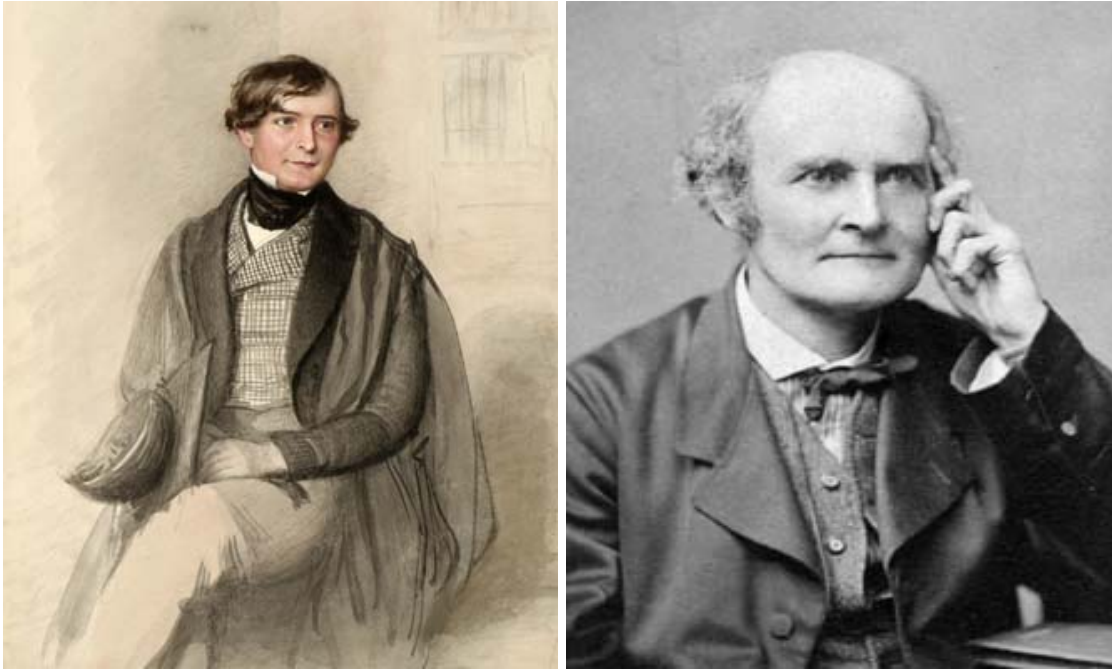


Taken from the book: Men of Mathematics by E. T. Bell, 1937.

Cayley (1821-1895) the inventor of matrix algebra.



A British mathematician of the 19th century. He was born at Richmond, Surrey.

Cayley began his university career at the age of seventeen at Trinity College, Cambridge. Among his fellow students he passed as "a mere mathematician" with a queer passion for novel-reading. His mathematical genius showed itself very early. The work on his greatest fame rests is in the theory of algebraic invariants. He entered the field in 1845 with his pathbreaking memoir: "On the theory of linear transformations". At the time he was twenty four. In 1846 Cayley left Cambridge. No position as a mathematician was open to him. He was called to the Bar in 1849. On being admitted to the Bar, Cayley made a wise resolve not to let the law run off with his brains.

Three outstanding contributions to mathematics in addition to his work on the theory of algebraic invariants are:

- i) He invented the theory of matrices
- ii) He invented the geometry of space of n dimensions
- iii) One of his idea in geometry threw new light (in Klein's hands) on non-Euclidean geometry.

One of his great inventions is that of matrices and their algebra in its broad outline. The subject originated in a memoir of 1858.

We should highlight an interesting phenomenon of frequent occurrence in the history of mathematics: The necessary mathematical tools for scientific applications have often been invented decades before the science to which the mathematics is the key was imagined. The bizarre rule of multiplication for matrices, by which we get different results according to the order in which we do the multiplication (unlike common algebra where $x \times y$ is always equal to $y \times x$), seems about as far from anything of science or practical use as anything could possibly be. Yet sixty seven years after Cayley invented it, Heisenberg in 1925

recognized in the algebra of matrices exactly the tool which he needed for his revolutionary work in quantum mechanics.

In 1863 Cambridge University established a new professorship of mathematics and offered the post to Cayley, who promptly accepted. As he gradually aged his mind remained as vigorous as ever and his nature became, if anything, gentler. To younger men and beginners in mathematical careers he was always generous with his help, encouragement and sound advice.

Cayley continued in creative activity up to the week of his death, which occurred after a long and painful illness, on January 26, 1895. To quote the closing sentences of Forsyth's [Forsyth was a pupil of Cayley and became his successor at Cambridge] biography: "His life had a significant influence on those who knew him: they admired his character as much as they respected his genius: and they felt, at his death, a great man had passed from the world.

Sylvester (1814-1897)



Sylvester did important work on matrix theory

Sylvester, a friend of Cayley and fellow mathematician, he prepared for a legal career, and in 1850 was called to the Bar. Thus he and Cayley came together at last. Cayley was twenty nine, Sylvester thirty six at the time; both were out of the real jobs to which nature had called them.

Lecturing at Oxford thirty five years later Sylvester paid grateful tribute to "Cayley, who, though younger than myself is my spiritual progenitor-who first opened my eyes and purged them of dross so that they could see and accept the higher mysteries of our common Mathematical faith."

Sylvester gloried in the fact that the great mathematicians, except for what may be classed as avoidable or accidental deaths, have been long-lived and vigorous of mind to their dying days. In his presidential

address to the British Association in 1869 he called the honor roll of some of the greatest mathematicians of the past and gave their ages at death to bear out his thesis that "...there is no study in the world which brings into more harmonious action all the faculties of the mind than the[mathematics],...or, like this, seems to raise them, by successive steps of initiation, to higher states of conscious intellectual being.... The mathematician lives long and lives young; the wings of the soul do not early drop off, nor do its pores become clogged with the earthy particles blown from the dusty highways of vulgar life."

Sylvester was a living example of his own philosophy. But even he at last began to bow to time. In 1893-he was then seventy nine-his eyesight began to fail, and he became sad and discouraged because he could no longer lecture with his old enthusiasm. The following year he asked to be relieved of the more onerous duties of his professorship, and retired to live, lonely and dejected in London. All his brothers and sisters had long since died, and he had outlived most of his dearest friends. But even now he was not through. His mind was still vigorous. Late in 1896, in the eighty second year of his age, he found a new enthusiasm in a field which had always fascinated him, and he blazed up again over the theory of compound partitions and Goldbach's conjecture that every even number is the sum of two primes. He had no much longer. He died on March 15, 1897, at the age of eighty three. His life can be summed up in his own words: "I really love my subject."