NEWS RELEASE

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NTU Singapore launches S$160 million research centre to advance molecular analysis with digital tools

Research could pave the way for real-time analysis of health, disease, and environmental information

Nanyang Technological University, Singapore (NTU Singapore) today launched the **Institute for Digital Molecular Analytics and Science (IDMxS)**, which aims to advance the science behind analysing biological molecules (biomolecules) through the use of information technology and data science.

This could pave the way for instantaneous monitoring and analysis of health or environmental information, much like how we access real-time traffic information on our mobile phones.

IDMxS, NTU's newest national Research Centre of Excellence (RCE)[1], is supported with a total investment of around S$160 million over 10 years, comprising S$94 million from the Singapore Ministry of Education, with the remainder from NTU and National University of Singapore.

At the heart of the work done at IDMxS is **digital molecular analytics**, a new field of science that drills down to the level of a single molecule to detect, identify, and quantify biomolecules with unprecedented precision.

Such a science will enable many branches of new discovery, including the development of diagnostic testing capabilities that could in turn lead to new technology development and spin-off commercial applications, such as blood testing kits that can produce immediate results using nothing more than a smartphone camera.

The IDMxS, hosted at NTU's Experimental Medicine Building, was officially launched today by Singapore's **Minister for Education, Mr Chan Chun Sing**. Mr Chan said: "As the latest Research Centre of Excellence awarded by the Ministry of Education to

[1] A Research Centre of Excellence carries out world-class investigator-led research aligned with the long-term strategic interests of Singapore.

NTU, IDMxS is a vital addition to the national Research, Innovation and Enterprise (RIE) efforts in supporting cutting-edge research that contribute to Singapore's long term developmental goals. The science done at the Centre will be instrumental in bridging the gap between biomedical sciences and information technology, and I look forward to IDMxS' future breakthroughs."

The Research, Innovation and Enterprise (RIE) plan lays the groundwork for Singapore's science and technology efforts every five years. RIE2025 was launched with a S$25 billion budget for 2021 to 2025.

NTU Acting President and Provost Professor Ling San said: "The Institute for Digital Molecular Analytics and Science (IDMxS) is the third Research Centre of Excellence hosted by NTU[2] and affirms the University's commitment to be at the forefront of cutting-edge research. IDMxS brings together world-class researchers and leading experts in the nascent field of digital molecular analytics, which will drive a paradigm shift in molecular detection and analysis and lay the groundwork for dramatic change in various fields such as biomedicine, biotechnology, and clinical science. Another important objective of IDMxS is to nurture postgraduate students in interdisciplinary education across the molecular sciences and information technology, as well as to develop continuing education programmes to uplift the expertise of our healthcare workers in the area of digital diagnostics."

NTU Senior Vice President (Research) Professor Lam Khin Yong said: "The Institute for Digital and Molecular Analytics and Science (IDMxS) is an example of how world-leading researchers of diverse disciplines at NTU are coming together to pursue fundamental research and advance their disciplines to new boundaries. This is in line with RIE2025's aim to build up foundational research capabilities in Singapore to form a strong base of knowledge and capabilities for transformative innovations."

IDMxS is led by **Founding Director Professor Jay T. Groves**, President's Chair in Bioanalytical Sciences at the NTU School of Materials Science and Engineering. Joining him is **Co-Director Professor Peter Török** from the NTU School of Physical and Mathematical Sciences, who will oversee the centre's facilities and capabilities.

The interdisciplinary centre is expected to bring together 100 full-time researchers and staff with expertise in areas spanning the gamut of science and engineering, from biology, medical technology, and chemistry to optics, computer science, and artificial intelligence (AI).

Through IDMxS' graduate programme, postgraduate students from NTU will have unique opportunities in interdisciplinary education and training, spanning the

[2] NTU houses two other Research Centres of Excellence: the Earth Observatory of Singapore, founded in 2008, and the Singapore Centre for Environmental Life Sciences Engineering established in 2011.

molecular sciences and information technology. The Centre will provide funding for more than 30 PhD students, four of whom have already started their studies.

IDMxS will also develop continuing education programmes geared towards advancing and modernising the healthcare work force to adapt to the digitisation of clinical diagnostics.

Marrying biology and information technology

IDMxS will develop the new science of digital molecular analytics by bridging the gap between biology and information technology – disciplines that have both undergone revolutions of their own in recent years.

The goal is to create capabilities to track health information such as viral infections or molecular signatures that indicate the presence of a disease, and environmental information such as air and water quality in a real-time manner.

This starts with building the foundational science, with an eye towards creating new solutions for problems in health, disease, and environmental monitoring.

Said **IDMxS Founding Director Professor Jay T. Groves**: “In order to spin off practical technologies, we must first have a clearer understanding of what happens at the molecular level. The laws of chemistry as we know it dramatically changes as we move from a continuum to the discrete, when we shift from analysing samples in a vial to the individual molecules making up such samples.”

Core to IDMxS’ digital molecular analytical strategies is the ability to collect many different types of information from a biological sample at the same time and use tools such as AI and machine learning algorithms to analyse and interpret the massive volume of information that is otherwise impossible for humans to make sense of.

Prof Groves, who holds a joint appointment at the NTU School of Chemistry, Chemical Engineering and Biotechnology, said: “Each molecular assay (the process of analysing molecular information in a sample) is akin to an individual pixel in an overall digital measurement. The defining feature of digital molecular analytics is the way results from these thousands or millions of individual assays are collected, interpreted, and ultimately reconstructed into a super high-resolution molecular analysis.”

Through digital molecular analytics, the research centre hopes to eventually spin off applications such as software that is available for mass use. **Prof Groves** said: “We foresee that many spin-off applications will emerge from this scientific programme once the foundational scientific research is established. Some of the most tangible

impact on the public will be felt as we begin to see molecular assay technology become available in the form of mobile device apps."

Finding applications in health and environmental monitoring

One possible application of digital molecular analytics that IDMxS is exploring is the creation of blood samples test kits. This project aims to develop a tool that can identify the different molecules which cause diseases, infections, and illnesses.

This means that a doctor could one day be able to draw a blood sample, use a smartphone camera to analyse the sample, and get an accurate, real-time reading right beside the patient at the doctor's table. Such an innovation may also remove the need for further lengthy laboratory tests.

Another project that is in the works is the large-scale monitoring of insect-borne diseases, such as dengue and malaria. By identifying and analysing the molecules that make up the dengue virus, researchers can one day develop an imaging system which can quickly detect and monitor dengue within the mosquito population.

Such research could have further applications in urban health as well, potentially tracking not just insect-borne diseases but also other airborne pathogens and infectious diseases.

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About Nanyang Technological University, Singapore

A research-intensive public university, Nanyang Technological University, Singapore (NTU Singapore) has 33,000 undergraduate and postgraduate students in the Engineering, Business, Science, Medicine, Humanities, Arts, & Social Sciences, and Graduate colleges.

NTU is also home to world-renowned autonomous institutes – the National Institute of Education, S Rajaratnam School of International Studies, Earth Observatory of Singapore, and Singapore Centre for Environmental Life Sciences Engineering – and

various leading research centres such as the Nanyang Environment & Water Research Institute (NEWRI) and Energy Research Institute @ NTU (ERI@N).

Under the NTU Smart Campus vision, the University harnesses the power of digital technology and tech-enabled solutions to support better learning and living experiences, the discovery of new knowledge, and the sustainability of resources.

Ranked amongst the world's top universities, the University's main campus is also frequently listed among the world's most beautiful. Known for its sustainability, over 95% of its building projects are certified Green Mark Platinum. Apart from its main campus, NTU also has a medical campus in Novena, Singapore's healthcare district.

For more information, visit www.ntu.edu.sg