



EXPLORING CONNECTIONS: A NEW FORCE IN BRAIN RESEARCH

NEUROSCIENCE RESEARCH is thriving at a young and vibrant university in Shanghai.

At ShanghaiTech University, a new, well-resourced university with a modern residential campus in the heart of Shanghai Pudong's Zhangjiang Hi-Tech Park, a collective of 20 neuroscientists have joined forces to find solutions for brain injury and disease. In just five years, they have made the neuroscience division at ShanghaiTech's School of Life Science and Technology (SLST) a rising star in research and education.

With the rapid advances in life sciences, the neuroscience field is becoming more prominent, given its potential for improvement to human life. Many large-scale national projects have been launched to explore how the human brain works and controls behaviour, as well as the causes for problems. Committed to research in line with national development strategies, ShanghaiTech, soon after establishing the SLST in 2013, started planning a neuroscience division.

With support from nearby national facilities such as the National Protein Science

Center, Shanghai Synchrotron Radiation Facility, and Shanghai X-ray Free-Electron Laser, the neuroscience division in the SLST has become a hub for faculty members, postdoctoral fellows, and students to realize their neuroscience ambitions. Advanced in-house facilities such as the nano-scale imaging centre, cryo-EM, super-resolution microscopes, and nuclear magnetic resonance spectroscopy facilitate cutting-edge research, primarily in developmental neuroscience, system neuroscience, neurological diseases, and neurotechnology.

In the brain, neurons are wired together via axons and synapses, whose anomalies during development underlie many neurological diseases. In developmental neuroscience, a group led by Zhenge Luo has systematically explored the molecular mechanisms underlying axon development and synapse formation, and now aims to understand the genetic basis of cortex expansion during human evolution. Other groups are looking at neuronal

morphogenesis, synapse refinement, and circuit formation.

System neuroscientists at ShanghaiTech are working on memory, stress, learning, and thermoregulation and feeding. Jisong Guan's group has revealed how memory is stored and regulated in the cortex circuitry, improving our understanding of how the brain learns. Collaborative efforts from Wei Shen and Ji Hu's groups have found how neurons control body temperature, feeding, reward, and stress.

Researchers in the neurotechnology team are devoted to harnessing the latest technologies, including X-ray structure, gene editing, super-resolution imaging, and integrative biology for brain research. Using X-ray crystallography methods and the latest cryo-EM facility, Zhijie Liu and colleagues have revealed the key structures of some important biological molecules in the nervous system, such as endocannabinoid and serotonin receptors. The latest gene technology has allowed researchers to create the first

genetically engineered monkeys for modelling psychogenic disorders.

Other groups are working toward the treatment of a variety of neurological diseases, including retina regeneration, neuromuscular disorders, and injury repair. There are also collaborations to unlock psychiatric and cognitive problems, such as plasticity disorders and Alzheimer's disease.

With comprehensive networks between groups and a unique environment for scientists to develop, the neuroscience division of ShanghaiTech has ambitions to become an internationally-recognized neuroscience centre. It seeks to lead in brain development, behaviour encoding, technology development and disease treatment. Talented researchers are invited to join the push to untangle the mysteries of the human brain. ■



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