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BOOK REVIEW

Imagining the Elephant: A Biography of Allan MacLeod Cormack

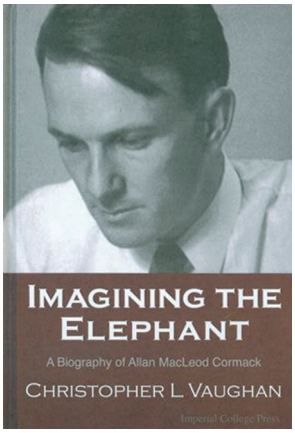
C.L. Vaughan. Imperial College Press; 2008, 324 pages, $51.00.

In our professional readings, it is valuable on occasion to step back from the standard journal articles and textbooks and take a look at the pioneers in medicine and physics to understand the struggles that brought us to our current level of sophistication. Such an insight into the development of CT is available now in the intriguing biography of the Nobel Laureate in Medicine and Physiology, *Imagining the Elephant: A Biography of Allan MacLeod Cormack*.

Starting from his humble origins in the most northern part of Scotland, John O'Groats, to the stage in Stockholm, one reads of the building blocks that formed the life and career of Allan Cormack. When reading the review and before reading the book itself, one can speculate as to the meaning of the title *Imagining the Elephant* and imagine how it fits in with Cormack's seminal work in CT.

Early in this biography, one gets the flavor of the history of Scotland, particularly in the most northern reaches of the Highlands. From there, we see the many components that shape a productive and valuable life: early education in South Africa; a curiosity shaped by his teachers, A.A. Jayes in particular; development of debating skills; and an alternating interest in science from engineering to mathematics to physics. The value of a well-rounded exposure to many areas of science is clear when we read of Cormack's first publication in an astronomy journal and then a second publication in a geology journal. His first academic appointment was as a lecturer in physics at the University of Capetown (UCT), but he shortly went to Cambridge University (1947) to pursue further studies and research in physics at the Cavendish Laboratory. It was here that he met his future wife Barbara, a Bostonian, who was also a Cambridge student.

On his return to UCT, he became involved in microbiological research, but it was an appointment at the Groote Schuur Hospital in the radiology department in radiation therapy where he first was exposed to medicine and the questions surrounding differences in radiation doses during treatment. A sabbatical leave at Harvard in the Cyclotron Laboratory resulted first in a paper published in *Acta Crystallographica* on the mathematic calculations of cylindrical structures. He then worked on calculating attenuation of an x-ray beam through the head. Articles that were critical in the recognition of his work for the Nobel Prize were published in the *Journal of Applied Physics* (1963, 1964), but as Cormack himself noted, "There was little response" to this article.



Jumping back to UCT for 3 months while on the faculty at Tufts University, he continued his work on what is termed the "line integral problem" and had his first positive results on a phantom that resembled the brain. Returning to Tufts, he built a prototype computerized axial tomography (CAT) scanner (which incidentally is now in the Smithsonian Institution) and during the same period became involved in proton beam therapy and positron-emission tomography scanning at Massachusetts General Hospital.

An intriguing part of the book describes the simultaneous work by Godfrey Hounsfield, who shared the 1979 Nobel Prize with Cormack. Independent of Cormack's work, Hounsfield, an engineer, developed a commercial CAT scanner for EMI in 1972. Cormack, aware of this work, wrote to Hounsfield (the letter is reproduced in the book) but received no reply; in fact, there was no direct contact between these Nobel Laureates for 7 years. Described in the latter part of the book is the introduction of the Hounsfield CAT scanner and the clinical results at a 1972 neuroradiology meeting in New York, which, as this reviewer recalls, was a course run by the late Manny Schecter from Albert Einstein Medical School. Then in December of 1972, CAT scanning was presented for the first time at the annual meeting of the Radiological Society of North America.

From this point on, we are made aware of the contributions of luminaries in neuroradiology, nuclear medicine, and neurology in furthering the development of CAT scanning, namely Drs Di Chiro, Ambrose, Kuhl, Oldendorf, and Lauterbur.

Now the intrigue of the workings of awarding the Nobel Prize comes into play; specifically when it became widely known that Godfrey Hounsfield was being considered for the Nobel Prize, the Provost at Tufts University wrote a letter supporting Cormack's work. It is here that the readers get a glimpse into how nominations for the prize occur. The key elements that seemed to have secured Cormack's nomination for the prize included the fact that he had constructed a scanner that incorporated linear and angular scanning and that he had developed a mathematic algorithm for accurately reconstructing images. Most interesting, the algorithms used by Hounsfield were dissimilar to those used by Cormack, but nonetheless both understood the enormous leap forward that this type of image generation would have on the future of medicine. This was understood by others who were involved in the seminal work in CAT scanning development. Therefore, we can see where the book title comes from—as is mentioned "like the proverbial six blind men, we had all recognized the elephant together."

Cormack received the call informing him of the Nobel award in October 1979. Soon thereafter, a congratulating letter, reproduced in the book, was sent from President Carter to Cormack. (I note that Carter misspells Cormack's middle name "McLeod" instead of MacLeod.) It is fascinating to note that Hounsfield, apparently being an extremely shy person, requested that Cormack make the 3-minute Nobel acceptance speech for both of them, which Cormack did. That brief speech and Nobel Lecture ("Early Two-Dimensional Reconstruction and Recent Topics Stemming from It") are both reproduced in their entirety.

Cormack never did earn a PhD, but he did receive an honorary doctorate from Tufts. This and the fact that Cormack, a

mathematician and a physicist, won the Nobel Prize for Medicine and Physiology, are 2 great ironies of his life. Cormack continued to work in radiation therapy and pondered and wrote about humanitarian issues and ethical scientific concerns.

Allan Cormack was found to have bile duct cancer in 1997 and died shortly thereafter. His ashes are interred in an urn near a granite rock in New Hampshire.

Although the writing in the book can be faulted to some degree for its jumping back and forth from year to year and not following a life's story in a clear chronologic order, Allan Cormack's biography shows how a person with an inquisitive mind who is well trained in the basic fundamentals of science can make contributions affecting a discipline (such as medicine and radiology) ostensibly remote from his primary field of expertise.

This book is recommended to those interested in medical history and to those who want an insight into a brilliant and productive life.

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