

Vice Chancellor, I have the honour to present, for the award of the degree of Doctor of Science, honoris causa, Michael Makepeace Thackeray.

In the middle of the Imperial State Crown, the most famous of the British Crown Jewels, is a deep red coloured stone, about the size of a large strawberry. It sits directly above South Africa's Cullinan II diamond. This unusual-looking jewel is called the Black Prince's Ruby, but it's not a jewel at all, it's a spinel: a semi precious stone that is actually magnesium aluminium oxide.

Spinel has been at the centre of the scientific life of Michael Thackeray. He first completed Bachelor's and Master's of Science degrees, as well as a PhD at UCT taking (according to his supervisor) rather too long on the Master's degree due to his interest in the then unfashionable sport of marathon running. Thackeray was an elite runner, running track, cross country and marathons, including a sub-2:30 marathon, as well as 10 Two Oceans' and 14 Comrades.

Thackeray arrived at Oxford for a postdoc with a few spinels in his bag. The prevailing view of the spinel was that they could not accommodate conducting ions, but Thackeray had some great ideas for their potential. Within a few weeks at Oxford, he had completed the experiments that showed how the spinels could be used as conductors for the Lithium ion, and the basic idea for the Li-ion battery was established.

The 3V Li-ion battery, the size and shape of a R2 coin, is lightweight, rechargeable, operates at low temperatures and has very high charge density. They have revolutionised consumer electronics and are essential to clocks, watches, cameras, thermometers, calculators, iPads, laptops and pacemakers. The Mars Rover is powered by a lithium ion battery. They are also used in toys, where they usually outlast the toy itself.

After Oxford, Thackeray returned to South Africa, and, over the next 10 years, as part of a team at CSIR, continued his innovations with the design of new Li battery materials, structures and compositions^[1].

In 1994, he moved with his wife and daughters to Chicago, to the Electrochemical Energy Storage Department at Argonne National Laboratory. Once again, he got off to a quick start. Within a few months, he had identified other cathode materials, which had more **energy** and more **power** than the existing materials.

While he's better known for his rare highly cited status, his very successful track record in raising funding and his significant innovations in the area of energy storage, Thackeray considers one of his greatest achievements to be "growing the battery team at Argonne from its original size of 10 in 1994 (the year of his arrival) to the current complement of about 250 team members at Argonne, other National Laboratories and universities across the country^[2]".

The red spinel at the centre of the Imperial State Crown dates back to 1367, and honours an ancient belief that it is good luck to have a red gem in the prime position. From the perspective of energy storage, it's been very lucky to have Michael Thackeray at the centre of developments in battery science and technology.

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1. Desmond, K., 2012. *The long and fruitful road to Argonne. Battery Heroes: Michael Thackeray*. Batteries International, , Spring 2014.
2. Thackeray, M., *Personal Communication*, 9 December 2014

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