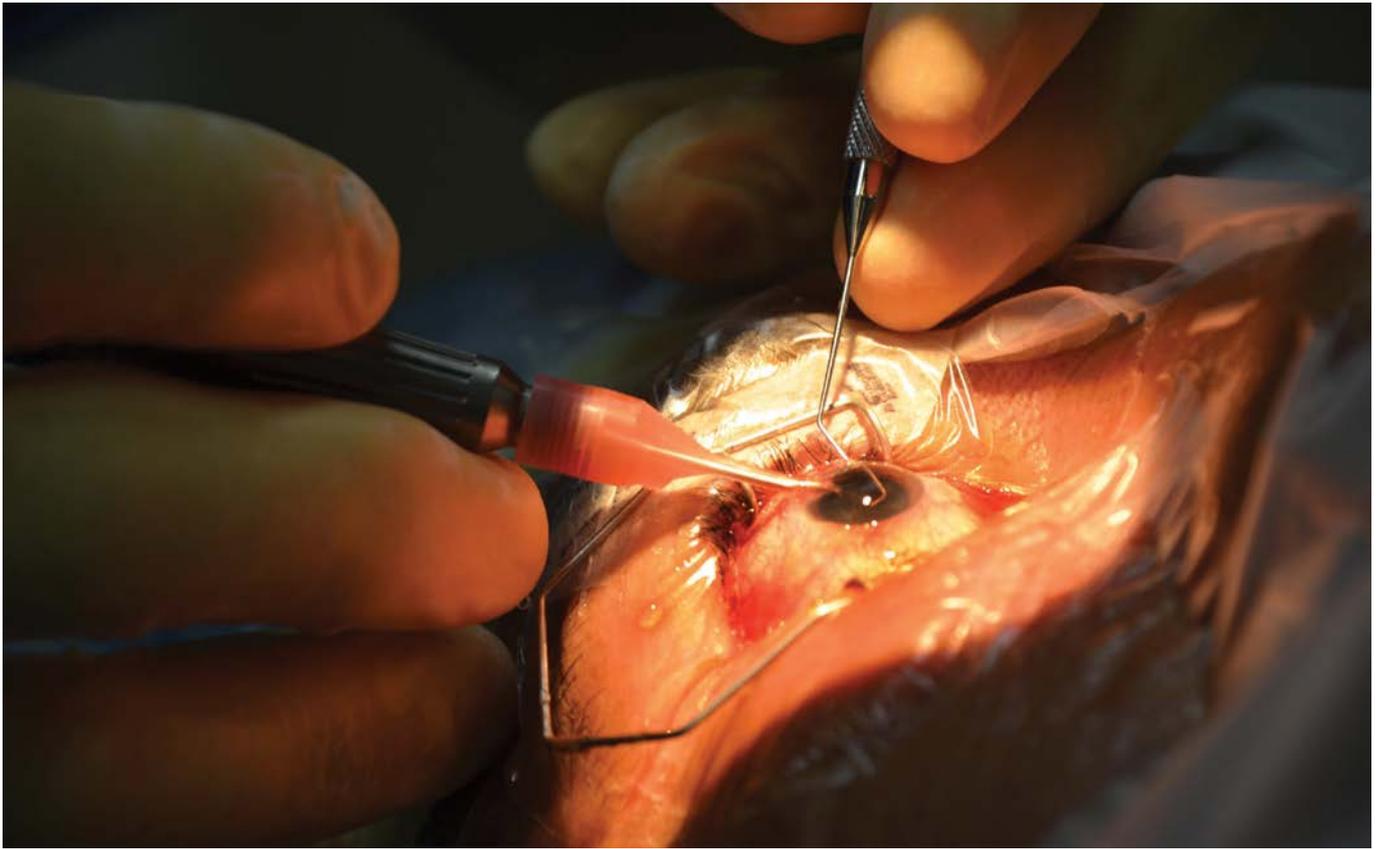


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# OUR INNOVATION NATION

*Mike Bruton tells us about some local inventions that put South Africa on the world stage*

Did you know that a South African ophthalmologist used his own invention to operate on Nelson Mandela’s eye the day before his inauguration as President? Or that one of our greatest inventors was also a war hero?

## Cryoprobe

Dr Selig Percy Amoils briefly studied mechanical engineering prior to attending medical school at the University of the Witwatersrand, where he qualified in 1956. He used his combined training in engineering and medicine to good effect when he invented the ‘cryoprobe’, a pencil-shaped device with a frozen tip that is used for eye surgery. When he first demonstrated the device at the University of Oxford in 1965, he was still a young, unknown medical doctor, but his invention made him famous as it changed the course of cataract and retinal surgery worldwide.

The cryoprobe works by freezing gas that is released from a small nozzle under high pressure in a closed tube. When the probe is inserted into a cut in the eye and the gas is switched on, it freezes to a cataract, which can then be removed. In 1983 Dr Amoils used the cryoprobe to cure British Prime Minister Margaret Thatcher of retinal detachment after laser surgery had failed to do so. Then, in May 1994, he famously removed a cataract from President Mandela’s left eye the day before his inauguration.

Miraculously, Madiba was able to read his speech at the ceremony without using spectacles!

Dr Amoils also invented the rotary epithelial scrubber, an improvement on the brush first developed by the Greek ophthalmologist Ioannis Pallikaris to remove epithelial cells from the cornea in preparation for laser eye surgery. Then, in 1970, he developed diamond vitrectomy cutters, a group of medical instruments that facilitate very fine control of blade depth during eye surgery, as well as the oval comparator to control astigmatism after cataract surgery.

Dr Amoils was richly rewarded for his multiple contributions to ophthalmology. In 1975 he received the Queen’s Award for Technological Innovation and the Medal of Honor from the US Academy of Applied Science.



**The South African Mint’s latest range of collectable coins includes the 2020 Crown and Tickey series in sterling silver honouring Dr Amoils’ invention.**

South African Mint

In 2005, then President Thabo Mbeki awarded him the Silver Order of Mapungubwe for 'Excellence in the field of ophthalmology and for inspiring his colleagues in the field of science'.

### Tellurometer

Trevor Wadley was arguably our greatest inventor, our own Thomas Edison. He was born in Durban, the seventh child in a family of 10, and from an early age was an avid tinkerer, taking things apart to see how they worked. He once connected the family telephone to a radio speaker so that he could listen to his sister's calls to her boyfriend! Later in life he re-engineered an electric lawnmower into a small electric car. After obtaining electrical engineering degrees from the universities of Natal and the Witwatersrand, he served in the Signal Corps during the Second World War, during which he made such important contributions to the design of radio and radar equipment that he was promoted from lieutenant to major in just four years.

Wadley's radio innovations ensured, in particular, that platoons on the battlefield could stay in contact with their commanders at headquarters. During the war he also developed the 'panoramic adapter' that allowed the viewer to monitor a wide range of radio frequencies in a particular waveband, which was of great strategic value.

After the war Wadley joined the telecommunications research laboratory of the newly formed CSIR, where he perfected the Wadley loop receiver, a unique circuit for cancelling frequency drift. In 1947 he invented the automatic ionosonde, which measures radio wave reflections from the ionosphere. The reflectivity of the ionosphere is what makes the use of shortwave radio for long-distance communication possible, so it was very useful to be able to study, understand and predict its behaviour.

In the same year, he developed one of the first practical broadband radios, known as the Barlow-Wadley broadband radio. This was followed in 1948 by the first crystal-controlled radio, the all-wave communications receiver, which became the standard high-frequency radio used by the British Navy, and was made by RACAL in England. Wadley also developed the Wadley transistorised receiver and the rack-mounted receiver, which was used by the BBC for its international broadcasts.

But Wadley's greatest invention, made in 1954, was the tellurometer or 'earth measurer', a revolutionary device that used radio waves to measure distances accurately. The tellurometer measured the travel time of a radio wave between two parabolic reflectors to an accuracy of three parts per million over a range of 3–50 km, and revolutionised land surveying worldwide. By 1958 tellurometers were in use in more than 60 countries and their export earned South Africa over R300 million (in 1950s terms) in foreign earnings.

Wadley received many international awards, including an honorary doctorate from the University of Cape Town in 1976, and in 1979 a postage stamp was issued to



Trevor Wadley using a whirling hygrometer to measure humidity while demonstrating his tellurometer in England in 1957.

commemorate the 25<sup>th</sup> anniversary of his invention of the tellurometer. Sadly, he died of cancer at the age of 61. His tombstone reads, "Trevor Lloyd Wadley. Philosopher, Scientist, Beloved Family Man".

Other important South African inventions include:

- The CATscanner, a three-dimensional X-ray device separately invented by South African Alan MacLeod Cormack and British electrical engineer Godfrey Hounsfield, for which they shared the Nobel Prize for medicine and physiology in 1979 (see *Quest* 15.2)
- The digital laser, the first laser with a beam that can be shaped digitally using a hologram, developed in 2013 by Sandile Ngcobo for his PhD from the University of KwaZulu-Natal under the supervision of Prof. Andrew Forbes, based at the CSIR in Pretoria
- The Kreepy Krauly, the first commercially successful swimming pool vacuum cleaner, invented by Belgian immigrant Ferdinand Chauvier in 1951.



More information on these and over 700 other South African inventions can be found in Mike Bruton's book *What a Great Idea! Awesome South African Inventions*, published by Jacana Media in 2017.

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2020

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