UC **SANTA BARBARA**

Neuroscience Research Institute

Annual Report
Fiscal Year 2020-2021
Dr. Stuart Feinstein, Co-Director
Dr. Kenneth Kosik, Co-Director

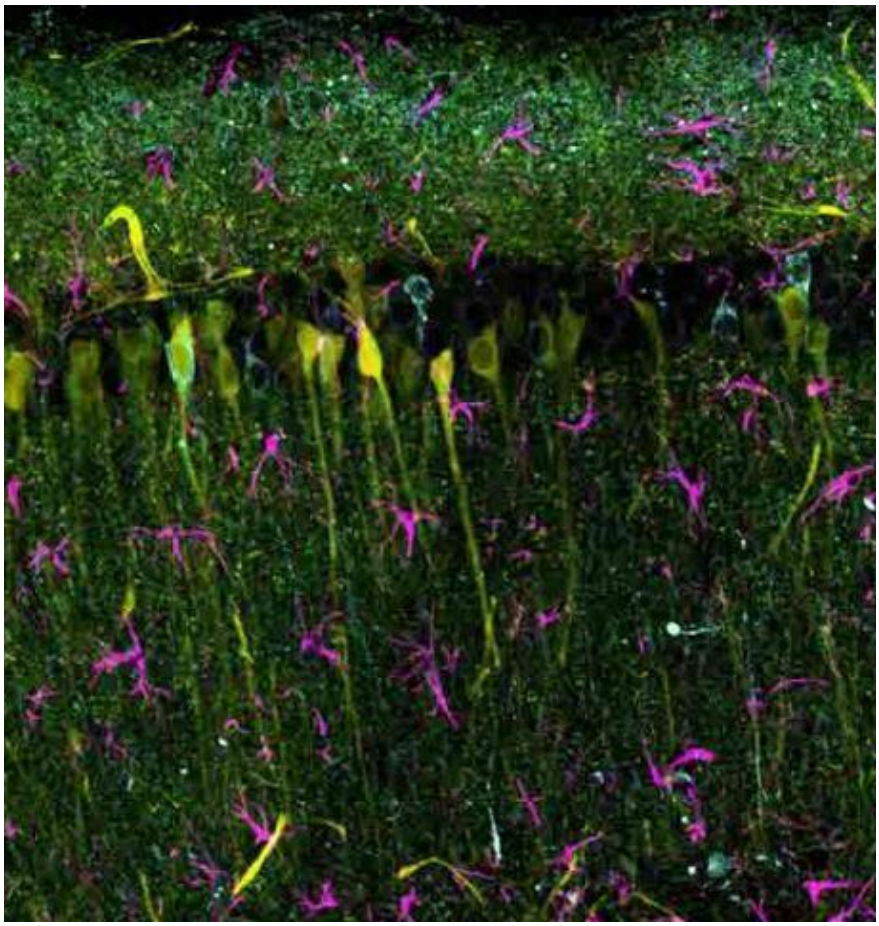


Table of Contents

Mission Statement 3

Overview 4

Executive Summary 5

Organization Chart 6

Advisory Committee, Administrative, and Technical Staff 7

Statistical Summary 8

Principal Investigators 9

Postdoctoral Researchers, Graduate and Undergraduate Students 10

External Participation 11

Other Projects and Activities 12

Proposal and Award Administration 12

Required Supplementary Materials 12

- Fiscal Information 12
- Space 12
- Center Reviews 12

Mission Statement

The mission of the Neuroscience Research Institute (NRI) is to foster knowledge and understanding of the nervous system by serving as a center for scientific research breakthroughs. The NRI is a group of investigators whose collective goal is to create an intellectual atmosphere conducive to exploration at the frontiers of human knowledge where disciplinary boundaries disappear. Investigators in the NRI recognize that the interests of neuroscience extend broadly from repair and prevention of human disease to the principles that underlie the development and function of nervous systems, from the human mind to the single molecular building blocks of the brain.

Overview

Who is the NRI and what does the NRI do?

NRI provides an intellectual and administrative home for cutting-edge neuroscience research for over forty labs on campus, most of whom also have joint appointments with various academic departments.

NRI has long been the hub of neuroscience research on campus. In addition to expanding and growing further into our traditional areas of strength including Alzheimer's and Related Dementias, Cell Biology and Biophysics of the Nervous System, Neural Development, Stem Cells and the Visual System, NRI has more recently developed five new areas of intense investigations in the areas of Behavioral Neuroscience and Neuroethology, Computational and Theoretical Neuroscience, Systems Neuroscience and Imaging of Neural Activity, and Tools and Technology Development. NRI's inter-disciplinary expansion over the past few years has been achieved, in large part, through the successful recruitment of 12 outstanding young new faculty working at the cutting-edges of their disciplines with academic appointments in Molecular, Cellular and Developmental Biology, Psychological and Brain Science, Chemical Engineering, and Physics.

The NRI research agenda has continued very strong. A few highlights are: Michael Goard has devised novel optical instrumentation to observe neuronal firing in awake behaving mice. Craig Montell has introduced a gene drive to control mosquitos that exploits their mating behavior. Kenneth Kosik has advanced drug discovery for Alzheimer's disease with small molecules that are directed at novel targets. Dennis Clegg has developed a bio-based platform to deliver stem cells to the eye for the treatment of retinal disease.

The NRI is not the sole locus of neuroscience on the campus, as there are 3 academic departments in which neuroscience is a prominent component of their graduate programs. These programs are Dynamical Neuroscience, MCDB and Psychological and Brain Sciences. The educational missions of these programs all enhance the overall presence of neuroscience on the campus. In an effort to provide the campus and outside communities (including potential graduate student and postdoctoral candidates) with an integrated view of both the research and academic aspects of neuroscience here at UCSB, NRI has collaborated with Dynamical Neuroscience, MCDB and Psychological and Brain Sciences to develop a single UCSB Neuroscience website. This very successful effort was spearheaded by Professor Michael Goard, who is a member of all 4 units listed above. The NRI also collaborates and supports additional neuroscience programs on campus with support for numerous seminars, programs for fellows in the Sage center, and a brain series in the Center for Black Studies.

Executive Summary

Summary Statement

The state of the Neuroscience Research Institute is strong. Although the pandemic has impacted collaborations both within and outside the institution, the Institute has maintained its historic level of grant support and productivity with gifts amounting to just under $4.5 million and several large NIH grants funded. Both junior and senior investigators have sustained or increased their grant support throughout the pandemic. During the pandemic members of NRI and their lab members pivoted in their research agenda to develop campus testing (Wilson, Kosik, Arias and Acosta-Alvear) and manage the entire campus COVID approach (Feinstein). Other critical science in NRI required that we keep some labs open under restricted conditions during the most severe phase of the pandemic and the high degree of compliance kept cases within the NRI at near zero.

The missions of the NRI are: (i) to serve the research interests of the campus in all facets of neuroscience; (ii) to promote collaborative, interdisciplinary neuroscience research at UCSB; (iii) to encourage diversity and support the next generation of neuroscientists. Our work includes both basic science inquiries into the development, function, degeneration and regeneration of the nervous system as well as translational studies directed toward developing therapeutic strategies for the many neurological maladies afflicting society. The NRI junior and senior investigators create a vibrant, interdisciplinary neuroscience environment at UCSB.

NRI Support of Research: Communal Core Facilities

NRI also continues to provide outstanding technical expertise and communal instrumentation support for over a hundred laboratories from all over the campus in two fundamentally important aspects of modern life sciences research through its long standing operation of our NRI/MCDB Microscopy Facility and our Stem Cell Core Facility. In order to promote absolute cutting edge research capabilities for our UCSB researchers, the Microscopy Facility and its many investigators have acquired three new state-of-the-art-microscopes with different modalities via highly competitive federal grant mechanisms. The investigators in the Stem Cell Center have likewise maintained their position at the leading edge of the field by, for example, developing brain organoid preparations and advanced physiologic monitoring of the organoids. These futuristic technologies position the NRI at the cutting of the neuroscience research community.

NRI has played, and continues to play, a unique role on campus during the pandemic.

Unlike most labs on campus that closed down or greatly reduced the level of activity during the pandemic, several NRI labs remained active as their efforts were considered essential to the campus' effort to confront the pandemic. Very early in the pandemic, four NRI labs (also associated with MCDB; Kosik, Arias, Acosta-Alvear and M. Wilson) developed a novel, scalable and cost-effective test for the SARS-CoV-2 virus that was widely used to assess the extent of COVID-19 exposure in the campus community. Additionally, several NRI faculty (Feinstein, Kosik, Arias) have been critical members of the Campus COVID-19 Response effort since it began, both advising the Chancellor's Planning and Working Groups as well as the campus' many Vice Chancellors and Deans. Additionally, NRI faculty have been pivotal in building the campus' COVID-19 Response infrastructure including a clinic to collect patient samples, a laboratory to conduct COVID-19 tests and a contact tracing operation to manage and minimize transmission.

NRI provides outstanding administrative support for all aspects of grants management.

The NRI also promotes neuroscience research on campus with its outstanding administrative support. Our administrative staff and faculty work together in an environment of professionalism, excellence, cooperation and respect that greatly facilitates the many administrative components of our operations. Although the NRI has had to confront a number of administrative changes in the past year, the team has continued to function smoothly while often working remotely. Under the superb chairmanship of Dr. Megan Valentine, the NRI advisory committee convenes quarterly. The meetings have been lively, upbeat and provide sage counsel to the NRI Co-Directors.

The key trend to note over the past 5 years with regard to our grants activity is the steady increase in (i) proposals submitted by NRI investigators, and (ii) dollars awarded to NRI investigators. For more complete details of grant administrative activity, see the table in section Proposal and Award Administration (below).

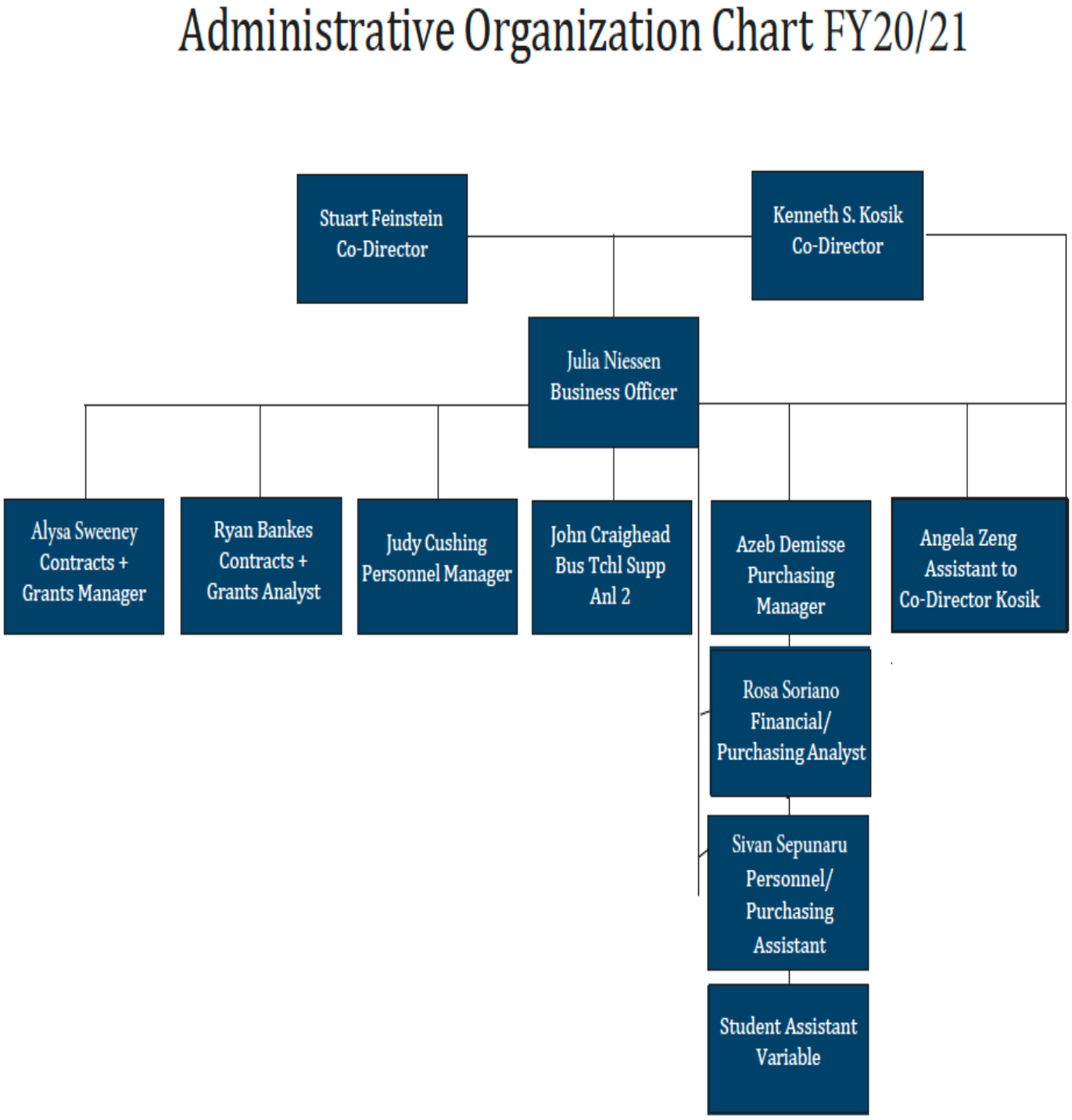
Future Goals

Looking forward, we hope to continue our growth in both numbers and excellence. Specifically, we hope to fill the remaining Brain Initiative FTE as a high priority. Professor Louis Matthieu will serve as the chair of the search committee once the FTE is issued. Recruiting a faculty member in computational neuroscience will fill an existing lacunae. Another high priority is coalescing like-minded faculty to be competitive for large grants that focus on multidisciplinarity. Working through the leadership of NRI member Michael Goard, the NRI will share implementation of a

campus wide neuroscience lecture series that will replace the Gus Gurley lecture series from before the pandemic. This series will focus on basic molecular and cellular neuroscience and will complement the cognitive lecture series organized by the Sage Center.

As we move forward to the coming year, the NRI will increasingly serve as a scientific and administrative home to ongoing neuroscience research as well as for efforts to broaden, enhance and better integrate neuroscience research across the campus.

Organization Chart



Advisory Committee, Technical and Administrative Staff

Advisory Committee:

Megan Valentine, Mech. Engineering, Chair

Members:

Mark Brzezinski, EEMB
Steve Fisher, NRI
Tom Harriman, Community Member
Emily Jacobs, Psych & Brain Science
Matthieu Louis, MCDB
Craig Montell, MCDB
Denise Montell, MCDB
Spencer LaVere Smith, ECE

Ex-Officio Members:

Stuart Feinstein, MCDB/NRI
Kenneth Kosik, MCDB/NRI
Julia Niessen, NRI
Ben Lopez, NRI

NRI Administrative Staff:

Ryan Bankes, C&G Analyst
Judy Cushing, Personnel Manager
Azeb Demisse, Purchasing Manager
Julia Niessen, Business Officer
Sivan Sepunaru, Payroll/Purchasing Asst.
Alysa Sweeney, C&G Manager
Angela Zeng, Assistant

NRI Technical Staff:

David Asplund, SRA, Weimbs Lab
Morgane Audouard, SRA, Kosik Lab
Jay Barragan, Lab Asst, Kosik Lab
Tiffany Chin, SRA, Weimbs Lab
John Craighead, IT Support, LSB
Luke Crimson, Lab Asst, Lewis Lab
Shahira Ellaboudy, Lab Asst, Weimbs Lab
Adishthi Gurav, SRA, Montell Lab
Mika Katsure, SRA, Clegg Lab
Yoo Min Kim, Lab Asst, Montell Lab
Bradley Kroes, SRA, Weimbs Lab
Matthew L Hammond, Lab Asst, Montell Lab
Benjamin Lopez, R&D Eng. Microscopy Lab
Scott Mahan, Lab Asst, Mahan Lab
Sunanda Surendranath, SRA, Simpson Lab
Kathryn Murray, Lab Asst, Montell Lab
Josephine Nguyen, SRA, Montell Lab
Katie Pham, Lab Asst, Clegg Lab
Chongu Qiu, SRA, Weimbs Lab
Carolyn Radeke, SRA, Coffey Lab
Jason Rodriguez, Lab Asst, Montell Lab
Dulce Simental, SRA, Montell Lab
William Wayne, SRA, Clegg Lab
Cricket Wood, SRA, Rothman Lab
Shingo Yoshikawa. SRA. SImpson Lab

Statistical Summary

UC SANTA BARBARA
Research Division
Statistical Summary

Department:	Neuroscience Research Institute
Fiscal Year:	20/21

Personnel engaged in research (head count):	
Faculty	25
Professional Researchers *(including Visiting)*	28
Project Scientists	19
Specialists	9
Postdoctoral Scholars	31
Postgraduate Researchers	0
Graduate Students	45
Undergraduate Students	13
Technical & Research Staff	25
Total	112
Participation from outside UCSB (head count): (optional)	
Academics (without Salary Academic Visitors)	25
Other (specify)	0
Total	25
Unit Operational Staff (# of FTE):	
Administrative	8
Computing	1
Technical & Service *(e.g. recharge personnel, lab manager)*	1
Programmatic Staff	24
Total	34
Sponsored Research:	
Number of Principal Investigators*	25
Proposals submitted (#)	89
Proposals submitted ($ value)	$66,832,615
Awards issued (#)	37
Awards issued ($ value)	$13,000,319
Extramural awards administered during year (#)**	58
Extramural awards administered during year ($ value)**	$41,388,735
Costshare funds managed during year ($ value)**	0
Awarding agencies dealt with (#)****	27
Other Projects & Progams:	
Seminars, symposia, workshops sponsored (#)	0
Other projects administered (#)****	219
Other projects administered ($ value)*****	$17,060,758
Intramural support administered ($ value)**	$152,147
Budget & Space:	
Total base budget for the year	$795,630
Total assigned square footage in ORU	24894

Principal Investigators

In the table below, please provide a list all active Principal Investigators, and Co-Principal Investigators, who have submitted proposals and/or have active awards.

PI Name	Title	Home Department	Home Division
Dennis Clegg	Faculty	MCDB	MPLS
Stuart Feinstein	Co-Director	MCDB	MPLS
Steven Fisher	Faculty	MCDB	MPLS
Michael Goard	Faculty	MCDB	MPLS
Songi Han	Faculty	CHEM	MPLS
Emily Jacobs	Faculty	Psych & Brain Sci.	MPLS
Kenneth Kosik	Co-Director	MCDB	MPLS
Matthieu Louis	Faculty	MCDB	MPLS
Michael Mahan	Faculty	MCDB	MPLS
Craig Montell	Faculty	MCDB	MPLS
Denise Montell	Faculty	MCDB	MPLS
Benjamin Reese	Faculty	Psych & Brain Sci.	MPLS
Julie Simpson	Faculty	MCDB	MPLS
Ikuko Smith	Faculty	MCDB	MPLS
Spencer Smith	Faculty	Engineering	College Engineering
William Smith	Faculty	MCDB	MPLS
James Thomson	Faculty	MCDB	MPLS
Rene Weber	Faculty	Communication	Social Sciences
Thomas Weimbs	Faculty	MCDB	MPLS
Leslie Wilson	Faculty	MCDB	MPLS
Max Wilson	Faculty	MCDB	MPLS

Postdoctoral Researchers, Graduate and Undergraduate Students

Please provide a listing of the names of graduate students and postdoctoral researchers directly contributing to the unit who (a) are on the unit's payroll, (b) participate through assistantships, fellowships or traineeships, or (c) are otherwise involved in the unit's work. List also undergraduates on payroll or otherwise participating in the research of the unit.

Name	Status	Home Department	Home Division
Jeffrey Bailey	Postdoc	Clegg Lab	MLPS
Lauran Bowers	Postdoc	D. Montell Lab	MLPS
Joseph Campanale	Postdoc	D. Montell Lab	MLPS
Avinash Chandel	Postdoc	C. Montell Lab	MLPS
Nicolas Debeaubien	Postdoc	C. Montell Lab	MLPS
Sagen Flowers	Postdoc	Rothman Lab	MLPS
Luis F. Mendoza	Postdoc	Goard Lab	MLPS
Anindya Ganguly	Postdoc	C. Montell Lab	MLPS
Stella Glasauer	Postdoc	Kosik Lab	MLPS
Elmer Guzman	Postdoc	Kosik Lab	MLPS
Dasol Han	Postdoc	Max Wilson Lab	MLPS
Qiaoran Li	Postdoc	C. Montell Lab	MLPS
Xiaodong Li	Postdoc	C. Montell Lab	MLPS
Andrew Longhini	Postdoc	Kosik Lab	MLPS
Guangxia Miao	Postdoc	D. Montell Lab	MLPS
James Mondo	Postdoc	D. Montell Lab	MLPS
Saeed Najafi	Postdoc	Han Lab	MLPS
Maddalena Nano	Postdoc	D. Montell lab	MLPS
Britney Pennington	Postdoc	Clegg Lab	MLPS

Jennifer Rauch	Postdoc	Kosik Lab	MPLS
Nitesh Saxena	Postdoc	Louis Lab	MPLS
Tal Sharf	Postdoc	Kosik Lab	MPLS
Sebastian Strubl	Postdoc	Weimbs lab	MPLS
Durafshan Syed	Postdoc	Simpson Lab	MPLS
Caitlin Taylor	Postdoc	Jacobs Lab	MPLS
Izel Tekin	Postdoc	C. Montell Lab	MPLS
Dhananuay Thakur	Postdoc	C. Montell Lab	MPLS
Alba Torres Espinosa	Postdoc	D. Montell Lab	MPLS
Rachel Warrington	Postdoc	Radeke Lab	MPLS
Che-Hang Yu	Postdoc	Ikuko Smith Lab	MPLS
Yinpeng Zhan	Postdoc	C. Montell Lab	MPLS
Juliana Acosta Uribe	Grad	Kosik Lab	MLPS
Shagun Agrawal	Grad	Weimbs Lab	MLPS
David Aguilar	Grad	C.Montell lab	MLPS
Geneva Alok	Grad	Rothman Lab	MLPS
Joseph Alzagatiti	Grad	Ikuko Smith	MLPS
Lindsay Bailey-Steinitz	Grad	Coffey Lab	MLPS
Lucien Barnes	Grad	Mahan Lab	MLPS
Cezar Borba	Grad	Smith Lab	MLPS
Zhuowei Cheng	Grad	Kosik Petzold	MLPS
Janeva Chung	Grad	D. Montell Lab	MLPS
Chee Kiang Ewe	Grad	Rothman Lab	MLPS
Mohamed Faynus	Grad	Clegg Lab	MLPS
Allison Gabbert	Grad	D. Montell Lab	MLPS
Hannah Grotzinger	Grad	Jacobs Lab	MLPS

LI Guo	Grad	Simpson Lab	MLPS
Xiaoran Guo	Grad	D. Montell Lab	MLPS
Nickolas Holznecht	Grad	Weimbs Lab	MLPS
Jiaxiang (Tom) Jiang	Grad	Manjunath Lab	MLPS
Yingying Jin	Grad	Han lab	MLPS
Erica Keane	Grad	Kosik Lab	MLPS
Brad Killingsworth	Grad	Kosik Lab	MLPS
Bridget Kulesh	Grad	Reese Lab	MLPS
Ryan Lach	Grad	Wilson Lab	MLPS
Xiaohe Lei	Grad	Han lab	MLPS
Menglin Li	Grad	C. Montell Lab	MLPS
Carolina Maciel Camargo	Grad	Kosik Lab	MLPS
Geoffrey Meyerhof	Grad	C. Montell Lab	MLPS
Yishen Miao	Grad	Smith Lab	MLPS
Angela Morales	Grad	C. Montell Lab	MLPS
Elle Murata	Grad	Jacobs Lab	MLPS
Surenna Pecchia	Grad	Wilson Lab	MLPS
Hannah Pellegrini	Grad	Weimbs Lab	MLPS
Laura Pritschet	Grad	Jacobs Lab	MLPS
Melanie Rodriguez	Grad	D.Montell	MLPS
Kirstin Rollins	Grad	Louis Lab	MLPS
Margaret Schimmel	Grad	Weimbs Lab	MLPS
Fnu Shailja	Grad	Manjunath Lab	MLPS
Elizabeth Sharpe	Grad	Weimbs Lab	MLPS
Xinran (Sharon) Tian	Grad	kosik Lab	MLPS
Thuc To	Grad	Louis Lab	MLPS

Nora Wolcott	Grad	Goard's lab	MLPS
Philip Wong	Grad	Louis Lab	MLPS
Tsung-Han Yeh	Grad	Rothman Lab	MLPS
Angela Zhang	Grad	Manjunath Lab	MLPS
Ning Zhang	Grad	Simpson Lab	MLPS
Emyrose Ancho	Undergrad	Rothman Lab	MLPS
Tyree Byrd	Undergrad	Tettegah/Kosik	MLPS
Tiffany Fierros	Undergrad	Weimbs Lab	MLPS
Sanaaya Lakdawal	Undergrad	NRI IT Team	MLPS
James McCardle	Undergrad	NRI IT Team	MLPS
Luis Mejia Ojeda	Undergrad	NRI IT Team	MLPS
Sophie Nebeker	Undergrad	C. Montell Lab	MLPS
Daniel Padilla Ortiz	Undergrad	NRI IT Team	MLPS
Ryan Parisi	Undergrad	Reese lab	MLPS
Aijalon Warden	Undergrad	Tettegah/Kosik	MLPS
Lindsey Washiashi	Undergrad	Rothman Lab	MLPS
Hasset Yishak	Undergrad	Kosik/Tettegah	MLPS
Isaac Zanoria	Undergrad	NRI IT Team	MLPS

External Participation

Please include information regarding student and faculty participation from other campuses or universities.

Name	Title/Status	Affiliation	Project/Program
Christopher Aichinger	Visitor	Weimbs Lab	
Rica Chan	Visitor	Weimbs Lab	
Lindsey Dickerson	Visitor	Weimbs Lab	
Claudia Do	Visitor	Weimbs Lab	
Ben Dotan	Visitor	Weimbs Lab	
Miles Ellman	Visitor	Weimbs Lab	
Joe Fleming	Visitor	Goard Lab	
Alan Fridman	Visitor	Goard Lab	
Adriano Getman	Visitor	Weimbs Lab	
James Harber	Visitor	Clegg Lab	
Rhianna Haynie-Cion	Visitor	Weimbs Lab	
Ziyi (Helen) Huang	Visitor	Goard Lab	
Corina Logan	Visitor	Kosik Lab	
Tucker Lowell	Visitor	Weimbs Lab	
Junjie Luo	Visitor	Montell Lab	
Evan McCormack	Visitor	Weimbs Lab	
Stephen Minne	Visitor	Goard Lab	
Veronica Page-Harley	Visitor	Weimbs Lab	
George Polchin	Visitor	Goard Lab	
Varsha Raju	Visitor	Beth Pruitt lab	
Juliette Rebello	Visitor	Weimbs Lab	

Jason Sciamanna	Visitor	Goard Lab	
Julia Sergejeva	Visitor	Weimbs Lab	
Karandeep Sidhu	Visitor	Clegg Lab	
Hanna Von	Visitor	D.Montell lab	

Other Projects and Activities

Microscopy Facility

The NRI-MCDB Microscopy Facility, founded in 1990, is jointly maintained by the Neuroscience Research Institute and the Department of Molecular, Cellular, and Developmental Biology at the University of California, Santa Barbara. The Facility's mission is to promote and facilitate microscopy-based research. To achieve this mission the Facility houses state-of-the-art instruments, supports expert full-time support staff, hosts outreach events and provides both individual and workshop-based training in microscopy.

The Facility is the primary light microscopy core on campus supporting researchers in more than 13 department/units including the Life Sciences, Physics, Chemistry, Materials, and Engineering. The Facility has over 100 registered Principal Investigators with use by 48 PIs this year. In the last 12 months, the Facility supported 103 users and 1850 reservations. Those reservations count for approximately 3,500 hours of use for $63,336 of recharge income. This is roughly the same hours of use and 15% increase in recharge income compared to the previous year. The Facility users are asked to acknowledge the Facility in their publications and report new publications supported by the Facility. A list of the research publications that have been reported to the Facility in 2020-2021 conclude this report.

The 15% increase in recharge income represents about half the recovery needed to get back to pre-pandemic income levels for the facility. We anticipate a return to normal recharge income for the next year. Recharge income covered costs last year and that should be true this coming year as well.

This centrally located Facility is based within the Neuroscience Research Institute, in the Biological Sciences II building. Presently, the Facility maintains multiple sophisticated instruments including a JEOL JEM-1230 transmission electron microscope, a Leica SP8 resonant scanning confocal with white-light laser, an Olympus Fluoview 1000 Spectral Confocal Laser Scanning Microscope, an Olympus DSU Spinning Disk Confocal, and a Zeiss Z.1 lightsheet. A novel instrument is the Nanolive 3D Cell Explorer which uses holographic tomography to generate a three-dimensional image of the sample with contrast determined by refractive index. It works primarily with adherent cell cultures where the instrument makes many subcellular structures immediately visible label-free. The Facility also hosts five compound microscopes configured with transmitted and fluorescent light-paths as well as a stereomicroscope configured with transmitted and reflected light. These microscopes are further equipped with research grade digital cameras and computer workstations for image acquisition, processing, and analysis. The confocal and lightsheet microscopes are equipped with time-lapse software controls for automated long-term imaging and are equipped with a

motorized XY stages for automated sampling of multiple locations. The facility also provides two high-end workstations for 3D image processing and analysis with software licenses for Imaris, Leica LASX, and Zeiss Zen.

In May of 2019 an NIH HEI (High End Instrumentation) grant proposal was submitted for an Aberrior Instruments STED super resolution microscope. Ben Lopez was the head PI with Denise Montell, Ken Kosik, Max Wilson, and Skirmantas Janusonis as Major Users. Thomas Weimbs and Anthony DeTomaso were also included as Minor Users. The proposal was funded in August of 2020. The funding is $909,120 for purchase of the STED microscope and there is an additional $133,000 from the Office of Research that will pay for four years of its maintenance contract. The PI and Users evaluated the current state of the art and did demos with Leica Microsystems and Abberior Instruments. The Abberior Instruments microscope was found to be the best system with the most capabilities. That scope was purchased and has just very recently been installed in the facility. The new STED microscope will be a huge benefit to the researchers involved in the proposal and others across campus. A STED microscope is a confocal type microscope with the additional STED optical technique which can be used to reach resolutions of 30-50 nm in the optical plane and 100 nm in the focal direction (compared to 250 nm in the plane and 600 in the focal direction for standard confocal). It can be used with fixed and live samples and the same labeling techniques as standard confocal imaging. The microscope is equipped with 5 excitation laser lines (405, 440, 485, 561, and 640 nm), two STED lasers (595 and 775 nm). There are four objective lenses: 10x and 20x air, 60x water, and 100x oil. There is a special Matrix detector for reduced background along with 3 high-sensitivity APD detectors all with full spectral detection bands from 400-800 nm. There is an adaptive optics system for clear imaging deep into samples and a stage-top incubator for live samples. Although there isn't any dedicated super resolution analysis software, we have two Bitplane Imaris workstations, and that software is fully compatible with super resolution images. We also have Huygens Deconvolution from SVI (Scientifiic Volume Imaging). STED is one of the techniques that was included in the 2014 Nobel Prize in chemistry for super-resolved fluorescence microscopy. This instrument builds on the existing microscopy facility which includes: (i) Light and Electron Microscopy

The facility director since March 2016 is Dr. Benjamin Lopez. Ben has experience in doctoral and postdoctoral research involving microscope instrument design, imaging, and image analysis. Ben is assisted by Dr. Geoff Lewis who oversees transmission electron microscopy. Both Ben and Geoff have published numerous papers employing conventional, TIRF, optical trapping, transmission electron microscopy and confocal microscopy. Drs. Lopez and Lewis provide training on a daily basis and regularly meet with individuals to provide advice and to address additional microscopy needs.

Other University contributions
MCDB103L: Cellular Biology Lab
Introduction to fluorescence microscopy lecture.
MCDB133L: Molecular Immunobiology Lab

Guest lecture on fluorescence microscopy.
MCDB290MR: Introduction to Microscopy
The facility microscopes were used for live Zoom demos of brightfield, fluorescence, confocal, lightsheet, TEM, and image analysis.

Public Service and K-12 Outreach
The NRI-MCDB Microscopy Facility participates in campus-wide events as well as undergraduate and graduate student tours and orientations. Unfortunately, none of these events were included in the past year due to pandemic limitations.

Facility Supported Publications 2020-2021

2021

Brackett K, Mungale A, Lopez-Isidro M, Proctor DA, Najarro G, Arias C. 2021. CRISPR Interference Efficiently Silences Latent and Lytic Viral Genes in Kaposi's Sarcoma-Associated Herpesvirus-Infected Cells. Viruses. 13:783.

Kourakis MJ, Bostwick M, Zabriskie A, Smith WC. 2021. Disruption of left-right axis specification in Ciona induces molecular, cellular, and functional defects in asymmetric brain structures. BMC Biol. 19(1):141.

Zhan Y, San Alberto DAlonso, Rusch C, Riffell JA, Montell C. 2021. Elimination of vision-guided target attraction in Aedes aegypti using CRISPR. Current Biology.

Wilken S.Elmo, Monk JM, Leggieri PA, Lawson CE, Lankiewicz TS, Seppälä S, Daum CG, Jenkins J, Lipzen AM, Mondo SJ et al.. 2021. Experimentally Validated Reconstruction and Analysis of a Genome-Scale Metabolic Model of an Anaerobic Neocallimastigomycota Fungus. mSystems. 6

Kim AA, Nguyen A, Marchetti M, Montell D, Pruitt B.L, O'Brien LErin. 2021. Independently paced calcium oscillations in progenitor and differentiated cells in an ex vivo epithelial organ. bioRxiv.

Lin Y, Fichou Y, Longhini AP, Llanes LC, Yin P, Bazan GC, Kosik KS, Han S. 2021. Liquid-Liquid Phase Separation of Tau Driven by Hydrophobic Interaction Facilitates Fibrillization of Tau. Journal of Molecular Biology. 433:166731.

Best RL, LaPointe NE, Azarenko O, Miller H, Genualdi C, Chih S, Shen B-Q, Jordan MAnn, Wilson L, Feinstein SC et al.. 2021. Microtubule and tubulin binding and regulation of microtubule dynamics by the antibody drug conjugate (ADC) payload, monomethyl auristatin E (MMAE): Mechanistic insights into MMAE ADC peripheral neuropathy. Toxicology and Applied Pharmacology. 421:115534.

Smith HM, Khairallah SM, Nguyen AHong, Newman-Smith E, Smith WC. 2021. Misregulation of cell adhesion molecules in the Ciona neural tube closure mutant bugeye. Developmental Biology. 480:14-24.

Riedman LAnne, Porter SM, Czaja AD. 2021. Phosphatic scales in vase-shaped microfossil assemblages from Death Valley, Grand Canyon, Tasmania, and Svalbard. Geobiology.

Podolsky IA, Seppälä S, Xu H, Jin Y-S, O'Malley MA. 2021. A SWEET surprise: Anaerobic fungal sugar transporters and chimeras enhance sugar uptake in yeast. Metabolic Engineering. 66:137-147.

Rodriguez D, Taketa DA, Madhu R, Kassmer S, Loerke D, Valentine MT, De Tomaso AW. 2021. Vascular Aging in the Invertebrate Chordate. Front Mol Biosci. 8:626827.

2020

Dow LP, Khankhel AH, Abram J, Valentine MT. 2020. 3D-printable cell crowding device enables imaging of live cells in compression. BioTechniques.

Hu C, Huang Y, Wu L, Zhao H, Soo CPac, Lian Q, Ma D. 2020. Apoptosis and necroptosis occur in the different brain regions of hippocampus in a rat model of hypoxia asphyxia. International Journal of Neuroscience. 1-11.

Vaidya B, Kulkarni NS, Shukla SK, Parvathaneni V, Chauhan G, Damon JK, Sarode A, Garcia JV, Kunda N, Mitragotri S et al.. 2020. Development of inhalable quinacrine loaded bovine serum albumin modified cationic nanoparticles: Repurposing quinacrine for lung cancer therapeutics. Int J Pharm. 577:118995.

Bernstein JH, Filippidi E, J. Waite H, Valentine MT. 2020. Effects of sea water pH on marine mussel plaque maturation. Soft Matter. 16:9339-9346.

Lin Y, Fichou Y, Zeng Z, Hu NY, Han S. 2020. Electrostatically Driven Complex Coacervation and Amyloid Aggregation of Tau Are Independent Processes with Overlapping Conditions. ACS Chemical Neuroscience. 11:615-627.

Kassmer SH, Rodriguez D, De Tomaso AW. 2020. Evidence that ABC transporter-mediated autocrine export of an eicosanoid signaling molecule enhances germ cell chemotaxis in the colonial tunicate Botryllus schlosseri. Development. 147

Beach S, Grundeen S, Doyle A, Theogarajan L. 2020. Fabrication and validation of flexible 3D pillar electrodes for neural electrophysiological recording. Engineering Research Express. 2:025025.

Kassmer SH, Langenbacher AD, De Tomaso AW. 2020. Integrin-alpha-6+ Candidate stem cells are responsible for whole body regeneration in the invertebrate chordate Botrylloides diegensis.. Nat Commun. 11(1):4435.

McCuskey SR, Su Y, Leifert D, Moreland AS, Bazan GC. 2020. Living Bioelectrochemical Composites. Advanced Materials. 32:1908178.

Giamblanco N, Fichou Y, Janot J-M, Balanzat E, Han S, Balme S. 2020. Mechanisms of Heparin-Induced Tau Aggregation Revealed by a Single Nanopore. ACS Sensors. 5:1158-1167.

Steffes VM, Zhang Z, MacDonald S, Crowe J, Ewert KK, Carragher B, Potter CS, Safinya CR. 2020. PEGylation of Paclitaxel-Loaded Cationic Liposomes Drives Steric Stabilization of Bicelles and Vesicles thereby Enhancing Delivery and Cytotoxicity to Human Cancer Cells. ACS Applied Materials & Interfaces. 12:151-162.

Kaytanli B, Khankhel AH, Cohen N, Valentine MT. 2020. Rapid analysis of cell-generated forces within a multicellular aggregate using microsphere-based traction force microscopy. Soft Matter. 16:4192-4199.

Song J, Levenson R, Santos J, Velazquez L, Zhang F, Fygenson D, Wu W, Morse DE. 2020. Reflectin Proteins Bind and Reorganize Synthetic Phospholipid Vesicles. Langmuir.

Jeon B-J, Nguyen DT, Saleh OA. 2020. Sequence-Controlled Adhesion and Microemulsification in a Two-Phase System of DNA Liquid Droplets. The Journal of Physical Chemistry B. 124:8888-8895.

Seo D, Chen S-Y, Lee DWoog, Schrader AM, Ahn K, Page S, Koenig PH, Gizaw Y, Israelachvili JN. 2020. The shape and dynamics of deformations of viscoelastic fluids by water droplets. Journal of Colloid and Interface Science. 580:776-784.

Dai W, Guo X, Cao Y, Mondo JA, Campanale JP, Montell BJ, Burrous H, Streichan S, Gov N, Rappel W-J et al.. 2020. Tissue topography steers migrating Drosophila border cells. Science. 370:987–990.

Lab for Stem Cell Biology and Engineering

The mission of the UCSB Center for Stem Cell Biology and Engineering is to foster an interdisciplinary program of stem cell research and teaching in the field of regenerative medicine. Stem Cells are essential for the research of numerous investigators across campus in over a dozen departments/units in the Life Sciences, Physics, Chemistry, Materials and Engineering. Two remarkable new state-of-the-art microscopes, acquired via successful NIH and NSF grant applications 3 years ago are being used extensively by UCSB investigators. We have additional applications to federal agencies in the pipeline to further enhance the Facility's (and our researchers) capabilities The center is home to 25 research groups carrying out stem cell research in the areas: molecular mechanisms of stem cell differentiation; biotechnology and bioengineering approaches to stem cell research, and regenerative medicine (stemcell.ucsb.edu). Over the past year, the Center has continued to make significant advances, despite the complications of COVID-19.

Research outcomes are documented in the many publications listed elsewhere in this report. Some highlights include:

* The Clegg and Coffey groups have concluded two collaborative Phase I clinical trials for Age-Related Macular Degeneration, one at the University of Southern California and one at Moorfield's Eye Hospital / University College London. These trials are investigating novel cell therapies that were developed in part at UCSB and funded by the Garland Initiative for Vision. Both have yielded promising results and cell production is underway for Phase II studies.

* The Thomson group has continued long term studies of a new pre-clinical animal model for Diabetic Retinopathy: the Nile Rat. This animal develops diabetes with associated eye disease that is remarkably similar to humans and can now be used to develop novel therapies.

* The Pruitt group has used CRISPR/Cas9 technology to isolate atrial and ventricular-specific cardiomyocytes from human induced pluripotent stem cells.

* The Kosik and Striechan groups published an exciting study in Nature using stem cells to understand how geometric constraints regulate human neural tube morphogenesis

The William K. Bowes Laboratory for Stem Cell Biology and Engineering, our core facility for stem cell research, continues to be the “nerve center” for exciting stem cell research that is making high impact discoveries possible in stem cell biology, vision science, mechanobiology, optogenetics, materials science and device engineering.

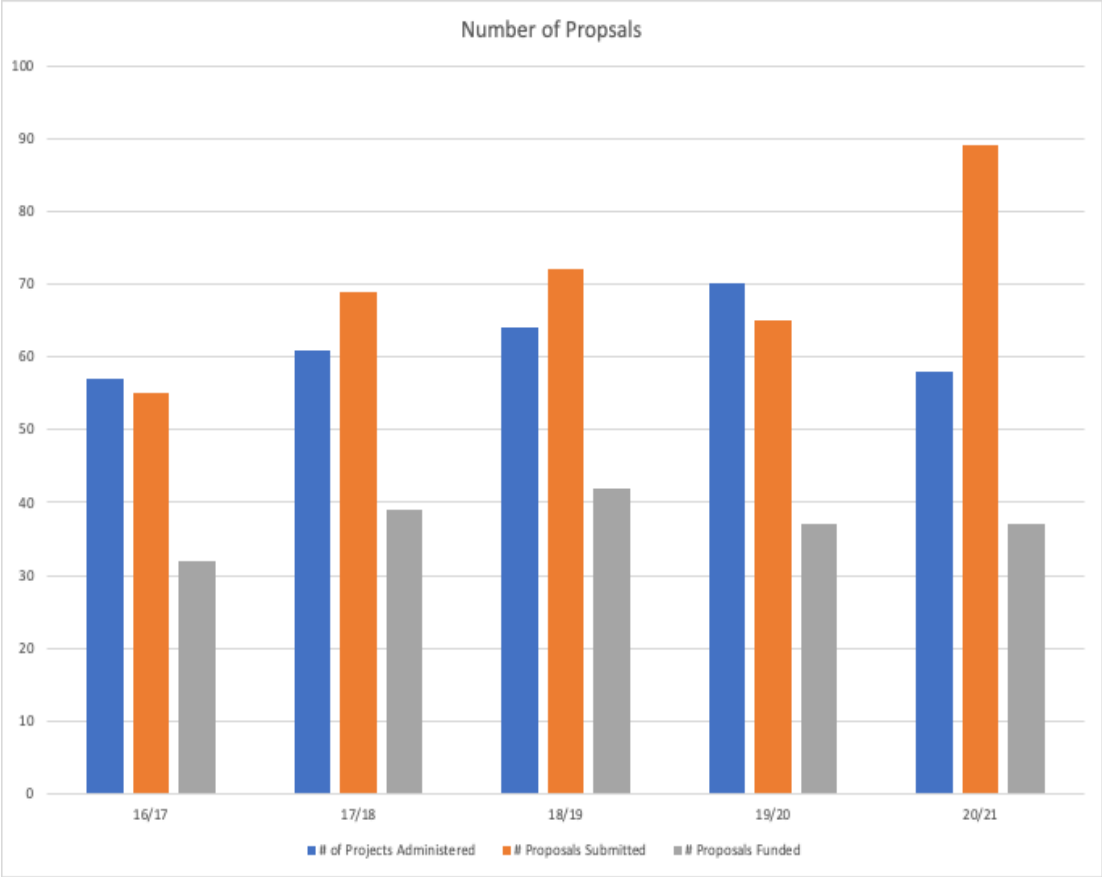
Educational and outreach highlights include:

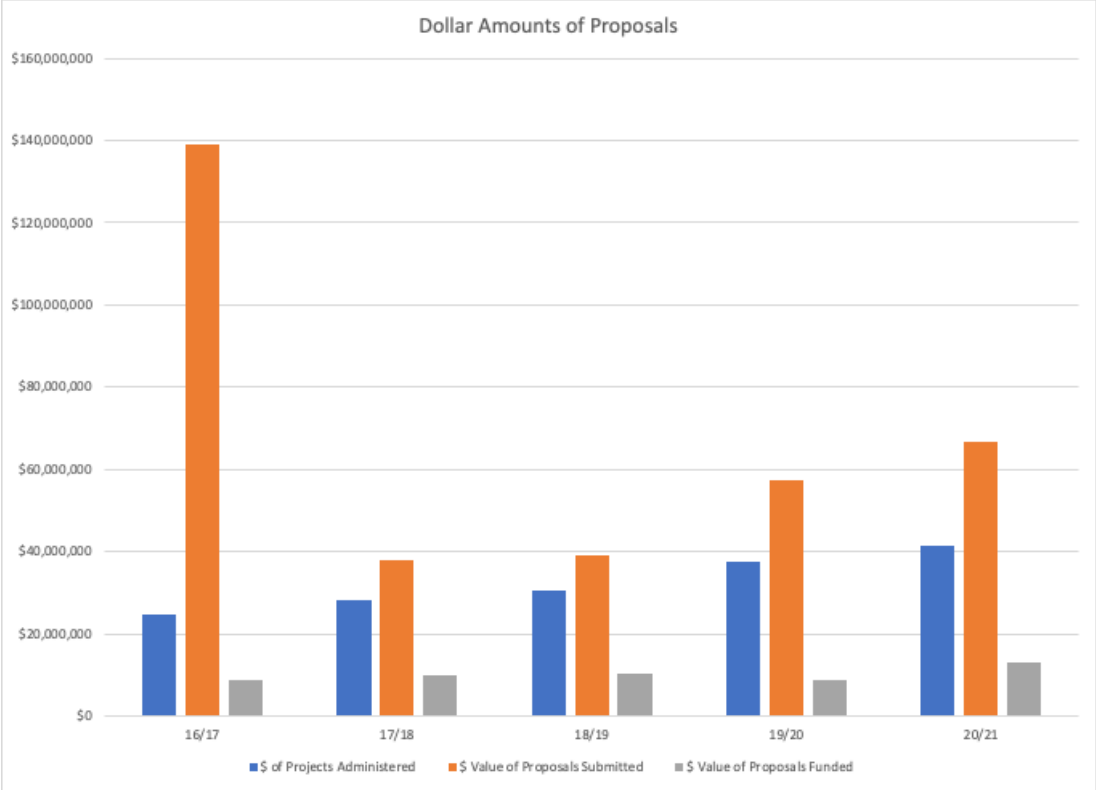
* We were awarded a new $1.9M grant from the California Institute of Regenerative Medicine for the support of education and research training of graduate students and postdoctoral scholars.

* Despite the COVID-19 pandemic, we have continued our educational programs in regenerative medicine for undergraduates and graduate students, and engaged the public through outreach efforts. Due to the pandemic, these activities occurred via online remote interactions.

Proposal and Award Administration

	from GUS statistics report		from Orbit Proposals by Dept: FY/record #		from Orbit Awards by Dept: FY/record #	
FY	# of Projects Administered	$ of Projects Administered	# Proposals Submitted	$ Value of Proposals Submitted	# Proposals Funded	$ Value of Proposals Funded
16/17	57	$24,851,623	55	$139,135,045	32	$8,646,104
17/18	61	$28,268,784	69	$37,826,080	39	$9,846,029
18/19	64	$30,325,507	72	$38,958,574	42	$10,339,826
19/20	70	$37,690,875	65	$57,191,514	37	$8,844,358
20/21	58	$41,388,735	89	$66,832,615	37	$13,000,319


Number of Propsals
100
90
80
70
60
50
40
30
20
10
0
16/17
17/18
18/19
19/20
20/21
# of Projects Administered
Proposals Submitted
Proposals Funded


Dollar Amounts of Proposals
$160,000,000
$140,000,000
$120,000,000
$100,000,000
$80,000,000
$60,000,000
$40,000,000
$20,000,000
$0
16/17
17/18
18/19
19/20
20/21
$ of Projects Administered
$ Value of Proposals Submitted
$ Value of Proposals Funded

Required Supplementary Materials

Please upload the required supplementary materials to the Unit-OR Shared Drive and save them to the annual Report folder.

Fiscal Information

The Office of Research will provide fiscal information for inclusion in annual reports. Once this information is available, it will be shared with you.

Fiscal Year 2020-21 Overview for CHAN - RESD - NRII (Multiple Subs)

Category	Core & Ext Core	Non-Core Student Fees	Sales & Services, Reserves, Other	Gifts & Endowment Income	Contracts & Grants	UCPath Suspense	Total
⊞ Prior Year Carryforward	$30,402	$0	$126,850	$3,990,115	$4,245,946		$8,393,312
⊟ Current Year Activity							
⊟ Resources							
⊞ Budgetary Transfers	$977,102		$64,863	$2,212,715	$9,477,976	($3,339)	$12,729,316
⊞ July 1 Budget Allocation	$385,512		$0	$559			$386,071
⊞ Recharge Income			$90,449				$90,449
⊞ External Revenue			$10,976				$10,976
Total	$1,362,614		$166,288	$2,213,274	$9,477,976	($3,339)	$13,216,813
⊟ Expenditures							
⊞ Salaries	$661,539		$86,376	$1,148,549	$3,752,438	$134	$5,649,036
⊞ Other Expenses	$42,996		$91,937	$378,697	$2,567,203		$3,080,833
⊞ Employee Benefits	$353,408		$1,386	$438,428	$1,393,094	$218	$2,186,534
Total	$1,057,943		$179,698	$1,965,674	$7,712,735	$352	$10,916,403
Current Year Total	$304,671		($13,410)	$247,599	$1,765,241	($3,691)	$2,300,410
Ending Net Position	$335,073	$0	$113,440	$4,237,714	$6,011,186	($3,691)	$10,693,723

Fiscal Year 2020-21 Overview for CHAN - RESD - NRII (Multiple Subs)

Department	Core & Ext Core	Non-Core Student Fees	Sales & Services, Reserves, Other	Gifts & Endowment Income	Contracts & Grants	UCPath Suspense	Total
⊞ NRII-Neuroscience Research Inst	$335,073	$0	$113,440	$4,237,714	$6,011,186	($3,691)	$10,693,723
Combined Ending Net Position	$335,073	$0	$113,440	$4,237,714	$6,011,186	($3,691)	$10,693,723

Overview for CHAN - RESD - NRII (Multiple Subs)

Category	2017-18	2018-19	2019-20	2020-21	2021-22
⊟ Current Year Activity					
⊟ Resources					
⊞ July 1 Budget Allocation	$343,032	$357,663	$373,258	$386,071	$397,057
⊞ Budgetary Transfers	$9,133,692	$9,483,930	$9,472,886	$12,729,316	$1,731,875
⊞ External Revenue	$29,988	$43,542	$24,916	$10,976	$1,389
⊞ Recharge Income	$86,320	$102,155	$102,301	$90,449	$19,716
Total	$9,593,032	$9,987,291	$9,973,360	$13,216,813	$2,150,037
⊟ Expenditures					
⊞ Salaries	$5,517,027	$4,858,679	$5,326,241	$5,649,036	$1,186,638
⊞ Employee Benefits	$1,861,705	$1,745,990	$2,014,951	$2,186,534	$282,459
⊞ Other Expenses	$2,650,227	$3,109,919	$2,856,842	$3,080,833	$423,210
Total	$10,028,959	$9,714,589	$10,198,034	$10,916,403	$1,892,307
Current Year Total	($435,927)	$272,702	($224,674)	$2,300,410	$257,730
⊞ Prior Year Carryforward	$8,777,873	$8,341,946	$8,614,648	$8,393,312	$10,693,723
Ending Net Position	$8,341,946	$8,614,648	$8,389,973	$10,693,723	$10,951,452

Space

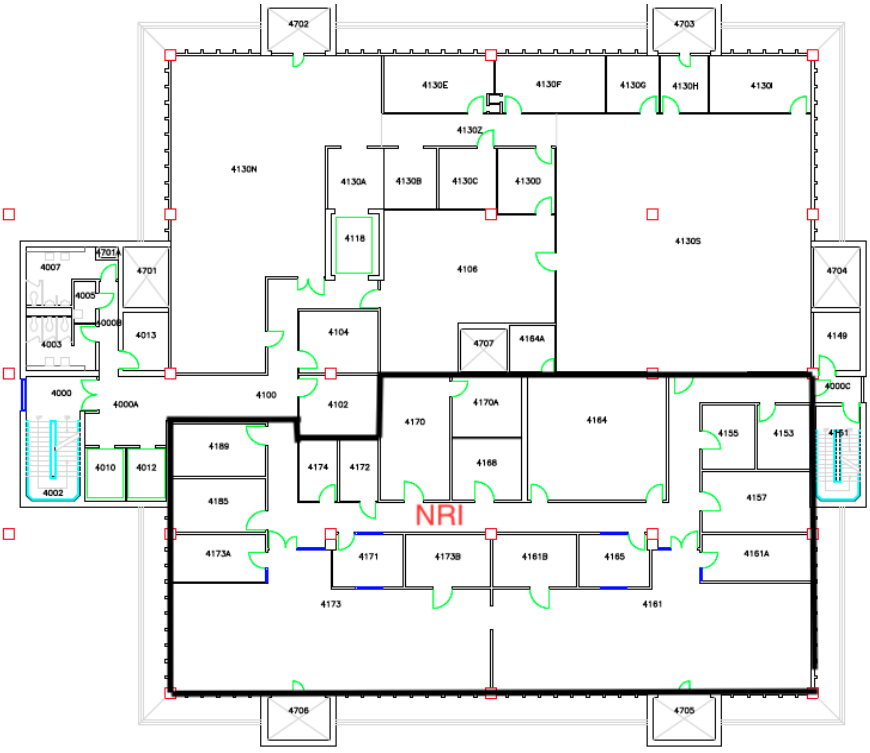
Overview of Space Controlled by the Neuroscience Research Institute

The NRI controls slightly less than half of the research space in the Biological Sciences Building 2. Specifically, the NRI shares the 6th floor of the building with the Animal Resources Center and the 3rd and 4th floors of the building with the Department of Molecular, Cellular and Developmental Biology. On each of these floors, the space is split approximately 50/50. Additionally, the NRI controls the entire 5th floor of the building. The 1st and 2nd floors of the building are controlled by the Department of Ecology, Evolution and Marine Biology and the Department of Molecular, Cellular and Developmental Biology, respectively.

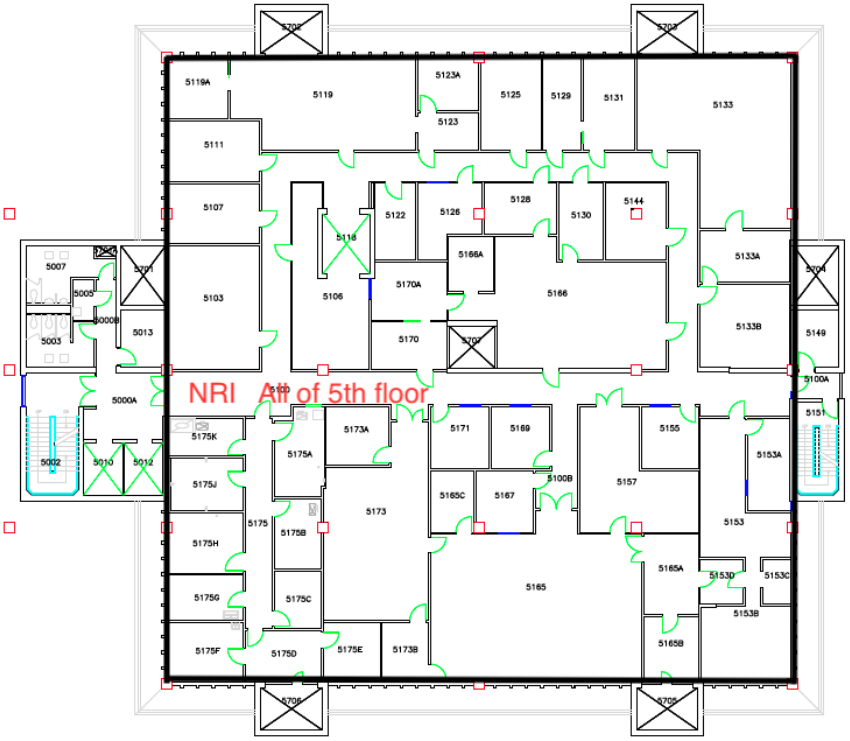
While many NRI investigators are housed in the above described NRI controlled space, many other NRI investigators are housed outside of NRI controlled space in space controlled by their respective home academic departments.

3rd Floor

4th Floor



5th Floor



6th Floor

Center Reviews

None done in FY2021.