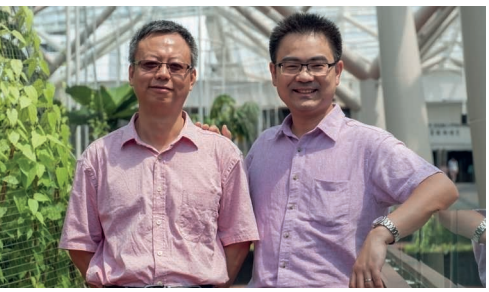

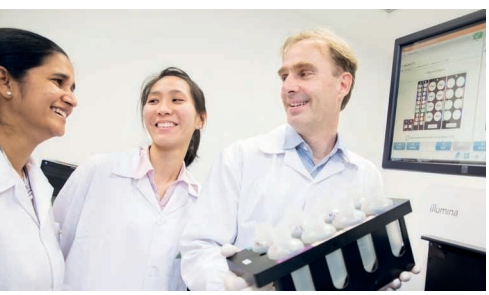

Nanyang Technological University, Singapore

A centre for leading science

Nanyang Technological University, Singapore, is ranked among the world's top universities in the fields of chemistry and engineering research. Boasting a strong science-based leadership team and some of the world's top researchers, it is now also leading the way in sustainable solutions and the life sciences.

The announcement earlier this year that Nanyang Technological University (NTU Singapore) will host the ambitious GenomeAsia 100K Project brought jubilation to the Singapore campus. The appointment means that over the next three to four years, NTU's world-leading genomics specialists, together with partners in Korea, India and the US, will oversee the sequencing of 100,000 genomes from people across Asia. NTU will store the analysed data, which will provide a detailed map of genomic variations in the region, in a central data archive. Remarkably, this happened at an institution that lacked any research capacity in the life sciences less than a decade ago.

The multinational non-profit population genomics project, which compares in size to similar programmes in the USA and UK, is intended to provide data that will enable modern medical treatments to be tailored to Asian populations. NTU's Stephan Schuster — one of the world's leading genomics experts and is known for his work in helping sequence the genome of the woolly mammoth — will be the project's scientific leader. "Advances in sequencing, computing and mobile access mandate that we begin to study these underrepresented Asian populations," he says.

Schuster is a research director at the NTU-based Singapore Centre for Environmental Life Sciences Engineering (SCELSE) and professor for environmental genomics at the university. "My goal has been to sequence the unsequenceable — especially for sources of DNA that have been deemed DNA free," he says. "This has allowed us to identify organisms from almost any kind of source material." One such application is analysing DNA from the environment, including air samples. This has rapidly led to a system for tracking organisms, which will be useful for monitoring disease outbreaks and ensuring food safety.

Schuster has been instrumental in NTU's growing prominence in life sciences research. "SCELSE's long-term funding, which enables research in often-underfunded areas, has allowed us to build a new life sciences programme at a university that historically is a stronghold in the engineering disciplines."

This funding has permitted Schuster and his colleagues to use new techniques and equipment to examine previously hidden DNA in the human biome. "Human biome research holds enormous promise, not only for understanding infections and co-existence with microbial species, but also for determining the complex interactions of microorganisms with pharmaceutical substances," he notes.

Science-backed leadership

Contributing significantly to these developments is NTU's leadership, which has a bold long-term vision for the life sciences. "In many large and very large universities, key decisions for future research are made by administrators who lack a

scientific background," says Schuster. "In contrast, NTU leadership members have all had very successful academic careers and therefore still have access to their scientific networks, which helps them to strategize new directions for the university to take."

The outcomes show that the leadership's strategies are working. At 25 years old, NTU Singapore, is already ranked as one of the leading research-intensive institutions in Asia and is in the top tier of universities worldwide. In the 2016 Nature Index, NTU is ranked 32nd among universities globally and its young chemistry department outperformed some of the stalwarts of science to be placed 5th among universities in the world. The 2015/16 QS World University Rankings saw it jump 26 places to be ranked 13th — the youngest university to reach that level. And in 2015, for the second year in a row, it was ranked top out of all the universities in the world that are less than 50 years old.

These results make NTU President Bertil Andersson justifiably very proud. A plant biochemist with more than 300 research papers to his name, Andersson is a prime example of leadership with successful scientific careers. He has been leading the university for five years and attributes its rapid success to providing the best resources for research, attracting leading scientists and achieving a critical mass of cutting-edge research. "NTU is now on the map of the world's scientists — particularly young ones," says Andersson. "A young scientist wants to be where scientific excellence is, but also where there is a feeling that things are happening."

The university is recruiting promising young investigators from around the world and has also groomed its own scientists, such as David Lou and Hua Zhang, the only Asian-based researchers named in Thomson Reuters' World's Hottest Researchers for 2015, which is dominated by scientists from MIT and Harvard.

Young researchers attracted under NTU's Nanyang Assistant Professorship Scheme and the prestigious National Research Foundation Fellowship make up about 5% of the university's scientists but contribute more than a third of the institution's top scientific papers.

"My opinion is that you cannot have a university that is either for good education or good research," says Andersson. "For me, good education and good research must go hand in hand."

Collaboration for sustainability

One of the university's research strengths, in which it has become a world leader, is sustainability. From its award-winning campus to research institutes such as the Nanyang Environment and Water Research Institute (NEWRI) and a module in environmental sustainability taken by every undergraduate student, NTU places the Earth's future at the core of its identity. It is a focus that brings together the university's traditional research strengths in engineering with its rapidly developing performance in chemistry and the life sciences. NTU has developed its strengths in material sciences, with nanomaterials and biomaterials showing great potential to lead to next-generation technologies for healthcare and sustainability.

Alexander Zehnder, whose research contributed to the development of the Dow Jones Sustainability Index, leads the university's focus on sustainability. Interdisciplinary work is integral to NTU's status as a research hub, he says. "Our success in this area stems from a strong engineering school coupled with top natural and social sciences and humanities and the dynamic and open interaction between them without mutual reservations."

In addition to SCELSE and NEWRI, the Earth Observatory of Singapore (EOS), and the Energy Research Institute @ NTU (ERI@N) have contributed significantly to the university's sustainability initiatives in areas such as wastewater treatment, environmental engineering, energy and Earth sciences. Industry partnerships with organizations including BMW, Rolls-Royce, GE-Alstom, ENGIE and Schneider play a big role in NTU's sustainability work and the translation of its research for conserving the environment in Singapore and around the world.

Looking ahead: top 10 rankings

The capacity of NTU to attract the best researchers from around the world and establish productive partnerships with industry and other top universities means that these projects are only the beginning. Says Andersson: "We have recruited many young scientists who will continue to perform well in research and in academia. I want to consolidate that so that NTU will be ranked in the 20 best universities in the world for various rankings. And in some of those rankings it could be in the top 10. Maybe that's very ambitious, but it shouldn't be excluded."

NTU President Bertil Andersson

NANYANG TECHNOLOGICAL UNIVERSITY

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