

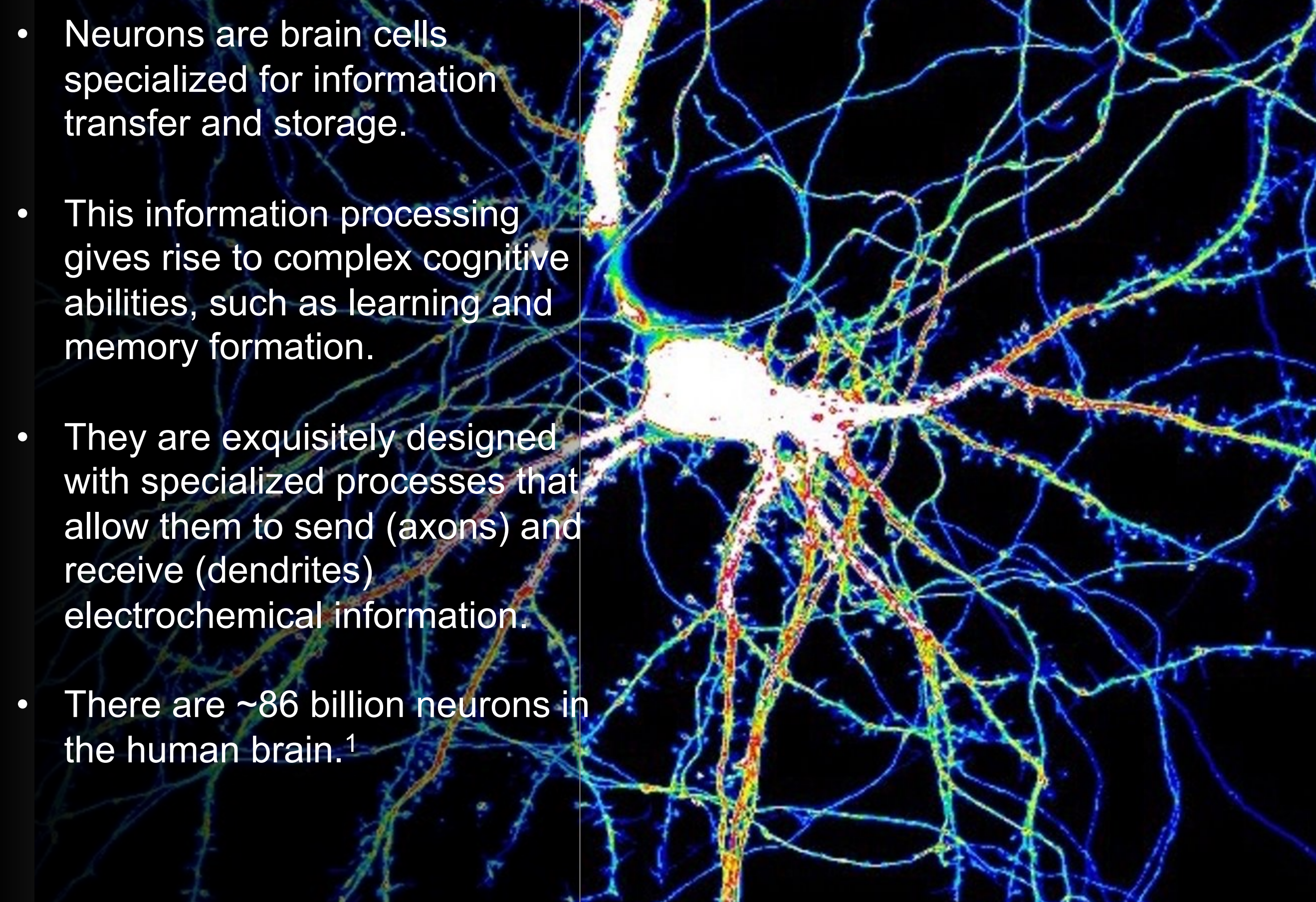
Synapse Formation in Human Brain Development



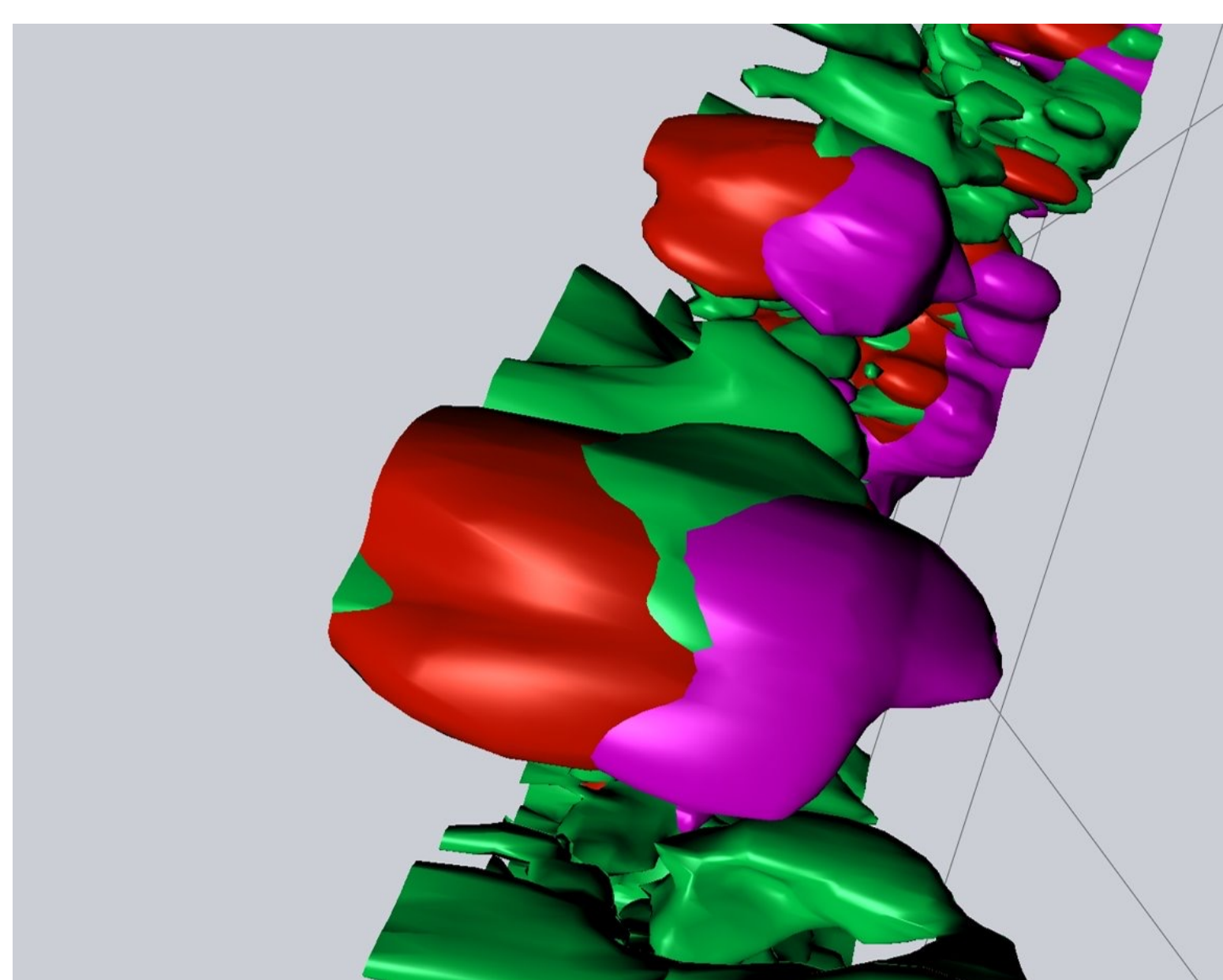
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WHAT IS A NEURON



WHY STUDY SYNAPSES



Synapses mediate information transfer.

The pre-synaptic axon terminal sends information in the form of neurotransmitters across a synaptic cleft.

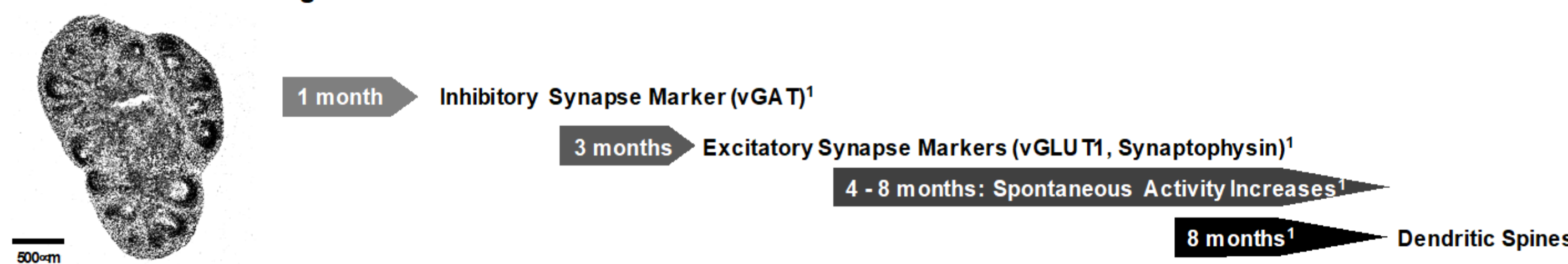
These neurotransmitters can then bind to receptors on the post-synaptic compartment, eliciting information transfer in the form of electrical activity, known as action potentials.

Understanding how synapses form will unravel mysteries of the brain, such as learning and memory formation.

This research will also help us to address how genetic mutations and environmental factors give rise to neurodevelopmental disorders, potentially leading to novel therapies.

These discoveries may also allow us to rebuild synapses when they are lost in neurodegenerative diseases.

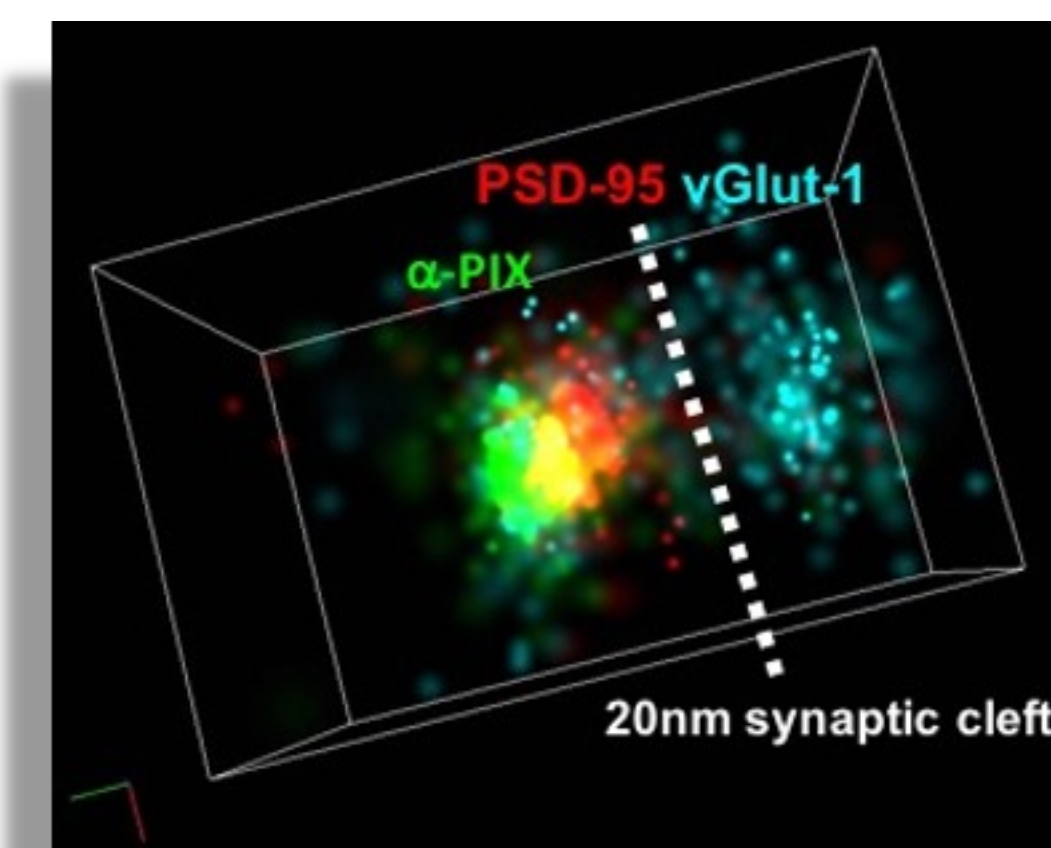
HIPSC-derived Brain Organoid



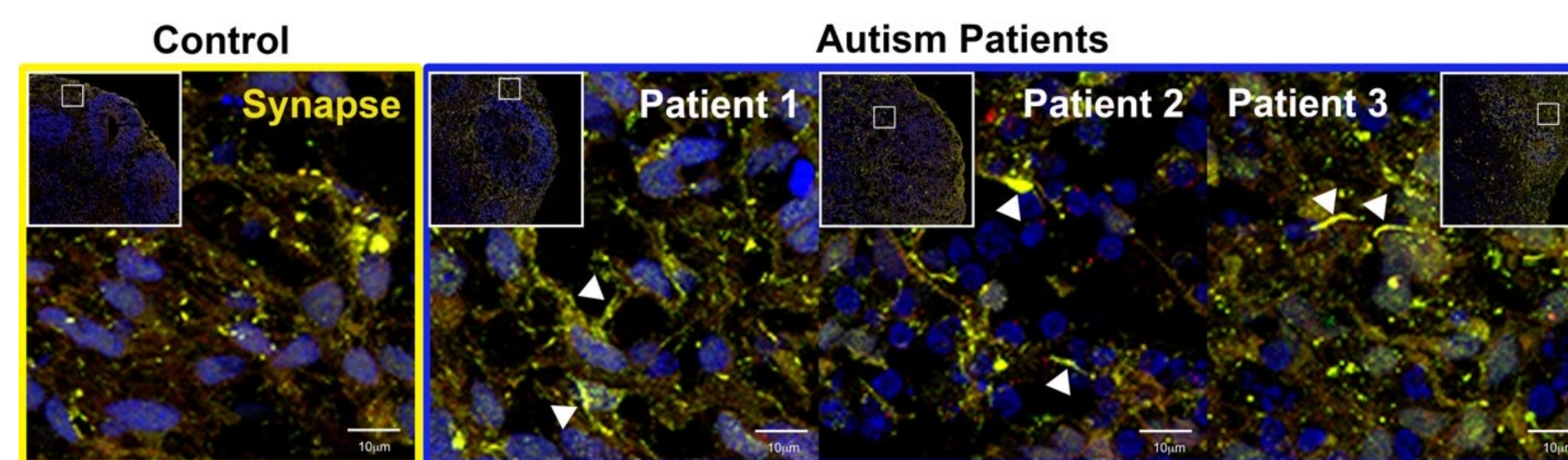
HUMAN SYNAPSE DEVELOPMENT Mid-Fetal Gestation: Synapse Formation/Spontaneous Activity^{4,4} Post-natal: Dendritic Spines^{7,8}

WE DEVELOP HUMAN BRAIN TISSUE TO RESEARCH HOW SYNAPSES FORM!²

HOW DO WE STUDY SYNAPSES

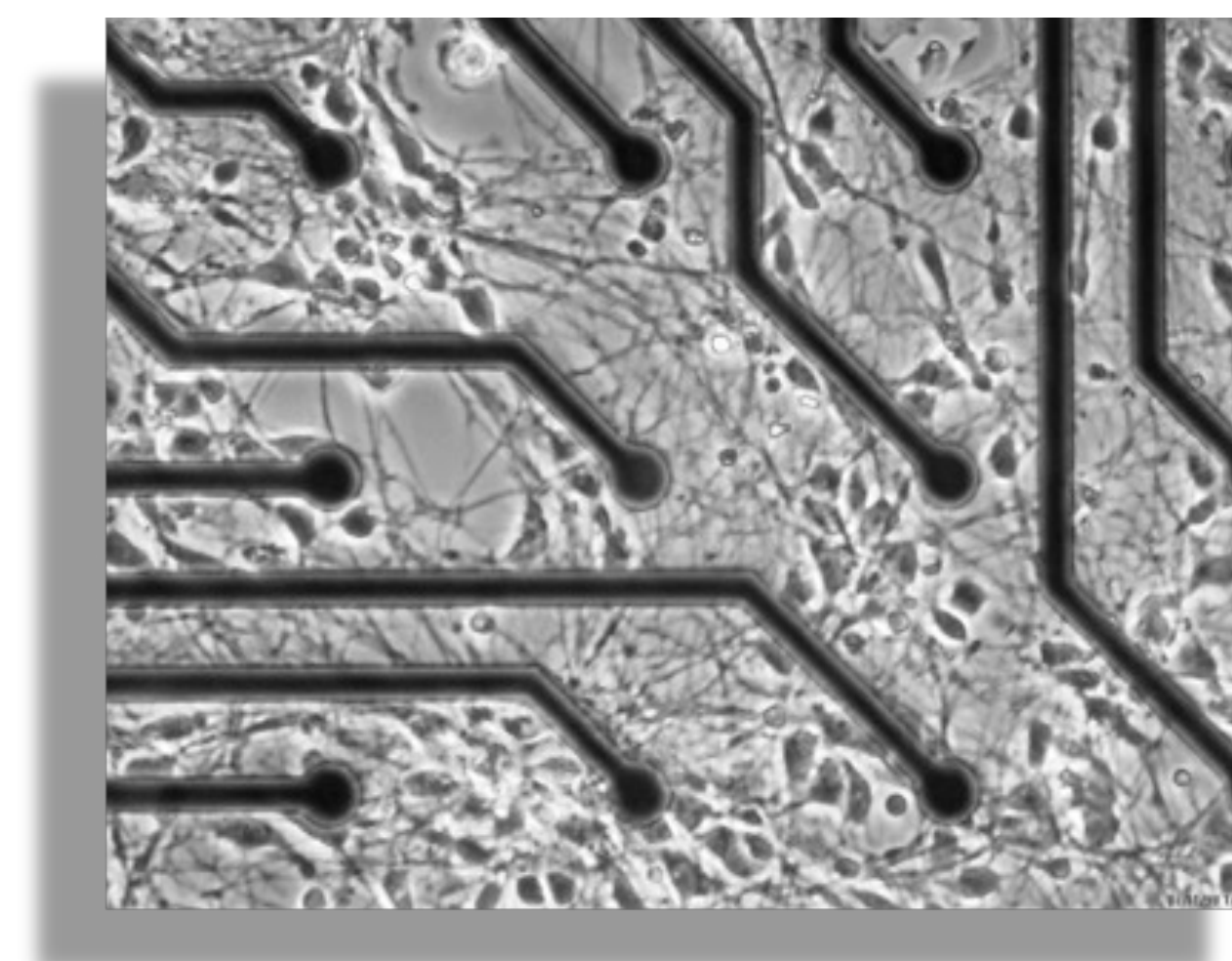


We visualize the formation of individual synapses with STORM super-resolution microscopy.³⁻⁶

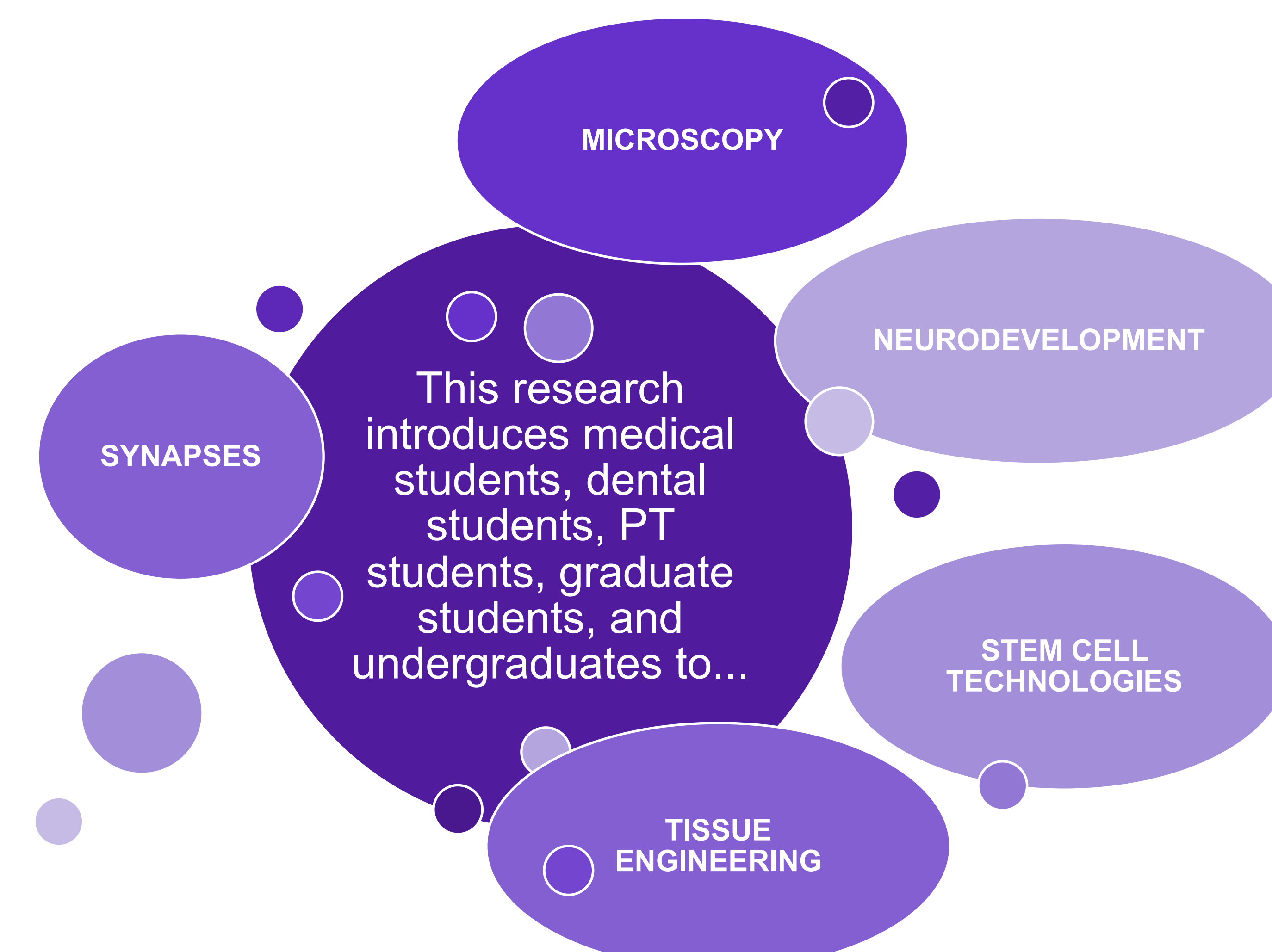


We develop human brain models from patient samples, allowing us to observe the emergence of synaptic alterations. We can also assess how different treatments impact synapse formation.³⁻⁷

We use microelectrode arrays to record electrical information transfer at synapses.⁴⁻⁷



Together, these technologies allow us to study how synapses form and function in brain development.



WE BUILD BRAINS!

WE ARE ALSO BUILDING THE NEXT GENERATION OF SCIENTISTS!

How is teaching through biomedical research preparing students for STEM careers?

Build critical thinking skills

Innovate new research tools

Optimize experiments to test your hypothesis

Master cutting-edge technologies

Expose yourself to new ideas

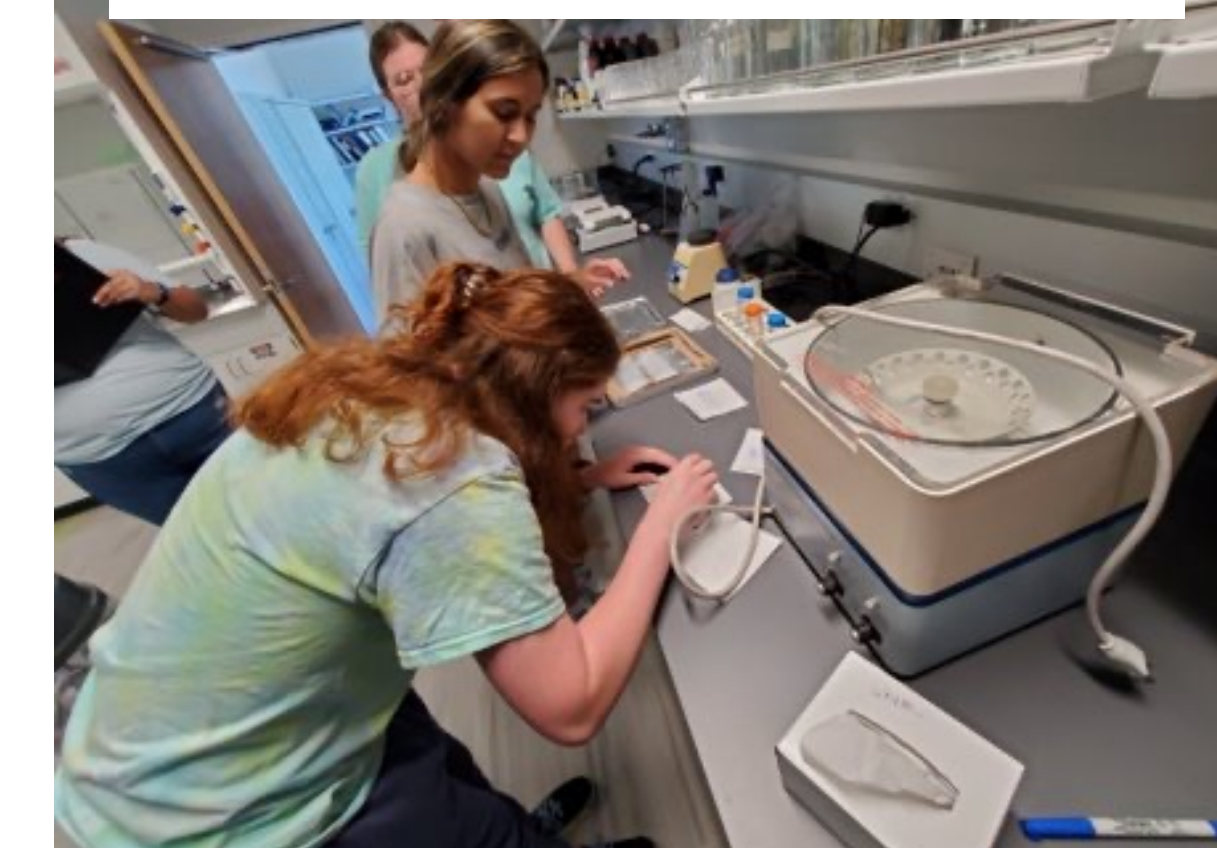
Develop the ability to effectively share science



LABORATORY RESEARCH



COURSE-BASED RESEARCH



ACKNOWLEDGEMENTS

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