2027 LKY Postdoctoral Fellowship

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2027 LKY Postdoctoral Fellowship

COLLEGE OF ENGINEERING & COLLEGE OF SCIENCE

SCHOOL OF CHEMISTRY, CHEMICAL ENGINEERING AND BIOTECHNOLOGY

Chemical Engineering & Biotechnology

- Chemical Engineering
- Biotechnology & Synthetic Biology
- Energy & Chemical Technologies
- Food Science & Technology
- RNA Technology
- Pharmaceutical Engineering
- Translational Healthcare Technology/Bioinstrumentation
- Translational Medicine
- Artificial Intelligence, Big Data and Machine Learning in Chemical Engineering & Biotechnology

Chemistry & Biological Chemistry

- Analytical Chemistry
- Bioinorganic, Bioorganic and Biophysical Chemistry
- Chemical Biology
- Decarbonization, Sustainability
- Fine Chemicals
- Green Chemistry
- Inorganic and Organic Chemistry
- Medicinal Chemistry
- Nanotechnology, Nanomaterials and Nanobiotechnology
- Physical, Theoretical and Computational Chemistry
- Polymer Chemistry
- Synthesis, Methodology and Catalysis
- Total Synthesis of Natural Products and Drugs
- Artificial Intelligence, Big Data and Machine Learning in Chemistry

COLLEGE OF ENGINEERING

SCHOOL OF CIVIL & ENVIRONMENTAL ENGINEERING

Construction Technology and Management

- Novel Construction Technologies and Management
- Building Information Modeling (BIM) and Digitalisation for Built Environment and Infrastructure
- Construction Productivity and Safety Studies
- Prefabricated Prefinished Volumetric Construction
- Automation and Smart Robotics Ddevelopment in Infrastructure Engineering
- Smart Sensing and Human-machine Interaction for Construction Inspection

Geotechnical Engineering

- Land Reclamation and Coastal Protections
- Space Creation via Planning and Intensification of Land Use
- Innovative Materials and Technologies such as Biocement
- Innovative Foundation Construction Methods
- Site Investigation and Geophysical Survey
- Underground Construction and Space Development
- Rock Mechanics and Engineering Geology
- Geo-energy Extraction and Storage
- Climate Change Impact on Urban Environment
- Vibration Barrier and Isolation
- Slope Stability and Protection
- Seismic Engineering

Maritime Studies

- Maritime Logistics
- Digitalisation and Decarbonation Technologies for Marine Industries
- Strategic and Quality Management in Shipping
- Supply Chain Management
- Sustainable Maritime Operations
- Data Analytics for Maritime Applications

Structures and Mechanics

- Protective Technology
- Structural Dynamics
- Concrete and Steel Technology
- Sustainable Timber Technology
- Structural Health Monitoring
- 3D Concrete Printing
- Seismic Engineering

Environmental Engineering

- Membrane Science and Technology
- Environmental Microbiology and Biotechnology
- Environmental Chemistry and Materials
- Environmental Toxicology and Public Health
- Simulation and Modelling of Environmental P
- Solid Waste Management
- Environmental Nanomaterial and Nanotechnology
- Climate Change and Environmental Issues: Impacts, Adaptation and Mitigation
- Impact of Climate Change on Urban Liveability

Water Resources Engineering

- Water Resources and Flood Management
- Coastal Protection and Risk Mitigation

Transportation Engineering

- Active Mobility
- Public Transport
- Urban and Last-mile Logistics
- Electric Vehicle, Automated Vehicles, and Connected Vehicle
- Transportation Safety Engineering & Practices
- Driver & Traveller Behaviours
- Traffic Management & Control Tools

SCHOOL OF ELECTRICAL AND ELECTRONIC ENGINEERING

- Renewable Power and Energy Systems
- Smart Power Grids and Energy Conversion Systems
- Electric Motors, Cars, and Vehicles
- Power Electronics and Electrification
- Smart Buildings
- RF, Analog/Mixed-Signal, and Low-power Digital ICs
- Edge/Neuromorphic Computing and ICs
- System-on-Chip/System-in-Package and Testing
- Terahertz, Millimeter Wave, and Intelligent Sensor ICs
- Positioning and RF Technologies
- Artificial Intelligence and Machine/Deep Learning
- Trustworthy AI and Trusted Robots
- Audio, Vision, Image and Video Analytics
- Big Data Analytics
- Cyber and Network Security
- Modeling and Control of Complex Systems
- Smart Manufacturing
- Intelligent and Autonomous Vehicles and Systems
- Cyber-Physical Human Systems
- Robotics and Human-Robotic Interactions
- 5G and Beyond 5G Communications
- Intelligent Transportation
- Future and Smart Mobility
- Vehicle to Vehicle (V2V) and V2X Communications
- Ubiquitous Sensing, Multi-Modal Sensor Fusion, Sensor Networks
- Nanoelectronics: Semiconductor Materials, Devices, Systems
- Flexible/Wearable and High-Speed Electronics
- Advanced Electronic Materials
- Bioelectronics, Biophotonics, Bio-Sensors
- Internet of Things (IoT), Internet of Everything (IoE) and Smart Nations
- Satellite Engineering and Space Technology
- Photonics, Optoelectronics, and Nanophotonics
- Specialty Fiber and Fiber Technology
- Quantum Engineering
- Quantum Computing
- Quantum Sensing
- Quantum Communication
- Interconnected digital spaces, augmented reality, and enabling technologies for metaverse

SCHOOL OF MATERIALS SCIENCE AND ENGINEERING

- AI for Materials Science and Engineering (e.g. Machine Learning and AI for Materials Discovery and Design)
- Biomaterials and Biomedical Devices
- Carbon Capture Materials
- Catalysis for Clean Energy Production
- Combinatorial Materials and Materials Simulation
- Defense Materials
- Drug Delivery Systems
- Functional Materials and Composites
- Human Longevity – Human Environmental Interactions
- Materials Characterization
- Materials Circularity
- Materials for Extreme Conditions
- Materials for Energy Storage and Conversion
- Materials for Food, Agri and Aqua-technology
- Materials for New Computing
- Materials and Renewable Energy Harvesting/Production
- Materials for Sustainability
- Metals/Alloys, Ceramics and Polymers
- Nanoelectronics and Flexible Devices
- Nanomaterials
- Nanomedicine
- Novel Flexible Electronics/Wearables
- Novel 2D, Perovskite and Oxide Semiconductors
- Quantum Materials
- Sustainable and Earth-Friendly Materials

SCHOOL OF MECHANICAL AND AEROSPACE ENGINEERING

- Aerospace Engineering (Aerodynamics, Flight dynamics & control, UAV, Smart materials, Aircraft Design, Aero-elasticity & aircraft structure, propulsion systems, hybrid & electrified propulsion)
- Air Traffic Management (Human Factors, Operation Research, Environment and Weather, Information management systems)
- Future mobility (Advanced power systems and drivetrains, electric mobility, autonomous vehicles, driver-automation collaboration)
- Biomedical Engineering (Bio-design and bio-manufacturing of tools/devices, Biomechanics, Medical simulation, Bio-sensors/biomedical devices, bio-inspired engineering and materials)
- Clean Energy & Sustainable Environment (Renewable, alternative energy, hydrogen, carbon neutralization, Fuel Cells, Clean technology & environment, Advanced cooling technologies, Waste heat recovery, Environmental acoustics, Urban sustainability)
- Micro/nanofabrication and Micro Systems (Thin films & coatings, MEMS & BioMEMS, Data storage, Sensors & actuators)
- Naval architecture and marine engineering (Fluid-marine structure interactions, Ship structure design, Marine engine emissions, clean propulsion technologies, Hull-propulsor design)
- Optical and laser engineering (Computational Optics, Nanoscale Optical Engineering, Precision Optics, Laser Structuring and Processing)
- Robotics and Embodied AI with applications in Manufacturing, Logistics, Facility Management, Healthcare, Housekeeping, Companionship, Disaster Response, Air-/Sea-port Operations, etc.
- Systems Engineering and Management (Human Factors Engineering, Operations Research, Systems Engineering, Design Studies)
- Additive Manufacturing (Selective Laser Melting, Selective Laser Sintering, Electron Beam Melting, Laser Additive Manufacturing, Bioprinting, Modelling and Simulation)
- Precision Machining (Laser-material interactions, surface modifications, nontraditional machining, ultra-precision machining)
- Advanced & Sustainable Manufacturing (Factory of the Future, Industry 4.0, Smart manufacturing, Industrial Internet of Things, Cyber-physical manufacturing system optimization, Non-destructive testing and evaluation)
- Mechanics of materials (Fracture mechanics, Material fatigue, Micromechanics, Soft matters, Computational mechanics)

COLLEGE OF COMPUTING and DATA SCIENCE

- Algorithms and Complexity
- Artificial Intelligence
- Audio, Speech and Signal Processing
- Biomedical Informatics
- Blockchain / Fintech
- Cloud Computing
- Cognitive Modelling
- Computational Neuroscience
- Computer Graphics and Interactive Visual Computing
- Computer Networks and Communication
- Computer Vision and Multimedia
- Custom / Re-configurable Computing
- Cyber Physical Systems
- Cybersecurity
- Data Management and Analytics
- Data Science
- Edge Computing
- Formal Methods and Logic
- Generative AI
- Hardware and Embedded systems
- High Performance Computing
- Human Computer Interaction
- Image Processing
- Information Retrieval
- Internet of Things
- Machine Learning
- Metaverse
- Modeling and Simulation
- Multi-Agent Systems and Agentic AI
- Natural Language Processing
- Parallel and Distributed Systems
- Probabilistic Programming
- Quantum Computing
- Reinforcement Learning
- Robotics
- Software Engineering
- Wireless and Smart Sensor System
- Statistical Machine Learning
- Programming Languages
- Logic and verification
- Networked systems
- Digital Trust
- AI safety

COLLEGE OF SCIENCE

ASIAN SCHOOL OF THE ENVIRONMENT

The Asian School of the Environment (ASE) is an interdisciplinary school in the College of Science that focuses on Asian environmental challenges. By integrating earth sciences, ecosystems ecology, natural hazards and coupled human-natural systems, the school will to address key issues of climate change, environmental science and sustainability. The school aims to fill a significant gap in our understanding of the tropical landscapes and Asian urban environments.

Our fields of research include:

Climate change (sea-level rise, storms)
Coupled human-natural systems
Ecosystems and ecology
Environmental systems science
Environmental genomics
Natural hazards (earthquakes, tsunamis and volcanoes)
Marine sciences (ocean chemistry and biogeochemistry)
Microbial ecology
Megacities and urban risk
Paleoclimate
Environmental Geochemistry
Climate and Disaster Risk Analysis
Coastal Geomorphology
Marine Sciences (Ocean Chemistry, Biogeochemistry, Coral reef ecology)

SCHOOL OF BIOLOGICAL SCIENCES

The School of Biological Sciences (SBS), which belongs to the College of Science, was established in 2002 with a mission to make a strong contribution to biological and biomedical sciences. Since then, many talented individuals from around the world and Singapore have joined us, from scientific leaders, researchers, postgraduate students, working across our various fields of research.

SBS collaborates with local and international research institutes, universities and hospitals, sharing a common goal to advance basic knowledge and translational application in the biological and biomedical sciences.

Our Fields of Research includes:

- Cancer
- Cell biology
- Chemical biology
- Computational Biology
- Drug Discovery and Therapeutics
- Gene regulation
- Immunology
- Infectious disease and Microbiology
- Neuroscience
- Plant Biology
- Stem cells and ageing
- Structural biology

SCHOOL OF PHYSICAL AND MATHEMATICAL SCIENCES

Mathematical Sciences

- Probability and Statistics
- Number Theory, Algebra and Combinatorics
- Analysis and Topology
- Coding Theory & Cryptography
- Mathematical Logic
- Scientific Computing and Computational Mathematics
- Theoretical Computer Science and Algorithms
- Financial Mathematics
- Optimization
- Applied Geometry and Geometric Mechanics
- Dynamical Systems
- Mathematics of machine learning and data analytics
- Operations Research
- Statistical Learning
- Partial Differential Equations and Mathematical Physics
- Mathematics of Quantum Information and Computation
- Mathematical Biology, Topological Data Analysis and AI for Science

Physics & Applied Physics

- Condensed Matter, Semiconductor Physics and Spintronics
- Photonics and Quantum Electronics
- Quantum Science and Technology
- Nanoscience and Nanotechnology, Surface and Interface Science
- Biophysics, Bioimaging and Soft Condensed Matter
- Plasma Physics and Fusion Energy
- Nonlinear and Complex Systems

LEE KONG CHIAN SCHOOL OF MEDICINE

LKCMedicine is a young and thriving medical school working to make disruptive discoveries and inventions that will shape future medicine and healthcare in Singapore and beyond. The school is populated by talented academicians from around the world who work closely with their clinical partners at the National Healthcare Group (NHG) as well as with colleagues from various NTU schools.

At LKCMedicine, prospective postdoctoral trainees will experience a rich and intense culture of research that is focused on pioneering impactful research outcomes through domain-specific and interdisciplinary research. Alongside this, the school also aims to generate societal impact from research outcomes by enhancing the capacity for clinical trials, empowering patients and the community to take care of their health and in tandem, strengthening the culture of innovation and entrepreneurship to create and capture economic value.

Key research topics that draw upon the strengths of our faculty and the synergy from our collaborations with clinical partners includes the following:

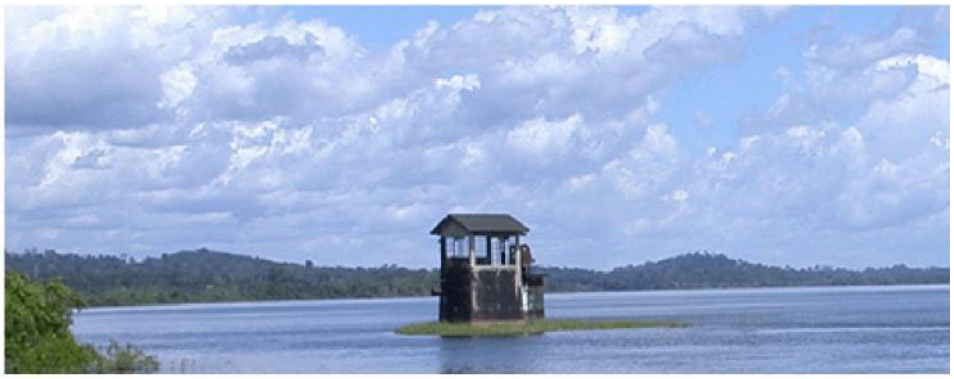
- **Neuroscience and Mental Health** – Neurodegenerative disorders such as dementia and Parkinson's disease, brain cell biology and neural circuits (*houses the Dementia Research Centre Singapore)*
- **Nutrition, Metabolism and Health** – Gastrointestinal system (GI) and Nutrition; obesity, diabetes, related gut and metabolic disorders
- **Population and Global Health** – Understanding and translating knowledge in behavioural, social, environmental and molecular factors that influence health and disease in Asian populations (*a partner of the National Precision Medicine Initiative*)
- **Respiratory & Infectious Diseases** - Bacterial infectious diseases, respiratory diseases, and vector-borne and emerging infectious diseases (*houses a state-of-the-art BSL3 facility)*
- **Skin Diseases & Wound Repair** – Asian skin diseases including atopic dermatitis, pigmentary disorders, acne, and chronic wounds (*a partner of the Skin Research Institute of Singapore*)
- **Data Science & Artificial Intelligence** – Unlocking the full potential of biomedical data through advanced analytics and state-of-the-art AI methodologies (*houses the Centre for Biomedical Informatics and WHO Centre for Digital Health and Education*)
- **Cancer Discovery and Regenerative Medicine** – Genomics, genome stability, and the ubiquitin system; Initiation of tumourigenesis and reprogramming; Rebuild tissue microenvironment, with an ultimate goal to identify druggable targets and biomarkers that can be translated for cancer diagnosis, prognosis and therapy
- **Microbiome Medicine** – Elucidating signalling pathways/molecules that regulate microbe host interactions during health and disease, including brain function, skin biology, liver function and exploiting these host's microbial-related components for therapeutic purposes (*houses the Microbiome Medicine Centre*)

For more information, please refer to: https://www.ntu.edu.sg/medicine/research.

Talent Development – In 2020, LKCMedicine established the LKCMedicine EArly Researcher Network (LEARN), a dedicated club for, and run by, the research fellows at the medical school. The goal of LEARN is to create an interactive community among the early career researchers through social and scientific events, professional development workshops and collaborations with other schools of NTU. Postdoctoral fellows at LKCMedicine are given the opportunity to apply for intramural research grants including the NTU Presidential Postdoctoral Fellowship, as well as external competitive grants such as the NMRC Open Fund - Young Investigator Research Grant (NMRC OF-YIRG). For more information, please refer to: https://www.ntu.edu.sg/medicine/research/lkcmedicine-early-researcher-network.

RESEARCH CENTRES

EARTH OBSERVATORY OF SINGAPORE (EOS)



Climate

Climate research at EOS aims to fill a gap of much-needed information on climatic forces in Southeast Asia, which will allow for a more accurate projection of regional consequences that can expected from global climate change. Several major drivers of global climate, including the Western Pacific Warm Pool and the Indian Ocean Dipole, are active in this tropical region, yet scientific knowledge about these drivers has been relatively scarce. Research conducted by the climate group focuses on regional climate monitoring, and the measurement and modelling of past and modern tropical climates.



Hazards, Risk, and Society

EOS conducts research that links policy and social science inquiry with natural science research, education, and engagement in areas affected by natural hazards. One project in Aceh aims to produce a comprehensive and integrated approach to post-disaster recovery and resilience. Another project is to assess current risk perceptions and mitigative actions related to earthquakes and tsunamis and the degree to which science communication has influenced

those perceptions and actions. The Hazards, Risk, and Society group seeks to improve understanding of how and why societies are impacted by natural hazards and to identify strategies that reduce vulnerability and increase resilience.



Tectonics

Southeast Asia and its surrounding regions have many large, active faults, as well as a number of major subduction zones that are responsible for some of the world's biggest earthquakes. Researchers in the tectonics group aim to increase understanding of the region's tectonic and seismic behaviour, to identify signs of previous earthquakes and tsunamis, their size, their recurrence, and their potential for destruction, as a basis for more reliable forecasting.



Volcano

Volcanic arcs in Southeast Asia are among the most active on Earth. The EOS Volcano Group conducts geologic, geochemical, and geophysical studies to improve understanding of volcanic activity, particularly processes related to eruptions. EOS research in this field is designed to build on knowledge and tools that will aid in the forecasting of volcanic eruptions, assessment of their environmental and societal impacts, and efforts to mitigate the hazards.

ENERGY RESEARCH INSTITUTE @ NTU (ERI@N)

Established in 2010, the Energy Research Institute @ NTU (ERI@N) focuses on cutting-edge innovations, research translation, strategic partnerships, and industry collaboration to accelerate decarbonization and sustainable energy transition. ERI@N distinguishes itself through interdisciplinary research excellence directed towards translational outcomes of industry relevance with focus on systems-level research for tropical megacities.

The Institute integrates research across NTU as a whole in the context of the energy challenge, and then helps translate outcomes into industry and practice. Apart from Interdisciplinary Research Programmes, Flagship Programmes and Standards Development that cover energy value chain from energy generation to innovative end-solutions, the Institute also hosts the ERI@N-Energy Centre of Innovation, which accelerates deep-tech energy innovation capabilities in Singapore to support the nation's future energy transition.

ERI@N's Interdisciplinary Research Programmes focuses on three main categories, namely:

Energy Systems
- Renewables & Low-Carbon Solutions (RLCS)
- Energy Storage (ES) and Hydrogen & Fuel Cells (H2 & FC)
- Geothermal

Grid Systems
- Multi-Energy Systems & Grids (MESG)

Urban Solutions
- Sustainable Built Environment (SBE)
- Future Mobility Solutions (FMS)
- Power Electronics & Electrification (PE&E)

ERI@N's flagship programmes: **EcoCampus** and **Renewable Energy Integration Demonstrator Singapore (REIDS)** – focus on ambitious but achievable outcomes in Energy Efficiency and Renewable Energy Integration. Both aim to strengthen the national competency in the domain of Clean Energy and Sustainability by developing and demonstrating relevant technology solutions in a living lab environment.

ERI@N strives to be the pioneer in research technology and is equipped with state-of-the-art facilities and laboratories to support and drive our research work. These resources offer our researchers access to develop innovation technologies and solutions for our energy future.

Located at CleanTech One and the NTU Campus, these include:
- Future Mobility and Systems Engineering Lab
- Energy Storage Prototyping Lab
- Singapore-CEA Alliance for Research in Circular Economy (SCARCE) Lab
- Fuel Cell Lab

- Solar Lab

Other facilities located around Singapore include:

- Renewable Energy Integration Demonstrator – Singapore (REIDS) on Semakau Island
- Electrification and Power Grids Centre (EPGC) on Jurong Island
- Centre of Excellence for Testing & Research of Autonomous Vehicles NTU (CETRAN) at CleanTech Park

ERI@N has close to 200 researchers and staff coming from 20 nations around the world. As a leading Institute that is equipped with a wide range of skillsets and expertise in Science, Engineering, Technology, Policy and Social Science that contributes to a vibrant, multidisciplinary and collaborative research environment, ERI@N strives to achieve our mission for distinction and contribute to National aspirations for a Smart and Sustainable Nation.

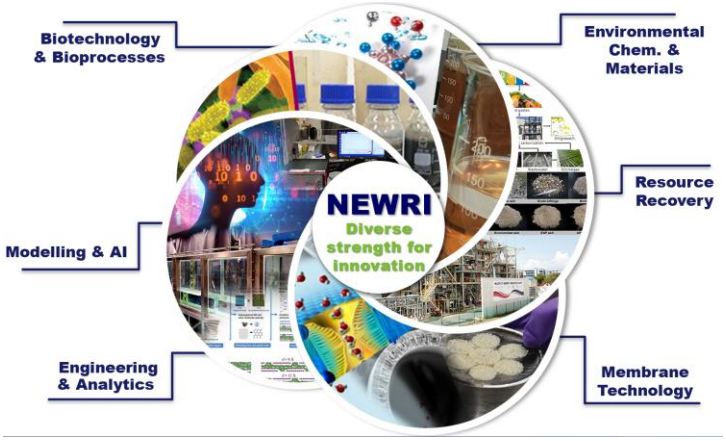
Visit www.ntu.edu.sg/erian for more information.

NANYANG ENVIRONMENT & WATER RESEARCH INSTITUTE (NEWRI)

Ranked among top global organizations in the domains of environment & water technology, NEWRI responds to national needs and global sustainability concerns in such areas as desalination, water treatment, food waste management, solid waste management and climate change.

Supported by NTU and the National Research, Industry (RIE) funding, and in collaborations and engagements with funding agencies and industrial partners, NEWRI has over the last 15 years developed and demonstrated successful operation of transformative capabilities in Membrane Technology, Biotechnology & Bioprocesses, Resource Recovery, Environmental Chemistry & Materials, Modelling & AI Machine Learning, Engineering, and Analytical Measurements.

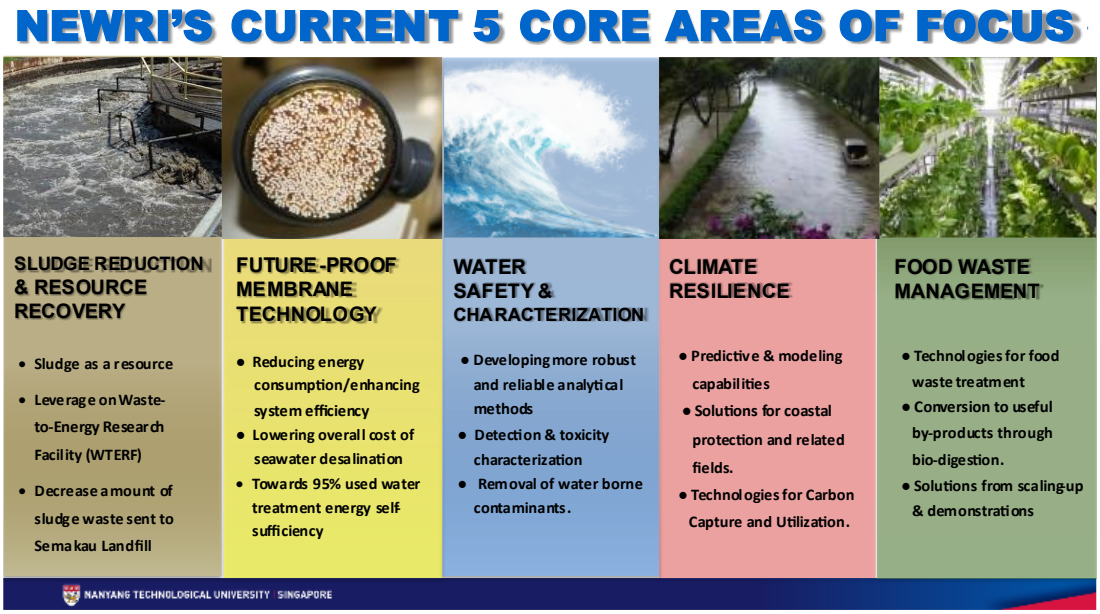
Well equipped with state-of-the-art facilities, including a remarkable suite of high-end analytical equipment - chromatography, spectroscopy, microscopy, imaging and cell analysis, and automated sample preparation, and a one-of-its-kind 7,000 sqm Waste-to-Energy Research Facility (WTERF), NEWRI's R&D activities are supported by strong analytical capabilities and scaled-up through robust engineering to industry-scale applications in the field, through piloting and deployment at full scale in real life settings.



The NEWRI multi- and inter- disciplinary Ecosystem towards cutting edge research and *sustainable, innovative engineered solutions.*

Some examples of NEWRI's urban solutions for deployment include lower energy desalination, autonomous water treatment systems, next generation solid-waste solutions, advanced agriculture technologies, and resource recovery for circular economy.

Through industrial and CSR projects with commercial and social impact, NEWRI continuously endeavours to make a difference towards developing a true circular economy through efficient reuse innovations and harnessing the value in waste.
NEWRI is keenly involved with funding agencies for national priorities such as Sludge Reduction Resource Recovery, Future-Proof Membrane Technology, Water Safety and Characterization, Climate Resilience and Food Waste Management.



Aligned with NTU's dramatic growth in global rankings and impact, NEWRI is committed to grow, evolve and diversify, as we continuously leverage on our cross-cutting interdisciplinary and transformative capabilities to build stronger and deeper bilateral innovation and diversification through our close engagement with funding agencies and industry partners. NEWRI will collaborate with multinational companies, large local enterprises, as well as small and medium enterprises and start-ups to co-create innovative and commercially viable products and processes.

NEWRI continues to stay engaged in its vision to be the pre-eminent Water and Environment Research Institute for leading-edge research, translation into world class products, and developing a highly skilled workforce



SINGAPORE CENTRE FOR ENVIRONMENTAL LIFE SCIENCES ENGINEERING (SCELSE)

The Singapore Centre for Environmental Life Sciences Engineering (SCELSE) is a unique interdisciplinary Research Centre of Excellence (RCE) and global leader exploring microbial biofilms, communities and microbiomes established to discover, control, and direct their behaviour for sustainable environmental, engineering, public health and medical applications.

SCELSE's mission is driven by three synergistic pillars: molecular and mechanistic discovery to identify the "why" behind microbial behavior; data-driven predictive biology using AI to forecast system shifts under changing variables; and the translation of these insights into applicable solutions with tangible health, societal, and economic value. By maintaining a world-class interdisciplinary environment where systems biology, physics, chemistry and engineering converge, we connect the dots across previously unseen nexuses of the microbial world. SCELSE defines and manages them to ensure the long-term resilience of interconnected global health and a liveable future for Singapore and the world.

SCELSE research takes advantage of the universality of microbial biofilm communities and microbiomes, employing high resolution 'omics tools (genomics, proteomics, and metabolomics), computational biology, state-of-the-art biofilm imaging and laboratory-to-pilot scale bioreactors to investigate microbial biodiversity and function in complex systems.

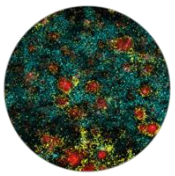
SCELSE leverages on the combined strengths of NTU and NUS, together with industry, government and academic partners, and research institutes in Singapore and abroad. This is further supported by the Singapore National Biofilm Consortium, which provides a platform to connect researchers and companies for translating biofilm and microbiome research into products and technologies to meet industry needs.

These underpin SCELSE's capacity to address cutting-edge multidisciplinary biofilm research questions. The centre's research model ensures all facets of biofilm research are rigorously investigated, employing ecological theories to link processes at difference scales to evaluate and predict microbial community biofilm behaviour under varying conditions, such as key urban sustainability challenges.

The exploratory power available to SCELSE researchers, combined with a singular level of interdisciplinary expertise enable the delivery of a comprehensive understanding of microbial

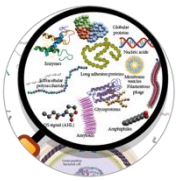
systems. This, in turn, feeds into the development of translational approaches that will deliver technological benefits and biofilm control applications.

SCELSE's key research areas include:



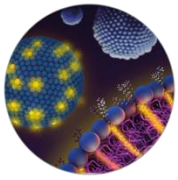
Biofilm composition & organisation

- Experimental biofilms and microbiomes for skin/scalp health
- Regulatory networks controlling bacterial biofilm formation and dispersal



Biofilm matrix emergent properties

- Extracellular polymeric substances & biofilm structure-function
- Matrix biophysics, biofilm formation, control



Microbial-driven bioprocesses

- Optimising bioprocessing mediated by microorganisms
- Controlling biofilms for bioprocessing
- Membrane insertion molecules to fortify or weaken target microbes



Biofilms, microbiomes & human health

- Recalcitrant bacterial biofilms in chronic infections
- Human-microbiome interactions
- Air microbiomes & respiratory health
- Pathogen detection and control



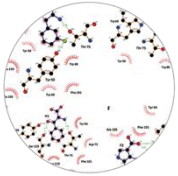
Wastewater engineering

- Optimising microbial community structure, function, resilience & productivity for resource recovery from sewage, food processing
- Circular economy: converting waste to high value products



Microbiomes & bioprocesses urban, natural ecosystems

- Marine host microbiomes, coastal green engineering, and biotechnology
- Bioremediating engineered urban waterways
- Understanding, managing bioaerosols in clean & polluted environments



Antimicrobials & antibiofilm drugs

- Chemical biology for microbial control technologies
- Bacterial signalling inhibitors as antibiofilm agents
- Targeted approaches to antimicrobial discovery



Biofilms & microbiomes in food production

- Biofilms, microbiomes for sustainable urban agri- and aquaculture
- Microbial, microalgal protein production, augmentation

SCELSE's in-house facilities and capacities include:

- The **High-throughput Sequencing Facility** is designed to provide researchers and collaborators access to cutting-edge next-generation sequencing technologies. The facility enables the interrogation of the genomic and transcriptomic data of complex microbial communities in both natural and engineered systems, and has created a pipeline for sequencing ultra-low biomass samples. The sequencing capacity is supported by a **High Performance Computing Facility** with more than 13,000 CPU cores for data storage and analytics.

- The **Advanced Biofilm Imaging Facility (ABIF)** provides access to state-of-the-art microscopy, image processing and analysis software, as well as bespoke microscope instrumentation tailored to the specific needs of biofilm researchers. This is supported by the in-house comprehensive microscopy expertise of ABIF staff, who train and instruct users in microscope operation, and advise and assist researchers with sample preparation, advanced imaging techniques, processing and analysis of microscopy images. ABIF belongs to imaging shared facility networks such as the NTU Optical Bio-Imaging Centre and SingaScope, extending the range of instrumentation available to SCELSE members.

- The **Bioreactor Facility** provides environmental bioengineering and bioreactor laboratories for a range of experimental scales. SCELSE currently hosts more than 30 laboratory-scale bioreactors associated with a variety of wider research projects ranging from single-cell protein generation to questions relating to wastewater treatment processes. Online monitoring and precise control of operational parameters enables researchers to investigate the temporal variation of microbial community dynamics, structure, and function, and provides the means to develop predictive models in a controlled environment.

- The **Integrative Analysis Unit** (IAU) is a hub for the analysis and interpretation of complex 'omics data sets generated within SCELSE. The IAU operates at the boundary of research and service provision, delivering bioinformatics support involving a mix of deep biological or bioengineering insights, skills in scientific computing and a knowledge of data science. When complex biological systems require non-standard solutions, it enables a deeper, more rigorous exploration of the data to overcome the limitations of standalone bioinformatics software.