Lambda Neuroscience Foundation

Open-Access Histology for Neuroscience Research
STEM Awareness, Inspiration, and Education

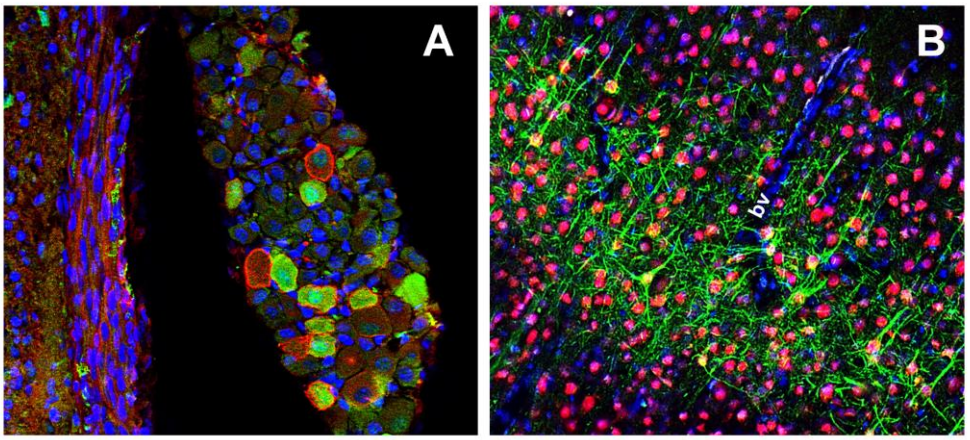
Our Mission

To accelerate neuroscience research and novel therapeutic discovery by removing bottlenecks in histology (i.e. brain tissue analysis via sectioning, staining, imaging, and digital analysis), while building public STEM education pathways for middle and high school students, and raising awareness of essential biomedical research for adults.

Our Purpose & Impact

Lambda Neuroscience Foundation (LNF) is a non-profit organization that offers innovative, comprehensive, and superior histological services specifically to any credible neuroscience researcher (LNF's charitable purpose). It is our goal to provide this outsource service for free and without quantity limits in an effort to yield faster discoveries through removal of technical barriers, and creation of an open-access database of extremely detailed brain images. Neuroscience researchers conducting translational research use mice to model brain diseases. At experimental end points, the brains from these mice are isolated, preserved whole, and submitted to LNF. At a minimum, we process these whole brains to create microscope slides and then image those slides. Detailed digital image analysis is also available if requested. The prepared slides are shipped back to the researcher, while images are available for download via our website. The sole obligation of the researcher in exchange for free service is that all digital images produced by LNF must be added to our online database.

Standard histological images typically use two labels to identify structural or cellular populations within cerebral tissue from only a very small portion (5%) of the brain. With two labels it is possible to identify up to 4 populations. With LNF's system of analysis utilizing six labels, it will be possible to identify up to *64 separate populations across the entire brain* (a 16x increase in population identity and a 20x increase in coverage) at high-throughput rates (Fig. 1). It is this comprehensive analysis that makes LNF's process unprecedented in molecular brain analysis, and when combined with the repository of images across many brain disease models, will push the frontier of this research forward at a significantly accelerated rate. Moreover, this process has a strong likelihood of meeting requirements for patent approval, and subsequently could be adapted to yield scalable, marketable products intended to accelerate discoveries for many neuropathologies such as: Autism, stroke, traumatic brain injury (TBI), dementia/Alzheimer's, Epilepsy, Cerebral Palsy (CP), Parkinson's, Multiple Sclerosis (MS), Huntington's, ALS, and of special interest to the co-founder, neuro-oncological diseases (brain tumors).



A) Nerve cells, called neurons, in the spinal cord where all cells label blue (nucleus of each cell), some red and some green. Using only two labels, it is possible to distinguish four cellular populations: R^-/G^-, R^+/G^-, R^-/G^+, R^+/G^+. **B)** A zoomed out, cross section of the neocortex of a mouse brain where all cells are blue, all neurons are red, and a subset of neurons also label green. A blood vessel is present from center to upper right (dark line labeled "bv"), and the cells making up the vessel label only blue because they are not neurons (dots at the periphery of line). Neurons and their specific axonal processes that extend and connect to adjacent neurons are easily visualized (red and green). Both individual cellular populations and cellular structures can be measured and analyzed throughout the entire brain using this process.

Secondary to the services we offer, we aim to encourage middle and high school students as well as inquisitive adults to engage in authentic neuroscience research through various modalities. First, we will create online lab diaries published to our website featuring pictures and videos of our process focusing on the science behind each step in an effort to educate the public and increase appreciation of hardworking scientists. Second, we will open our doors to middle and high school classes for lab tours, and offer hands-on, wet-lab experience to AP and Magnet Program high school students. The purpose of these collective efforts is to inspire young

adults and foster public interest in biomedical research by illustrating the complicated process of therapeutic discovery in a straightforward way, accessible to anyone at any stage.

Year-1 Objectives

- Set up lab space including two cornerstone instruments (vibratome, epifluorescence microscope).
- Develop unique standardized protocols and LNF's website for open-access resources.
- Perform foundational work in collaboration with neuroscience researchers at Cedars-Sinai.
- Provide free, comprehensive, high-throughput histology services to the approximate 350 different academic and industry neuroscience research projects in the greater Los Angeles area.
- Create public-facing lab diaries to demystify the complex process of neuroscience research and inspire students. Offer lab tours, and hands-on experience to high school students.
- Identify and pitch high-end, charitable donors while simultaneously advertising and accepting donations through our Go-Fund-Me all to raise Year-2 funds.

Seed Budget Request

Donor money funds real biomedical research, which in turn allows us to conduct our community outreach programs. Donors can easily and directly see the work they helped pay for.

Category	Amount	Notes
Founder annual salary & benefits	$50,000	Full-time leadership and continuity of operations
Vibratome	$35,000	Cornerstone instrument for reproducible brain sectioning (Leica VT1200S)
Epifluorescence microscope	$70,000	Core imaging system with multichannel fluorescence (Leica Aperio VERSA)
Lab rental, utilities, and compliance	$50,000	Small private suite with visitor access; waste disposal; permits (overhead)
Laboratory Materials & IT	$30,000	Bench equipment, consumables, reagents, antibodies, and digital infrastructure
Education/outreach content	$5,000	Online lab diaries, videos, and classroom materials
Strategic reserve	$10,000	Buffer for unexpected costs and rapid growth (contingency & scaling)
Total	**$250,000**	**Year-1 request**

Year-2 and Beyond

Throughout the first year LNF will grow to service the greater Los Angeles area. But beginning in the second year we will further build lab infrastructure, installing automatic slide stainers and hiring employees to increase our workforce, so that we can scale nationally to offer services to basic science, clinical, and importantly, pharmaceutical research labs. Long term, we aim to diversify our funding venues to become fiscally independent. These venues include tax-deductible donations from the public and philanthropic partners, R21 grants from the National Institutes of Health (NIH), and most essentially by becoming a Contract Research Organization with the NIH Blueprint for Neuroscience Research. In addition to these sources of income, we aim to pitch the Los Angeles Unified School District (LAUSD) for support and to integrate with the public school system STEM education programs, easing and ensuring our reach to local motivated students so they have the opportunity to engage with authentic biological work directed at helping individuals living with Autism.

Founder Background

I have a PhD in Biomedical Sciences with a focus in Neurobiology, multiple peer-reviewed primary neuroscience publications, and presented at prestigious national and international conferences. Most recently, I was manager of a translational biomedical research laboratory in the Neurology Department at Cedars-Sinai Medical Center. I first established the lab from the ground up, and then simultaneously performed my own experiments and kept the lab stocked and in-compliance for four other researchers facilitating their projects to completion. In addition to my leadership experience, I have 20 years of practical experience with histological staining, advanced molecular imaging systems, 2D and 3D digital tissue analysis, and the process of biomedical research as a whole.

Contact

Nicklaus A. Sparrow, PhD
Founder, Lambda Neuroscience Foundation
Email: nicklaussparrow@me.com | Phone: (310) 908-6681