Oxfordshire Innovation Engine 2023 Case Study – Oxford Nanopore Technologies

Oxford Nanopore Technologies (Oxford Nanopore) is now firmly established as one of Oxford's major innovation growth and impact stories. The Oxford Innovation Engine Update listed the business as one of the five, billion pound, or 'unicorn', tech businesses to be spun out of Oxford University. This was underlined in October 2021 when the business floated on the London Stock Exchange, valued at £3.3bn.

The company's DNA sequencing technology is now being used by researchers in more than 120 countries, supported by a worldwide team of more than 1000 staff. In the UK, Oxford remains its global HQ with offices and a state-of-the-art manufacturing facility at the nearby Harwell Campus. Internationally, the business operates out of 13 offices spread around the globe.

Sequencing disruption

Its technology represents a massive disruption to the scientific equipment market. Rather than charge hundreds of thousands of pounds for conventional optically-based devices, Oxford Nanopore customers buy consumables called 'flow cells' that are inserted into a sequencing device, the smallest of which costs as little as a few thousand pounds, and is often provided free of charge as part of a starter pack.

It is the only approach that sequences the original DNA/RNA of a sample as it passes through a tiny 'nanopore'. Its sequencing equipment was first made available in 2014. The company now offers sequencing options which vary in size from the desktop GridION and ultra-high-output PromethION systems to the lightweight, portable MinION, designed to be used in the field.

The equipment is much cheaper and faster than systems offered by rivals, empowering scientists to get results back in real-time, and to access sequencing at much lower cost than alternative systems. This speed of operation was proven at the start of 2022 when a team from Stanford University announced it had been awarded a Guinness World Record for sequencing a human genome in just five and a half hours with Oxford Nanopore's equipment. By way of comparison, the original Human Genome Project took 13 years from its inception, in 1990, to achieve the same feat.

A global company, from Oxford roots

The system was developed by Oxford Nanopore's substantial R&D teams, who while they were creating the nanopore sensing platform also worked with collaborators at the Universities of Harvard and California at Santa Cruz, as well as building on early work by Professor Hagan Bayley at the University of Oxford's Chemistry Department. Since forming in 2005, the company has proven the principle is sound, scaled the technology and manufacturing, and amassed more than 2500 patents as it developed the technology available today.

While the company is proud of its Oxford roots and operates its global headquarters in the city, it has operated as a global company for a decade.

"We started in Oxford and our HQ offers access to a highly skilled talent pool that includes scientific, manufacturing and operations teams – essential to drive growth" says Gordon Sanghera, CEO. "We established our first large scale, high-tech production facility in the nearby Harwell Campus. However, both our supply chain and our customer base are global. We support many of our users

online and also have commercial, support and logistics teams, and offices around the world who support our global user base. We're truly international."

For those who are not familiar with genetic sequencing, the advances made by Oxford Nanopore's technology can be likened to helping scientific researchers piece together a puzzle more effectively, and to see more detail in the pieces of that jigsaw.

Sequencing is a little like doing a jigsaw, but traditional technologies have only been able to supply jigsaw pieces akin to the "size of a grain of sand". Oxford Nanopore's technology can sequence longer fragments of native DNA or RNA, so it's a little like replacing those grains of sand with pieces the size of a 10 pence coin in the jigsaw puzzle. This is easier to put together, but where genetic variations are larger than the "grain of sand" size fragments – those can be seen with Oxford Nanopore's technology.

Even so, Gordon still describes the world as being "in the foothills" of what DNA and RNA sequencing can achieve, both inside and outside the laboratory, particularly in clinical settings where people are seeking rapid, information-rich insights that are near to the patient.

Hence, the company has recently announced a collaboration with a Dutch start-up, Cyclomics, to test a new method of detecting molecules associate with cancer in the blood stream. Additional collaborations have also been announced ranging from rapid *BRCA 1 and 2* testing with 4bases, automation with Tecan and joint work with PathoQuest to develop a quality control test for the biopharma industry to check the safety of biologic therapeutics.

The company has also announced that it is working with Genomics England on a range of programmes including comprehensive genetic analysis of cancer tumours using their unique capability of sequencing any-length fragments of DNA.