the development of an ultraviolet spectrophotometer. This was never completed because of the outbreak of war. He and Clare moved to the United States in 1939. Tragically, he was killed in a climbing accident soon after the end of the war.

My best-known scientific work was done jointly with Alan Hodgkin, who was four years older than me. I first came into contact with him in my first term at Trinity (November 1935), through an introduction from David Hill (see below). My diaries show that we lunched together once in 1937 and several times in 1938. He gave me supervisions in 1938–39, when I was doing Part II Physiology. In the Long Vacation of 1939 he went to the Marine Biological Laboratory at Plymouth in order to do experiments on the very large nerve fibres (diameter about half a millimetre) possessed by squids. He invited me to join him, which I did on 5 August. Our first attempt was to measure the viscosity of the interior of the fibre by suspending it vertically and dropping droplets of mercury down. This failed because the mercury droplets stopped as they entered the fibre, showing that its interior was a solid, not a viscous liquid as we had supposed. Hodgkin saw that we could make use of this position of the fibre by pushing an electrode down from the top, so as to measure directly the potential difference between inside and outside. According to all the textbooks of the time, the interior of a fibre at rest was up to one-tenth of a volt negative relative to the external solution but rose to equality with the external potential at the peak of a nerve impulse. We confirmed this as regards the resting state, but the internal potential at the peak of the impulse was substantially positive. We published our result in a short letter to *Nature* with no discussion and no explanation. In 1945 we published a full-length paper in the *Journal of Physiology* with four possible explanations, all wrong. It was also in 1945 that we began discussing the correct explanation: the membrane becomes specifically permeable to sodium ions. These are about ten times more concentrated in the external solution than inside the fibre, so they diffuse inwards carrying their positive charge. This now seems terribly obvious, and I was reminded of T.H. Huxley's remark when he first

made himself master of the central idea of Darwin's *Origin of Species*: 'How stupid not to have thought of that'.

We were not able to follow up this observation, as war with Germany was obviously imminent. We left Plymouth on 30 August and Hitler attacked Poland on 1 September. After the war we got back to further analysis of the permeability changes.

Retiring ages for Cambridge academics were introduced in 1926, when the Colleges were given new Statutes. Those already holding appointments were allowed to choose to remain under the old Statutes, and J.J. Thomson, who had become Master of Trinity in 1918, did make this choice and remained Master until he died in 1940 at the age of 84. He was thus Master throughout my undergraduate period, and as a Scholar I was invited to lunch with him once each year. He was easy to talk with. He was notoriously absent-minded, and there was a story, perhaps apocryphal, that on one occasion his wife found a pair of trousers in his bedroom and assumed that he had gone out without trousers.

The rules for retirement of the Master of Trinity under the new Statutes are that he is initially appointed to age 70 but that this can be extended to 75 by a vote of the Fellows. Hodgkin was appointed Master in 1978. All the Masters appointed since 1926 – G.M. Trevelyan, E.D. Adrian, and R.A. Butler – had been prolonged, and I assumed that Hodgkin would also be prolonged, and that I could not be asked to succeed him because I would be past the initial retiring age. In fact he was not prolonged and I was offered the position. I thought that an injustice had been done to him and I did consider declining the invitation for that reason, but the temptation was too great and I did accept. The Master's Lodge is very spacious and comfortable and the duties are not very onerous, so I enjoyed my time as Master very much.

I have been much influenced by members of three well-known families, the Trevelyans, the Hills, and the Wedgwoods. The wife of George Macaulay Trevelyan, historian and Master of Trinity, was a niece of my father's first wife, and through this connection I was invited to lunch with him many times during my undergraduate years. I was also invited to join him at his holiday home in Northumberland. He taught me to shoot, which we did largely on the fields belonging to his elder brother Sir Charles Trevelyan, living in the splendid eighteenth-century family house, Wallington. I thus got to know Sir Charles's family, especially his younger son Geoffrey, who has remained my closest friend.

The best-known member of the Hill family was A.V. Hill, famous for experimental and theoretical work on nerve and muscle. He was always known, even to his wife, as 'A.V.'. I got to know him through his son David, who was one of the first people I met when I came up to Trinity. David was then starting his second year, and he introduced me to many of his contemporaries. Contact with them was one of the most important components of my education. It was through A.V. that I got into 'operational research' during the war. In 1960 I was comfortably established as a Fellow of Trinity and it was largely through persuasion by A.V. that I accepted the chair of Physiology at University College London, where I remained until I was appointed Master here in 1984.

My contact with the Wedgwood family came about through my wife, Richenda née Pease, who was a grand-daughter of Josiah, the first Baron Wedgwood. I never met him because he died before I met Richenda, but I was familiar, through newspaper reports, with his entertaining and often irreverent remarks in the House of Commons before he was made a Baron. Through her I met Ralph Wedgwood, head of the London and North Eastern Railway after the amalgamation of 1923, his daughter

Veronica Wedgwood the historian, and Camilla Wedgwood, the anthropologist. All of these were most interesting people.

After my retirement, we moved back to our very nice house in Grantchester. Since my wife's death five years ago, I have stayed on in that house with our eldest daughter, who never married. One way and another, I have been very lucky throughout my life.