Christopher Longuet-Higgins

Hugh Christopher Longuet-Higgins was an outstanding scientist who made lasting contributions in two separate fields—theoretical chemistry and artificial intelligence. He was an applied mathematician of exceptional gifts, whose ability to see to the mathematical heart of a scientific problem transcended all disciplinary boundaries. He is survived by his younger brother Michael, who is a distinguished geophysicist

Christopher was born in Kent, the second of three children of the Reverend Henry Hugh Longuet-Higgins, and Albinia Cecil Longuet-Higgins, *née* Bazeley. He was educated at Winchester (where he was a contemporary of Freeman Dyson, whose brilliance in physics he said led him to avoid going in for that subject) and at Oxford, where he studied both music and chemistry. (While his career lay in science, he was also an exceptionally fine pianist, capable of brilliant improvisation in the late romantic style, with a deep love and understanding of music that sustained him throughout his life.)

While still an undergraduate, he published an important paper with his tutor Ronald Bell on the structure of diborane, from which several subsequently confirmed predictions concerning the existence and structure of similarly electron-deficient molecules followed. Later, he provided an analysis for the structure in terms of a novel type of bond whose existence he proved on the basis of Mulliken's molecular orbital theory, and which led to a complete analysis of the structure of the boranes. This work formed part of his PhD at Oxford under Charles Coulson, a pioneer in applying statistical and quantum mechanics to the analysis of molecular structure. He was briefly at the Universities of Chicago and Manchester, before being appointed to the Chair of Physics at King's College London in 1952. Two years later, he moved to take up the John Humphrey Plummer Chair of Theoretical Chemistry at Cambridge, whose previous incumbent had been John Lennard-Jones, Coulson's advisor and another founding figure of British quantum chemistry. He stayed at Cambridge until 1967, applying mathematical techniques to problems in theoretical and practical chemistry, including a foundational group-theoretic analysis of the symmetry of non-rigid molecules. During this period he also began his work on the formal analysis of music. He was elected a Fellow of the Royal Society in 1958, a Foreign Associate of the National Academy of Sciences of the United States of America in 1968, and a Fellow of the Royal Society of Arts in 1970.

In 1967, Christopher made a startling change of field, giving up his Cambridge chair and moving to the University of Edinburgh under a Royal Society Research Professorship, where he joined Richard Gregory, and Donald Michie in founding what was then called the Department of Machine Intelligence and Perception. He began research on diverse topics in artificial intelligence and cognitive science (as he christened the field in his 1973 commentary on the Lighthill report on the state of AI research), including neural computation, automated musical analysis, and computational natural language processing. He produced a number of remarkable papers in this period, among which several were as foundational to his new field as his earlier papers were to the old, particularly in the areas of associative memory models and the computational representation and analysis of harmony and metre in music.

In 1974, he moved to the University of Sussex, transferring his Royal Society professorship to the Department of Experimental Psychology, whose chair Stuart Sutherland had long been an advocate of research in AI. He continued to work on computational language understanding and musical analysis, and also began work on visual scene analysis using information from stereopsis and motion, work which continues to be influential in both psychology and machine vision.

This late work exemplifies a strong characteristic of Christopher's work throughout his career, namely his astonishing ability to recognise where others could not the susceptibility of well-known open problems to immediate exact solution by applied mathematics. His work (which is often spoken of as having been worthy of a Nobel prize) opened up many new areas of research that his students and others built their own research careers upon where he had shown the way. It is perhaps for this contribution that Christopher will most be remembered.

Throughout his career, Christopher worked hard to build and strengthen the many institutions he worked in. He has been credited with taking the already distinguished department at Cambridge to preeminence in the world in theoretical chemistry. At Edinburgh, besides the department he helped to found, he and the theoretical linguist Jimmy Thorne founded the School of Epistemics, an interdisciplinary research group including computer scientists, linguists, psychologists, and neuroscientists, establishing a tradition of collaboration across those fields that continues to this day. At Sussex, he helped to found a similarly interdisciplinary Institute of Cognitive and Information Sciences, which he later directed. He was a Governor of the BBC from 1979 to 1984, and his contributions to his many fields were recognized by many honorary degrees.

As a teacher and colleague, he was demanding, and he could be impatient with ideas and lines of research that he did not himself view as promising, a judgement on which he was frequently correct, but not invariably so. He was capable of devastating interruptions in colloquia, and equally penetrating remarks in conversation. However, he was also a kind and generous teacher, unstinting in the time he would devote to students and colleagues. His many distinguished graduate students, among whom are the physicist Peter Higgs and the computational neuroscientist Geoffrey Hinton, are grateful for his teaching. They and his many colleagues have been strengthened by interacting with one of the very finest scientific minds of our age.