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# NTU and NUS Strengthen Collaboration by Sharing Advanced Research Facilities to Propel Scientific Innovation in Singapore

Nanyang Technological University (NTU) Singapore and the National University of Singapore (NUS), two of the country's leading institutions, have embarked on a groundbreaking initiative to intensify their collaborative research efforts by sharing state-of-the-art scientific equipment and facilities. This renewed commitment exemplifies a forward-looking strategy aimed at harnessing the collective potential and expertise of Singapore's premier research universities. By pooling their resources and cutting-edge infrastructure, both universities are paving the way for accelerated scientific discoveries and enhanced innovation on a global scale.

At the heart of this partnership lies the strategic sharing of highly specialized instruments that are critical to frontier research across various scientific disciplines. NTU's aberration-corrected transmission electron microscope (AC-TEM) is among the flagship assets available to researchers at NUS. This ultra-high-resolution microscope uniquely combines aberration correction with advanced analytical techniques such as energy dispersive X-ray spectroscopy (EDX), electron energy loss spectroscopy (EELS), and electron holography. The exceptional capabilities of this instrument allow scientists to visualize materials at the atomic scale, distinguishing even single columns of atoms

and elucidating their chemical composition and bonding properties with unprecedented precision.

Aberration-corrected transmission electron microscopy represents a quantum leap in materials characterization. Conventional electron microscopes are limited by electron lens aberrations that blur atomic-scale details, but the AC-TEM uses sophisticated correctors to compensate for these distortions, producing images of extraordinary clarity. With complementary spectroscopic methods like EDX and EELS, researchers can obtain detailed elemental distributions and electronic structures of samples, while holography extends insights into the nanoscale electromagnetic fields that influence material behavior. These capabilities serve a wide array of disciplines, from quantum computing to biomedical nanotechnology, enabling the design of novel materials with tailored functionalities.

Conversely, NTU researchers benefit immensely from the access to NUS's Invizo 6000 3D Atom Probe microscope — an ultra-rare instrument, with only seven units worldwide and the sole example in the ASEAN region. This microscope extends capabilities beyond imaging by providing three-dimensional compositional mapping at the atomic level. Through atom probe tomography, it offers exquisite insight into the spatial distribution and dynamics of atomic species in complex materials. Such precision is invaluable for the semiconductor industry, advanced alloys development, and energy materials research where atomic-scale heterogeneities critically impact device performance and durability.

The importance of this equipment exchange goes beyond pure instrumentation. It nurtures a culture of interdisciplinary collaboration where researchers from both institutions leverage complementary expertise and facilities to address multifaceted scientific challenges. The renewed partnership also aims to optimize the utilization of costly research infrastructure, ensuring that cutting-edge equipment is accessible to a wider scientific community rather than confined within isolated facilities. This strategy translates to cost efficiencies, increased throughput of experiments, and elevated opportunities for breakthrough findings.

Moreover, the cooperation between NTU and NUS is aligned with Singapore's ambitious goal of cementing its position as a global research hub. Currently, Singapore ranks 16th worldwide in the Nature Index, an indicator that tracks publications in leading natural and health science journals. By fusing resources and expertise, these institutions are well positioned to amplify their research output, attract international funding, and produce innovations with real-world impacts—from energy-efficient technologies to advanced healthcare solutions.

Senior institutional leaders emphasize the synergy unlocked by this alliance. NTU President Professor Ho Teck Hua highlights that while NTU and NUS often compete internationally, their domestic collaboration through shared research infrastructure enhances their collective competitiveness. He underscores that sharing high-end equipment not only expands research capabilities but also fosters deeper collaborations and mutual knowledge exchange among scientists. Similarly, NUS President Professor Tan Eng Chye describes the partnership as a "force multiplier" that accelerates discovery processes by integrating talents, innovation ecosystems, and infrastructure strengths from both universities.

In practical terms, the AC-TEM at NTU enables detailed studies of materials crucial for emerging technologies. For instance, the ability to probe individual atomic columns helps materials scientists design quantum computing components with enhanced coherence times. In biomedical sciences, precise visualization of nanoparticles boosts the development of targeted diagnostic and therapeutic agents that operate on the nanoscale. Furthermore, the telescope into electric and magnetic fields at atomic resolutions creates opportunities to explore and engineer novel material properties that could revolutionize the construction and manufacturing industries.

On the flip side, the atom probe tomography capabilities at NUS deliver transformative benefits to materials research. This instrument's atomic-scale 3D imaging reveals previously unresolvable details about element segregation, clustering, and diffusion—phenomena that define the behavior of semiconductors, metallic alloys, and battery materials. Its role is pivotal in pushing the boundaries of material design for next-generation devices such as faster, energy-efficient chips, stronger and more reliable structural materials, and longer-lasting energy storage systems.

Beyond equipment sharing, NTU and NUS have established joint research endeavours tackling ambitious projects such as the Sustainable Tropical Data Centre Testbed, the world's first experimental platform aimed at developing energy-efficient cooling solutions tailored for data centers in tropical climates. This collaboration leverages multidisciplinary expertise to address the growing global demand for greener information technology infrastructure, exemplifying how shared infrastructure underpins impactful applied research.

Complementing these scientific collaborations is a tri-party initiative involving global investment firm Temasek, launched to accelerate the commercialization of deep-tech start-ups originating from research at both NTU and NUS. This programme fosters a pipeline from discovery-phase research to market-ready technologies, enhancing Singapore's innovation ecosystem and translating scientific excellence into economic growth and societal benefits.

In conclusion, the strategic alliance between NTU and NUS through shared access to world-class research tools represents a significant evolution in Singapore's research landscape. By integrating their unique assets and expertise, the two universities are not only maximizing the use of expensive scientific instruments but also creating a fertile ground for discoveries that could redefine technological frontiers. This collaboration underscores the power of partnership in science, demonstrating that when institutions unite, the collective capacity to innovate, educate, and contribute to global knowledge expands exponentially.

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