

# Preface

I think I am an Elephant,  
Behind another Elephant  
Behind *another* Elephant who isn't really there ...

AA Milne (1927)

In December 2007, we celebrated the 40th anniversary of the world's first heart transplant, performed by Dr Christiaan Barnard and his team at Groote Schuur Hospital. That event on 3 December 1967 focused international attention on Cape Town and led directly to the recognition that South Africans were capable of conducting world-class research in medical science. As important as Barnard's contribution was, however, I believe that an even more momentous breakthrough in medical science took place ten years earlier at the University of Cape Town. It is the story of computer assisted tomography (or CAT).

In August 1957, Allan MacLeod Cormack returned to the University of Cape Town (UCT) from a year's sabbatical at Harvard University. Although he had accepted a position as an Assistant Professor of Physics at Tufts University in Boston, the Council of UCT required him to return to Cape Town for three months to fulfill his teaching obligations to the university. On Thursday 5 September, in the basement of the physics department, Allan conducted the experiment that would later lead to a seminal publication in the *Journal of Applied Physics* in 1963. This research, which had been initiated during the first six months of 1956 when Allan worked with Dr James Muir Grieve in the radiology department at Groote Schuur Hos-

pital, ultimately led to the award of the Nobel Prize for Medicine in 1979, an honour that he shared with Godfrey Hounsfield.

When Allan died on 7 May 1998 I approached his family, both in South Africa and in the USA, with a view to creating a research group at the University of Cape Town that would honour his contributions to science. They readily agreed to my request and in May 2000 we launched the Medical Imaging Research Unit, which has been inspired by the idea that it is possible to conduct world-class research here on the southern tip of the African continent.

This biography on Allan Cormack had its genesis in 2003 when I spent a sabbatical year in Ireland as a Walton Fellow in the Department of Electrical Engineering at University College Dublin. Ernest Walton was Ireland's first (and so far only) Nobel Laureate in the natural sciences, having shared the physics prize with John Cockroft in 1951 for "their pioneer work on the transmutation of atomic nuclei by artificially accelerated atomic particles". In celebration of the centenary of Walton's birth, Vincent McBrierty, an Emeritus Professor of Polymer Physics at Trinity College Dublin, published a biography on Ernest Walton in 2003. That got me thinking. Maybe I could do the same thing for Allan Cormack.

In mid-2004 I approached the family with my idea and again they responded positively. The past three years have been an odyssey for me, as I have travelled from Cape Town to England, visiting Cambridge University, where Allan studied from 1947–1950, to Scotland, where his forebears all originated, to Boston in the USA, where he spent the last 40 years of his life. As you will see from the chapter titles, I have extended this analogy of a journey to the description of Allan's life. It begins in the far north of Scotland, at John O'Groats, stops off at Jo'burg, Table Mountain, Cambridge, Cape Town, Boston and Stockholm, and finishes in Massachusetts.

One of the challenges for any author who completes a book is to select a title that captures the essence of the subject. My challenge was no different. The primary source for *Imagining the Elephant* comes from the famous Indian legend, captured in the poem by John Godfrey Saxe (1816–1887):

It was six men of Indostan,  
To learning much inclined,  
Who went to see the Elephant  
(Though all of them were blind),  
That each by observation  
Might satisfy his mind.

Two scientists, in writing about computer tomography, have also alluded to this legend. The first was the late Paul Lauterbur, with whom I exchanged e-mail messages in October 2004. He won the Nobel Prize for Medicine in 2003 for his work in magnetic resonance imaging and he knew Allan Cormack well. He and Allan were on the organising committee for a workshop entitled *Techniques of Three-Dimensional Reconstruction* that was held at the Brookhaven Laboratory on Long Island, New York in 1974. This is what Lauterbur said to me just over three years ago:

Bob Marr and I toyed briefly with the idea of a follow-up meeting, until we realized that, unusually for scientific meetings, the first one had been so successful that another one was not needed – like the proverbial six blind men, we had all recognized the elephant together.

The other person was George Ellis, a distinguished cosmologist and applied mathematician at the University of Cape Town who wrote an essay on Allan Cormack for a recent book celebrating South Africa's Nobel Laureates. Here's what Ellis wrote:

Consider the age-old example of the elephant. If all you had ever seen of an elephant was a photograph taken from one viewpoint, you would not understand it very well. A series of pictures from a whole variety of vantage points would let you know much more about it – indeed you can build up a 3D image in your mind from an array of 2D images.

This is the essence of tomography, which is captured in the whimsy of AA Milne's poem about Christopher Robin in *Now We Are Six*, and quoted at the beginning of this preface. A CAT scanner allows us to uncover the identity of objects that would otherwise be hidden in a traditional 2D X-ray image. When confronted with this challenge 50 years ago, Allan started to think about the problem *ab initio*. It did not take him long to realise the problem was a mathematical one and so he set about devising a suitable algorithm for solving the problem.

There's another connection between Allan Cormack and the elephant. In December 1945 he and his friends from UCT hiked and climbed in the Cederberg, a mountain range about two hours' drive north of Cape Town. They came across an ancient rock painting, estimated to be two thousand years old, illustrating the Khoisan bushmen and elephants. I know this because I discovered a black and white photograph of the painting in Allan's personal album (see Figure 2.9). While the bushmen and elephants can no

longer be found in the Cederberg, the stunning painting endures and a photo of it has been used to illustrate the back cover of this book.

I twice heard Allan speak. The first occasion was on Monday 16 March 1981 when he delivered a public lecture at UCT on ‘Computer Tomography: Past and Future Portent’. His self-deprecating humour was in evidence, with the audience particularly enjoying his recollection of the lack of interest shown in his original publications and his anecdote of a CAT scanner being used in the search for a skier buried under an avalanche!

The second occasion was on Saturday 16 April 1994 when Allan was a keynote speaker at the Thirteenth Southern Biomedical Engineering Conference in Washington DC, and I was a Professor at the University of Virginia in nearby Charlottesville. He spoke on ‘CT Scanning up to the Appearance of the EMI scanner’ and again I was struck by his *joie de vivre* and genuine love of science. So, although I was never formally introduced to Allan MacLeod Cormack, I feel that I have come to know him well during these past three-and-a-half years.

I have written the text in a style and at a level that I hope will be accessible to all readers who have an interest in biography, and not just those scientists who may wonder how it was that a physicist, who solved a mathematical algorithm, came to win the Nobel Prize in Medicine. I trust you will enjoy reading this story about a family man who was often described as a ‘modest genius’.

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