J. mar. biol. Ass. U.K. (1997), 77, 1261-1262
Printed in Great Britain

JOHN ZACHARY YOUNG (1907–1997)

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Originally published in Nature, vol. 388, 21 August 1997

Zoologist who paved the way for modern studies in neurobiology

John Young, who died on 4 July aged 90, was one of the most distinguished biologists of the century – he himself made several seminal discoveries, and he had a great influence on the work of many others either directly or through his writings.

A zoologist by training and by inclination, JZ (pronounced the English way, 'Jay Zed') was passionately interested in how animals work, especially in the operation of their brains. But his restless curiosity and disdain for conventional academic boundaries led him to work in, and write about, areas that others might label physiology, neuroscience, experimental psychology or philosophy. He was eclectic but did not hesitate to go deep (as he used to put it) into whatever was his interest of the moment. Many are the collaborators who can vouch for his amazing grasp of detail in what they had hitherto thought of as their own subject area.

Born in Bristol, JZ was educated at Marlborough College and Oxford University, where he became a Fellow of Magdalen College before being appointed to the chair of anatomy at University College London in 1945.

The breadth of his achievements can be shown by considering his work – first as a cephalopod biologist, then as a teacher and, finally, as a neuroscientist. For some zoologists, JZ was an outstanding authority on cephalopods (the octopuses, squids, cuttlefishes and nautiloids). His first scientific paper, published in 1929, was about an organ that he had discovered on the stellate ganglion of the octopus. For nearly 70 years he continued to write papers and books about these animals, and many of them have long been classics.

JZ also wrote many papers about his experiments on octopus learning, in which he tried to establish the basis of memory. With his collaborators, he showed that octopuses have distinct stores in the brain for visual and touch memories, and that each of these has a complex arrangement of accessory lobes that help to establish memories and gain access to them. But the octopus brain proved to be far more complicated than he originally envisaged, and this aspect of his work languished in recent years.

For a far wider group of students and zoologists, JZ was a teacher – a textbook writer *par excellence*. His *Life of Vertebrates* (1950), *Life of Mammals* (1957) and modestly titled *Introduction to the Study of Man* (1971) each became, and remain, standard texts, widely translated. And it is not difficult to see why. They were well illustrated, authoritative, comprehensive and, above all, beautifully written. The ability to express himself simply was one of JZ's greatest gifts, and it made him a brilliant lecturer as well as writer. He brought to his lectures an excitement and an infectious enthusiasm that came from the heart. There was absolutely no pretence in him: he found animals and brains so fascinating (one of his favourite epithets) that he could not but convey that fascination to his listeners.

He was also a teacher in the broader sense, eager to convey to a wide audience the very essence of science (witness the title of his 1950 Reith Lectures: *Doubt and Certainty in Science*), and bold enough to speculate about the possible wider implications of an experimental result. This boldness runs through his later exploratory works, which differ from the writings of many superannuated scientists in that they make no concessions to mysticism and are remarkable for their humility. He recognized the absurdly wide canvas on which he was working, but felt that it was his duty to attempt it. JZ was convinced that understanding the human condition must involve studying the organ of study itself – the brain.

Finally, for neuroscientists of all kinds, JZ was the person who, in the 1930s, discovered the giant nerve fibres of squids, paving the way for the experiments that established how nerves transmit information. He made that discovery because, purely through intellectual curiosity, he looked for the squid equivalent of the organ that he had found on the stellate ganglion of the octopus. Unable to see it under the microscope, he cut sections of the squid stellate ganglion to confirm its absence, and observed a series of enormous, tubular structures that he at first took to be blood vessels. However, further observations and simple but crucial electrical stimulation experiments convinced him that each 'tube' was, in fact, a single nerve fibre – a so-called 'giant' fibre. The largest such fibres were nearly 1 mm in diameter and over a hundred times fatter than a mammalian nerve.

JZ immediately recognized the significance of his discovery. He showed his preparation to physiologists on both sides of the Atlantic, who succeeded in placing electrodes inside the giant fibre. They established that there was a small potential difference between the outside and the inside, and that this reversed when a signal passed along the axon. In 1963, Alan Hodgkin and Andrew Huxley were deservedly awarded a Nobel prize for their elegant experiments on the squid giant fibre, but there are many who thought that the award might have been extended to include JZ.

What kind of person was it who could achieve all of this? Complex, certainly – a curious mixture of self-confidence and humility, impatience and perseverance. With his indomitable drive to achieve, he could be irascible and inconsiderate, and he was often genuinely puzzled by the behaviour of those living life at a slower pace. Once, at the Naples Zoological Station, he rebuffed a visitor for trying to speak to him as he was walking down a corridor, and later complained, "Can't people see you're going somewhere?". Yet, having gained his attention, you would encounter immense courtesy and charm.

He was perhaps at his best in the pub after a hard day's work, talking enthusiastically about his results and yours, sharing his passion for the science that was his life. These attitudes stemmed from his socialist principles and deep humanism. The patrician style went hand in hand with the common touch: he loved the warm-hearted people of Naples, and of the many honours that came his way he especially cherished the honorary citizenship that this city bestowed on him in 1991.

All of us in his 'scientific family', as he called us at his ninetieth birthday party in April, mourn his death. But we remember his life and cherish the privilege of having known him.

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