Obituary

Albert Claude, 1899–1983

from Christian de Duve and George E. Palade

ALBERT CLAUDE, who died in Brussels on Sunday 22 May, belonged to that small group of truly exceptional individuals who, drawing almost exclusively on their own resources and following a vision far ahead of their time, opened single-handedly an entirely new field of scientific investigation.

He was born on 23 August 1899, in Longlier, a hamlet of some 800 inhabitants situated in the heart of the Belgian Ardennes. His mother developed breast cancer when he was 3 years old, and he was with her most of the time to witness the progress of the disease until she died four years later. He attended the village school for a few years, but then his family moved to the German-speaking village of Athus, where, as he has recounted, he found himself learning to read German in Gothic, without understanding it. Amazingly, his school education stopped there.

At the age of 12, he went to work in the local steel factory, where he had risen to the position of draughtsman by the time the First World War broke out. During the war, Claude served underground in occupied Belgium for the British Intelligence Service, and earned several military distinctions.

The activities and disturbances did not prevent Albert Claude from pursuing an intense process of self-education. His childhood dream had been to study medicine, but his lack of a high-school diploma barred his access to medical school. Reluctantly, he prepared, and passed successfully in 1921, the entrance examination to the School of Mining Engineering, for which a high-school diploma was not required. Then something of a miracle happened. He was able to take advantage of a government disposition — obviously not intended for him — allowing war veterans to enter a university without a diploma or examination. He immediately enrolled in the Medical School of the University of Liège — not without a good measure of apprehension as he believed that the courses were given in Latin. He graduated as an MD in 1928, one year ahead of the regular curriculum.

As a student, Claude was already fascinated by cells:

"I remember vividly my student days, spending hours at the light microscope, turning endlessly the micrometric screw and gazing at the blurred boundary which concealed from us the mysterious ground substance where, one felt, the secret mechanisms of cell life might be found. Until . . . I realized that I should stop that futile game, and should try something else. In the meantime, I had fallen in love with the shape and the color of the eosinophilic granules of leucocytes, and attempted to isolate them. I failed — and consoled myself later on in thinking that it was technically premature, especially for a premedical student, and that the eosinophilic granules were not pink, anyway."

(Out of Claude's Nobel lecture.)

Having failed in his first project, Claude went on to study the fate of the mouse sarcoma S-37 when grafted in rats. The thesis he wrote on his observations earned him a government scholarship which he used to go to Berlin. There he first worked at the Cancer Institute of the University, but was forced to leave prematurely after showing that the bacterial theory of cancer genesis propounded by Blumenthal, the Institute's director, rested on faulty experimental manipulations: the simultaneous inoculation of cancer cells with the incriminated bacteria. Claude then joined the Danish scientist Albert Fischer, a pioneer of tissue-culture techniques.

By then, Claude knew exactly what he wanted to do — isolate and characterize the agent of the Rous sarcoma — and where to do it — The Rockefeller Institute for Medical Research. With his characteristic mixture of naive directness and unselfconscious assurance, he wrote out a research project and sent it to Simon Flexner, the director of the Institute, asking to be admitted in one of the Institute's laboratories. It is to Flexner's credit that he reacted favourably to this unconventional approach and Claude sailed from Antwerp on Friday the 13th of September 1929 to spend the next 20 years at the Rockefeller Institute, first bringing to fruition his project on the Rous sarcoma virus, and moving on from there to prepare the fulfillment of his main dream: to enter the cell, 'the mansion of our birth'.

In 1949, he accepted a pressing offer from the Free University of Brussels to assume the directorship of the Jules Bordet Institute. Claude brought to his new duties the same thoroughness and perfectionist attention to detail that he had devoted to his scientific work. But it took him several years before he was able to return to the cell. He retired from the Bordet Institute in 1971, and moved to a new laboratory offered to him by the Catholic University of Louvain. In 1974, he was awarded the Nobel Prize in Physiology or Medicine. We were honoured to share it with him.

Claude's scientific career developed logically from a deep interest in cancer — the disease that killed his mother. His work at the Rockefeller Institute showed that the 'chicken tumour I agent' (Rous sarcoma virus) was a complex of ribonucleic acid, protein and phospholipid that lost its activity upon UV irradiation, the inactivation spectrum coinciding with the absorption spectrum of nucleic acids.

But then in the late 1930s, he discovered that similar complexes (without the biological activity of the agent) were present in large amounts in the cells of chick embryos he used as controls. These normal complexes became in time 'small granules' and finally 'microsomes'. That was the beginning of a rather long side voyage that led him into the heart of the cell, not in search of a virus, but with the determined intent to find out whatever there was in it in terms of isolatable particles, and to account for them in a careful quantitative manner. It was a glorious voyage during which he worked out his now classic cell-fractionation procedure. Most of what we know today about the chemistry and activities of subcellular components is based on his quantitative approach. Claude enjoyed isolating whatever was isolatable: from microsomes to 'large granules' (later recognized as mitochondria), chromatin threads and zymogen granules. The isolated particles were characterized in terms of their basic chemistry and — in the case of the large granules — in terms of enzymic activities in work done with G. Hogeboom, W. Schneider and R. Hotchkiss. It was a very impressive harvest for a relatively short period of about 8 years during which his attention was naturally and logically diverted to a new approach, electron microscopy.

In 1945 he succeeded with Keith Porter and Edward Fullam in getting electron micrographs of cultured fibroblasts in which 'a lace-like reticulum' could be clearly seen below the limit of resolution of the light microscope. In time, this reticulum became the now well known endoplasmic reticulum of all eukaryotic cells. Two years later, using essentially the same approach and working with K. R. Porter and E. Pickels, Claude finally found the chicken tumour I agent in infected cultured cells.

One year later, he gave a travelogue of that historic voyage at the Harvey Society. His lecture retraces in memorable fashion the construction of those two pillars of modern cell biology: cell fractionation and electron microscopy. It heralds the beginning of three decades of unprecedently rapid developments worked out in many laboratories throughout the world.

Albert Claude approached science and the other facets of human culture — he was a friend of the painter Diego Rivera and of the musician Varèse — with the candid and unprejudiced open-mindedness of the unschooled. In some ways, he could serve as a good example for the proponents of nature versus nurture. Yet, he was also a child of his environment, reflecting in his attitude the simple commonsense and fierce individualism of the Ardennais peasants, deriving his love of life and beauty from the rugged countryside in which he spent a lonely and dreamy childhood, marked by the "blues of the blueberries and of slate, the blue-green of the fir-trees, new comers among the oaks, the blue-grey of the covered skies, but also in full summer, by the clear waters and the black nights on the milky way" (quoted from a letter of Claude to Marcel Florkin). □

Christian de Duve is at the Catholic University of Louvain and at The Rockefeller University and George E. Palade is at the Yale University School of Medicine.

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