

Lambda Neuroscience Foundation

Open-Access Histology for Neuroscience Research
STEM Awareness, Inspiration, and Education
nicklaussparrow.com/LNF

Our Mission

To accelerate neuroscience research and novel therapeutic discovery by removing bottlenecks in histology (i.e. tissue analysis via sectioning, staining, imaging, and digital analysis), while also building an academic shared data resource, and public STEM education and awareness of essential biomedical research.

Our Purpose & Impact

Lambda Neuroscience Foundation (LNF) will be 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 the removal of technical barriers, and the creation of an open-access database of extremely detailed brain images across multiple brain diseases. Neuroscience researchers who conduct 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, but 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 database website. The sole obligation of the researcher in exchange for free service is that all digital images produced by LNF must be made public within the database. This will create an open-access collaborative scientific resource, strengthened by each participating laboratory.

Standard histological images typically use 2 labels to identify structural or cellular populations within cerebral tissue from only a very small portion of the brain (~5%). With 2 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* (that's a 16x increase in population identity, and a 20x increase in coverage) at high-throughput rates. It is this comprehensive analysis that makes LNF's process unprecedented in molecular brain analysis (see Fig. 1). When combined with the public repository of images across many brain disease models, it will lead to new insights and discoveries in brain disease progression, and will ultimately guide the development of potential new therapies. LNF's process can be

applied to many neuropathologies including: stroke, Alzheimer's disease and other dementias, traumatic brain injury (TBI), Parkinson's disease, epilepsy, Autism spectrum disorder (ASD) cerebral palsy, multiple sclerosis (MS), neuro-oncological diseases (brain tumors), amyotrophic lateral sclerosis (ALS), Huntington's disease.

In addition 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

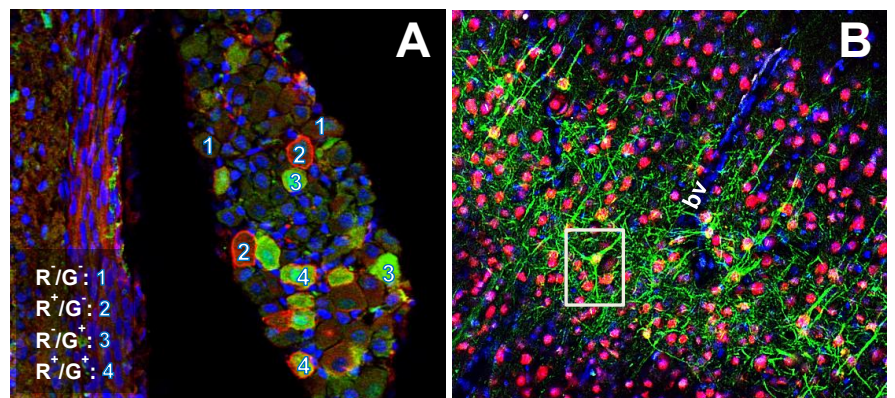


Fig. 1 Example Images by LNF. A) Nerve cells, called neurons, in the spinal cord where all cells label blue (nucleus of each cell), some neurons red and some green. Using only two labels, it is possible to distinguish four cellular populations: R⁻/G⁻, R⁺/G⁻, R⁻/G⁺, R⁺/G⁺. **B)** A cross section of the cortex 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 (red) and their specific axonal processes (green) that extend and connect to adjacent neurons are easily visualized (box highlights a single neuron with 3 processes). Both individual cellular populations and cellular structures can be measured and analyzed using only 2 colors (aka, channels), and even the absence of color is informative. Lambda's method uses 4 more colors and does this process throughout the entire brain.

to 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, fluorescence microscope).
- Develop unique standardized protocols, and two websites: a public-facing website for educational resources and donor engagement, and a database website for open-access resources.
- Create public-facing lab diaries to demystify the complex process of neuroscience research and inspire students. Offer lab tours, and hands-on experience to students.
- Pitch high-end, charitable donors while simultaneously advertising and accepting donations through our GoFundMe to raise Year-2 funds.

Seed Budget Request

With LNF, 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. We are currently fundraising on GoFundMe for two foundational pieces of equipment: a vibratome, and a microscope.

<i>Category</i>	<i>Amount</i>	<i>Notes</i>
Vibratome	\$35,000	Cornerstone instrument for reproducible brain sectioning (Leica VT1200 S)
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 sustained growth (contingency & scaling)
TOTAL	\$200,000	Requested Year-1 seed budget

Year-2 and Beyond

Beginning in the second year, we will first perform foundational work in collaboration with neuroscience researchers at Cedars-Sinai, and then expand our histology services to the approximate 350 different academic and industry neuroscience research projects in the greater Los Angeles area. In Year-3 we will continue building 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, industry research labs. Long term, we aim to diversify our funding avenues to become more fiscally independent. These include tax-deductible donations from the public and philanthropic partners, R21 grants from the National Institutes of Health (NIH), and pitching the NIH Blueprint for Neuroscience Research to become a Contract Research Organization. In addition to these sources of income, we aim to also 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 biomedical work directed at helping individuals living with brain diseases.

Founder Background

Dr. Sparrow holds a PhD in Biomedical Sciences with a focus in Neurobiology, has authored multiple peer-reviewed primary neuroscience publications, and has presented at prestigious national and international scientific conferences. He most recently served as laboratory manager of a translational neuroscience research laboratory in the Neurology Department at Cedars-Sinai Medical Center. He established that laboratory from the ground up while conducting his own research and managing compliance, operations, and project support for four additional researchers through project completion. He has nearly twenty years of practical experience in histological staining, advanced molecular imaging, 2D and 3D digital tissue analysis, and end-to-end biomedical research workflows.

Contact

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