# Integrated Electronics and Biointerfaces Laboratory (IEBL)

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**Professor Shadi A. Dayeh** (sdayeh@ucsd.edu)

## Introduction to Our Lab

**Who we are**: IEBL, which also stands for **Ingenuity, Ethics, Breakthroughs, Life**, is a multidisciplinary lab at the cutting edge of high-resolution neural interfaces and sensors.

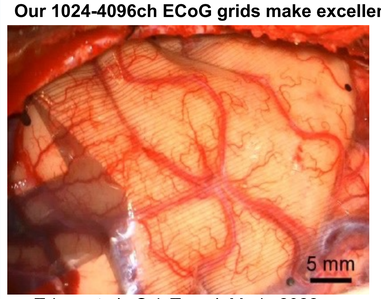
Our background though diverse is deep and is concerned with microfabrication, biomedical engineering, electronics and embedded system design, and software integration for real-time analysis and display.

**What we do**: We address unmet clinical needs by tightly collaborating with neurologists and neurosurgeons to innovate, design, microfabricate neural electrode technologies, test them in small and large animal models, and translate them for human use. **We are the first academic lab to obtain an FDA approval for multi-thousand channel brain interfaces (the other team is at Neuralink!)**. Our devices are used for epilepsy monitoring and treatment, chronic pain treatment, brain-machine interfaces, spinal cord stimulation, and tactile feedback for robot-assisted surgery.

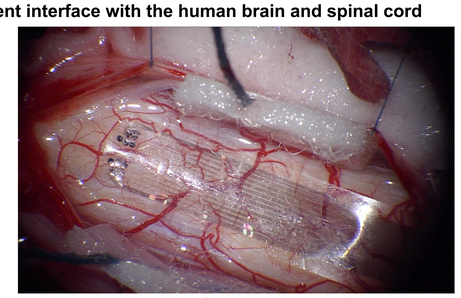
**Visit our lab** to experience the facilities and environment we built to do cutting edge research.

## Electrode Technologies

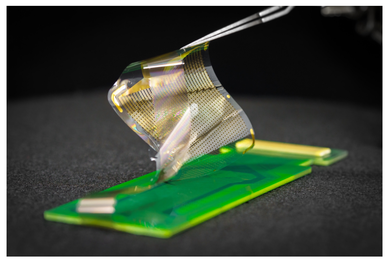
**Our 1024-4096ch ECoG grids make excellent interface with the human brain and spinal cord**

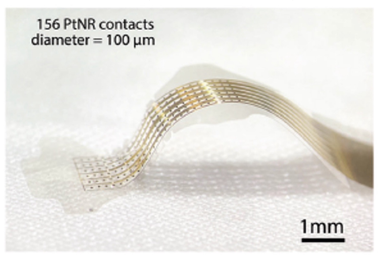



Tchoe et al., Sci. Transl. Med., 2022



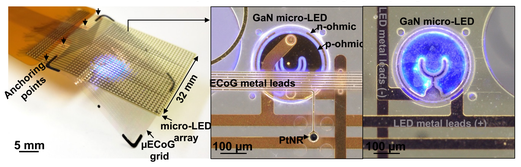
Russman et al., Sci. Transl. Med., 2022

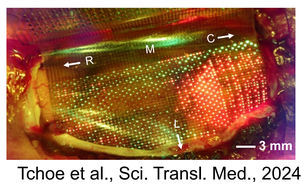





Russman et al., Adv. Func. Mat., 2025

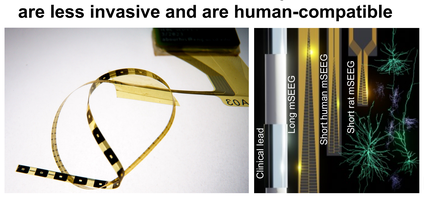
**We made flexible cell phone-like displays to project brain activity during surgery**

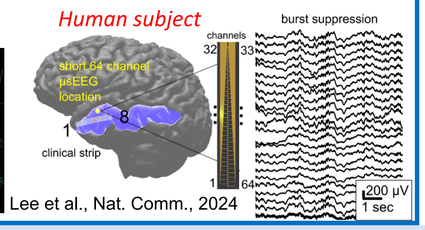



Tchoe et al., Sci. Transl. Med., 2024

**Our 128ch/16ch record/stim depth electrodes are less invasive and are human-compatible**

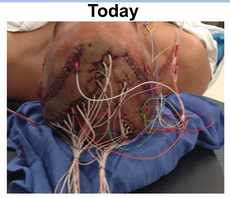



Lee et al., Nat. Comm., 2024

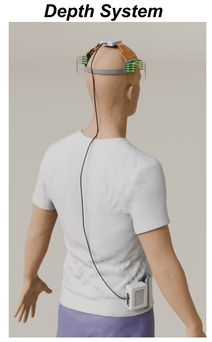
## Wireless Epilepsy Monitoring System

**Today**

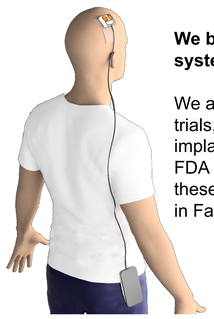


**Our wireless systems will enable ambulatory monitoring at home**

***Depth System***

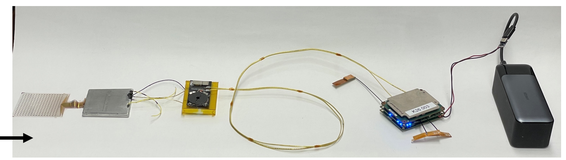


***ECoG System***



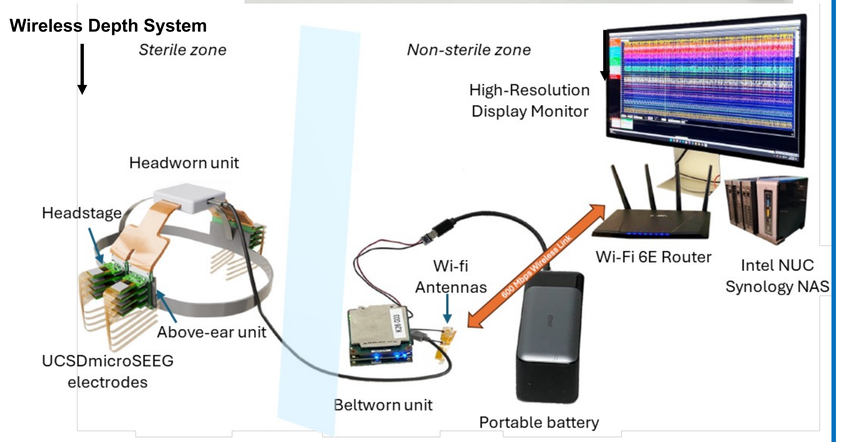
**We built the two wireless systems!**

We are conducting animal trials, biocompatibility and implantation tests, and FDA submissions to use these systems in humans in Fall 2026

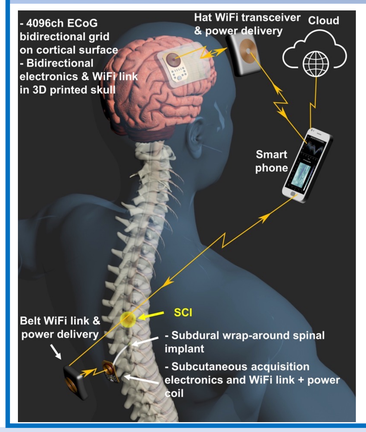


**Wireless ECoG System** →

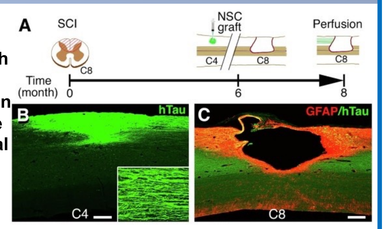
**Wireless Depth System**



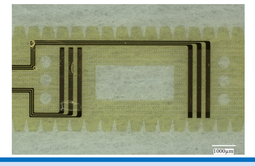

## Spinal Electrodes for Motor Control and Neural Regeneration

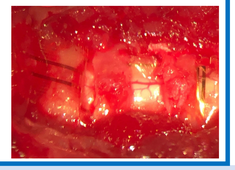



**We are working with Dr. Mark Tuszynski on bridging the gap in spinal cord injury**




Experimental Neurology 379, September 2024, 114889

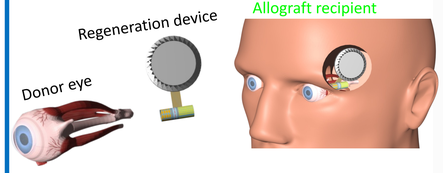




## Neurotech for Transplantation of Human Eye Allografts

**UC San Diego and Scripps Research Join National Team to Make Vision-restoring Whole Eye Transplants a Reality**

Technologies developed by both teams will map the human eye-brain connectome, extend the lifespan of the revived human eye, and help regenerate and monitor the optic nerve after a whole eye transplant

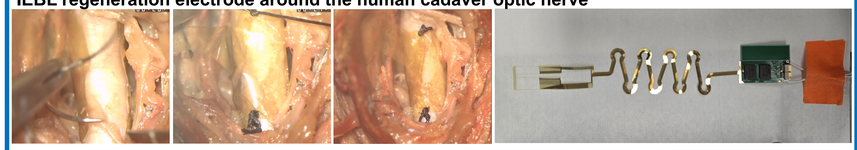



DEL MAR TIMES

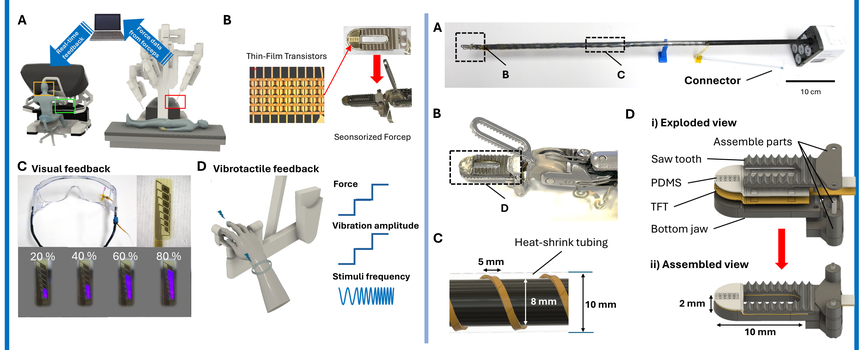
**Light after death: La Jolla scientists revive human eyes**

By restoring the light-sensing function of human retinas hours after death, Scripps Research new way to study age-related macular degeneration and other eye disorders.

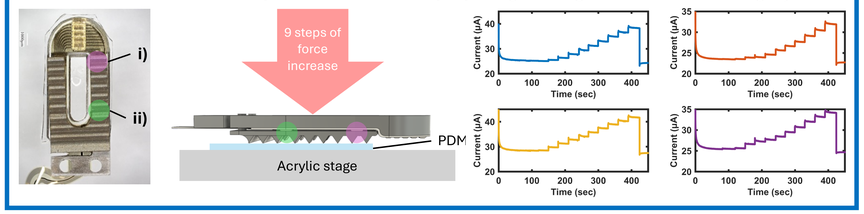
**IEBL regeneration electrode around the human cadaver optic nerve**



## Tactile Pressure Sensors for Robot-Assisted Surgery




**We conducted benchtop validation and are preparing for large animal robotic surgery**

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