

## Alexander Aitken

**Alexander Craig Aitken** (April 1, 1895 – November 3, 1967) possessed an astonishing computational brain. He could multiply two nine-digit numbers in his head in 30 seconds, and convert fractions to 26 decimal places in less than five seconds. He could perform a series of calculations by mental arithmetic, store them in his mind and finally bring them altogether to get a final answer to a complicated mental calculation. His interest in the



meaningful structures and patterns of what he remembered was his edge. He could recall the first 1000 decimal places of  $\pi$  (some sources claim he knew  $\pi$  to 2000 places), by reciting them in groups of 5, organized in rows of 10 such groups. However, Aitken is not known only for his phenomenal mental powers. His mathematical work was in statistics, numerical analysis and algebra. He contributed to econometrics in applying matrix algebra to problems in numerical analysis. He published papers on symmetric groups, invariant theory, eigenvalue problems, solutions of polynomial equations, and computational algorithms.

Aitken was born in Dunedin, New Zealand, where he attended Otago Boys' High School. He was not a child prodigy; in fact he did poorly in arithmetic until he was nearly 14. At that time his gift for mental calculations surfaced, and from that point on he was absorbed with numbers. His amazing computational powers were not due to some unexplained phenomenon, as with certain so-called idiot savants. He diligently practiced mental calculation, depending only on a most prodigious memory. In his last school year he taught himself to play the violin. Frederick Delius' secretary, Eric Denby, described Aitken as the most accomplished amateur musician he had known. In 1912 Aitken finished in first place in the nationwide University Scholarship Examination. He began a study of languages and

mathematics at Otago University, intending to become a schoolteacher, but World War I interrupted his studies. He enlisted and departed from New Zealand with the Sixth Reinforcements of the Otago Infantry, seeing action in Gallipoli, Egypt and France, before being wounded at the Battle of the Somme. After three years in a hospital he was sent home in 1917, but his war experiences haunted him for the rest of his life.

Following his recovery Aitken returned to the university, graduating in 1918 with First Class Honors in Latin. His instruction in mathematics was not first-rate and he received only Second Class Honors in Mathematics. He took a teaching position with Otago Boys' High School. Then he won a postgraduate scholarship that allowed him to study at Edinburgh University in Scotland. Aitken wrote a PhD thesis on the "smoothing of data" under the direction of E.T. Whittaker. This dissertation was considered so remarkable that he was awarded a D.Sc. and was appointed to the position of Lecturer in Statistics and Mathematical Economics at Edinburgh, where he spent the rest of his life. Aitken applied statistical methods to the theory of linear models and developed what is now the standard vector/matrix notation for the Linear Regression Model and its extensions. This and his Generalized Least Squares estimator are of great value in Econometrics. He wrote several books, including *The Theory of Canonical Matrices* (1932), with H.W. Turnbull. In 1939 he published *Determinants and Matrices* and *Statistical Mathematics*.

Aitken's mentor Whittaker regarded him as the greatest mathematician since Arthur Cayley. Aitken died in 1967 after a protracted illness. The annual student award given by the New Zealand Mathematics Society is named in his honor. One of his students recalled:

"Professor Aitken's first year mathematics lectures were rather unusual. The fifty minutes were composed of forty minutes of clear mathematics, five minutes of jokes and

stories and five minutes of “tricks.” For the latter Professor Aitken would ask for members of the class to give him numbers for which he would then write down the reciprocal, the square root, the cube root or other appropriate expression.”

Aitken’s brilliant memory was also his curse. His memories of the war did not fade and his horrific recollections of the battle of the Somme lived with him as real as the day he lived them. He wrote of them in *Gallipoli to the Somme*. What follows is a passage from that work.

“I slid the rifle-sight to ‘450’, aimed and fired ... The Turk plunged into the trench in a swirl of dust ... This, of course, was what I was there for, but it seemed no light matter, and kept me awake for some time. I would come to no conclusion except that individual guilt in an act of this kind is not absolved by collective duty nor lessened when pooled into collective responsibility. I further found that I bore the Turk no trace of enmity – nor for that matter did any of us; he was to us “Johnny Turk” or “Joe Burke”, almost a fellow sufferer. We were not indoctrinated against him, as we had been against the Germans by propaganda, the cartoons of Louis Raemakers, and tales of atrocity. But I saw, still further, that this Turk, at the moment of the shooting, had not even been a person; he might have been big game. It was a single step to the thought that certain “colonial” campaigns, not infrequent in our annals, might have been conducted in almost this game-hunting spirit. Here I balked; to become analytical might lead to doubt of the cause for which we were fighting; for this had been called, in those early years, the “war to end war.” I was far from such doubt then, and would have repudiated pacifism.”

Many people are unduly impressed with those capable of making mental calculations, while not overly impressed with those capable of mathematical reasoning. As students they may have been required to

do mental arithmetic, leading them to believe that correct calculations were the ultimate purpose of mathematics. Fortunately, this misconception is losing steam with the advent of electronic calculators, which enable even those who can barely remember the multiplication tables to make extraordinary calculations in precious little time. No one is in awe of calculators for the speed of their calculations. Skill in mental arithmetic shouldn't be confused with mathematical talent. It's not making calculations that is a mathematical gift; it is knowing which calculations to make, when to make them, where to make them, and why to make them.

**Quotation of the Day:** “Familiarity with numbers acquired by innate faculty sharpened by assiduous practice does not give insight into the profounder theorems of algebra and analysis.” –

Alexander Aitken