obituary

Arend Bouhuys

AREND BOUHUYS died on board the *Queen Elizabeth 2,* of a sudden and unexpected heart attack, on 15 June 1979, at the early age of 53. He had resigned from his appointment at Yale University and was on his way to Europe to become chairman and professor of the Department of Physiology at the University of Utrecht in his native country.

His untimely death has deprived occupational medicine and respiratory physiology of an active and brilliant research worker who had made an outstanding contribution to environmental lung disease and, in particular, byssinosis or brown-lung disease suffered by textile workers.

Bouhuys was born in Deventer, in The Netherlands, in 1925. He graduated MD at Utrecht in 1948. He spent his early years as a resident in internal medicine and chest diseases and as an instructor in physiology. He soon developed a special interest in pulmonary disease and methods of measuring lung function. At the age of 29 he was appointed head of the Pulmonary Function Laboratory at the University of Amsterdam. He had by then become interested in byssinosis and in 1959 he published the first of a series of original papers on effects of cotton, flax, and hemp dust exposure on respiratory symptoms and lung function.

In 1962 he left The Netherlands to take up an appointment in Emory University School of Medicine in Atlanta, Georgia. Two years later he was made a Fellow of the John B. Pierce Foundation in New Haven and was offered an associate professorship at Yale University where, in 1968, he was appointed full Professor of Medicine and Epidemiology. During his 15 years at Yale his output was prolific. He published 86 original research papers, two books on the physiology of breathing and lung disease and numerous review articles and abstracts. In 1975 he became managing editor of *Lung* which, under his direction, attracted good papers and increased its circulation.

By using computers for recording and analysing respiratory symptoms (by questionnaires) and lung function, he developed sensitive and accurate methods of measuring acute and permanent changes in lung function from exposure to air pollutants. In this way he advanced epidemiological techniques for investigating chronic respiratory disease in communities. His most ambitious study, undertaken by a multidisciplinary team, was of 8,000 community residents in urban and rural districts in Connecticut and a rural population in South Carolina.

Two of his most valuable papers were published a year before he died. One gave new equations based on height, age and weight for predicting normal lung function values in healthy blacks and whites. The other paper was published in *Nature* **276**, 466-471, (1978). It produced evidence from his own and other studies that cigarette smoking and textile dust exposure were far more deleterious to health than out-door air pollution. He concluded that no measurable effects could be expected from further air pollution control with respect to prevalence of chronic bronchitis, asthma and loss of lung function, but, instead, there should be systematic efforts to prevent cigarette smoking and to control exposures to textile dusts and other inhalant risks at work.

In Utrecht he planned to continue research into isolating the causal agent of byssinosis.

If Arend Bouhuys had not been strongly motiviated to apply his considerable skills and energy to the prevention of lung disease, he would have remained a laboratory research worker. Instead, with his co-research workers in various parts of the world, he undertook field studies of textile workers in several countries, including Spain, Holland and the United States. In the U.S. he focussed attention on brown-lung disease, which had been overlooked. His research findings and his own personal commitment helped to establish strict occupational health requirements for US cotton workers through dust control and medical surveillance.

He is survived by his wife, Fenna, who helped him a great deal in his work, particularly in preparing papers; a son and four daughters, two by a former marriage.

R.S.F. Schilling

P.C. Caldwell

THE DEATH of Professor P.C. Caldwell FRS, on 6 June 1979 at the age of 52 saddened his many friends and came while he was still at the height of his powers.

He was born in Warrington and belonged to a family which had lived there for several hundred years and prospered despite suffering heavy penalties for its steadfastness in the Roman Catholic faith. He was sent to Ampleforth School and there his exceptional academic gifts were recognised but these were so varied that the choice of career proved difficult. He finally decided on a scientific career and went as a scholar to Trinity College, Oxford where he studied physical chemistry for his first degree.

After graduating he stayed in Oxford to do research with Sir Cyril Hinshelwood on nucleic acid in bacteria. Together they showed that DNA per cell mass was related to the rate of growth, and hence protein synthesis, and discussed the need for a relationship between nucleic acid and protein, suggesting that two nucleotides would specify one amino acid. This was the first discussion of the coding problem.

From Oxford Peter Caldwell went to work with Professor A.V. Hill and Sir Bernard Katz at University College, London. It was there that be began his main life's work on the application of physico-chemical methods to biological problems. He made the first successful experiments in which micro-electrodes were used to measure intracellular *p*H. This led to a whole field of study in which similar electrodes are used to measure intracellular ion activities *in vivo*. In the course of this work he made the useful discovery that the leg muscles of the crab *Maia squinado* consisted of very large fibres 1-2 mm in diameter.

A.V. Hill believed very strongly that physicists and chemists entering biophysics should be sent to a marine biological station and so exposed to a great range of biological material and problems. It was not surprising, therefore, that Caldwell moved next to the Marine Biological Association's Laboratory in Plymouth and there, and at Bristol University, he continued to make key experiments in difficult and very competitive fields of study, often inventing powerful new techniques. With Sir Alan Hodgkin, Professor R.D. Keynes and other colleagues he played a leading role in the spectacular post-war advances in our knowledge of nerve and muscle.

Among the results of his many studies were: the first determinations of ATP, arginine phosphate and orthophosphate in single cells; providing the first example of a spatially orientated enzyme in a living membrane showing different sensitivities to inhibition on its two sides; and finding, on single crab muscle fibres, the first evidence that *ionised* calcium exists in very low concentrations in cells and that cell activity can be triggered by an increase in this calcium level. At Bristol University he trained a series of postgraduates in research and, with them, made important progress in our knowledge of the influx and efflux of substances from living cells. He was elected FRS in 1975.

Caldwell had many interests to which he gave himself wholeheartedly and in all of these his knowledge was deep and his technical skill so high that he could deal