SALK INSTITUTE
FOR BIOLOGICAL STUDIES

Systems Neurobiology Laboratories

To: Tanya Sharpee & Sam Pfaff
Appointments Committee Chair & Co-Chair

From: John Reynolds and Terry Sejnowski

Date: June 28, 2024

Re: Kristen Harris Adjunct Reappointment

Dear Tanya, Sam and members of APCOM:

I am writing, with Terry Sejnowski, to nominate Kristen Harris for an additional term as an Adjunct Professor of the Salk Institute. Dr. Harris is Professor of Neuroscience and Fellow in the Center for Learning and Memory at the University of Texas a Austin. Her laboratory is devoted to understanding structural synaptic plasticity in both the developing and the mature nervous system. She is one of the leaders in the development of computer-assisted approaches to study synapses in 3D using serial section electron microscopy (3DEM). This approach has altered our understanding of synaptic structure and synaptic plasticity. Her work has led to deep insights into how sub-cellular components are redistributed selectively to synapses as they undergo plasticity during learning and memory, during development, and under pathological conditions such as epilepsy.

In addition to her scientific contributions, Dr. Harris has also been a very good scientific citizen, serving on and chairing NIH study sections, serving as an ad hoc reviewer for the US and Swiss National Science Foundations, serving on the Scientific Advisory Boards of the Max Planck Institute for Brain Research, HHMI and the Allen Institute for Brain Research. In recognition for her scientific contributions she has won multiple awards over her career, most recently being elected as a Fellow of the AAAS. She and Terry have had a longstanding and highly impactful collaboration. I am also in an active collaboration with her, examining age related changes in the hippocampus of the common marmoset.

10010 North Torrey Pines Road, La Jolla, CA 92037-1099 reynolds@salk.edu
PO Box 85800, San Diego, CA 92186-5800
Tel 858.453.4100 x1023 Fax 858.455.7933

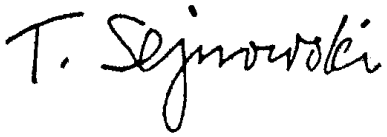
We have attached Dr. Harris' CV and Salk Adjunct Service/Contributions Form. In her form, Dr. Harris has identified multiple ways in which she can contribute to the Salk Institute as an adjunct faculty member. Given Dr. Harris' exceptional scientific achievements, her history of valuable contributions to the Salk Institute, and her enthusiasm for continued involvement, we wholeheartedly recommend her reappointment as an Adjunct Professor.

Kristen will be visiting Salk during the week of July 29 and will give a public lecture.

Thank you for considering this nomination.

Sincerely,

Professor John H. Reynolds
Fiona and Sanjay Jha Chair in Neuroscience
Professor, Systems Neurobiology Laboratory



Terrence Sejnowski
Francis Crick Chair
Computational Neurobiology Laboratory

10010 North Torrey Pines Road, La Jolla, CA 92037-1099 reynolds@salk.edu
PO Box 85800, San Diego, CA 92186-5800
Tel 858.453.4100 x1023 Fax 858.455.7933

CURRICULUM VITAE

Name: Kristen M. Harris, PhD
Address: 915 Wild Basin LDG
Austin, TX 78746
Place of Birth: Fargo, North Dakota USA

Education:

1976	B.S. Minnesota State University Moorhead, MN (Summa cum Laude, Biology Major, Chemistry & Math Minors)
1979	M.S. in Neurobiology University of Illinois (Advisor: WT Greenough, PhD)
1982	Ph.D. in Neurobiology, Northeastern Ohio Universities College of Medicine, and Kent State University (Advisor: Timothy Teyler, PhD)

Postdoctoral Training:

1982-84	Department of Neurology, Neurocytology Laboratory, Massachusetts General Hospital, Harvard Medical School, Boston, MA (Sponsor, Dennis Landis, MD; Collaborator, John Stevens, PhD, University of Toronto)

Academic Appointments:

1984	Instructor, Department of Neuropathology, Harvard Medical School, and Neuroscience Division, Children's Hospital, Boston, MA
1985	Assistant Professor, Dept. of Neurology at Children's Hospital, and the Program in Neuroscience, Harvard Medical School.
1996-99	Associate Professor, Dept. of Neurology at Children's Hospital and the Program in Neuroscience at Harvard Medical School, Boston, MA
1999-02	Professor, Biology Department, Boston University, Boston, Ma
2000-02	Co-Director, Program in Neuroscience, Boston University, Boston, MA
2002-04	Adjunct Professor, Biology Department, Boston University, Boston, MA
2002-06	Professor and Georgia Research Alliance Eminent Scholar, Neurology, Medical College of Georgia, Augusta, GA
2002-04	Chief, Synapses and Cell Signaling Program, Institute of Molecular Medicine and Genetics, Medical College of Georgia, Augusta, GA
2004-06	Director, Synapses and Cognitive Neuroscience Center, Medical College of Georgia, GA
2006-08	Adjunct Professor, Department of Neurology, Medical College of Georgia
2013-15	Associate Chair for Undergraduate Education, Department of Neuroscience, University of Texas at Austin, TX
2006-	Professor, Department of Neuroscience, and Institute for Neuroscience; Fellow, Center for Learning & Memory, University of Texas at Austin, TX
2019-	Adjunct Professor (renewed 2021), The Salk Institute for Biological Studies, La Jolla, CA

Awards and Honors:

1980	NIH Individual Predoctoral Fellowship,
1980	Scholarship, Neurobiology Course, Woods Hole, MA
1980	Sigma Xi Grant in Aid of Research

1982	NIH Individual Postdoctoral Fellowship
1987	Milton Fund Grant, Harvard Medical School
1987	Outstanding Young Alumna Award, Minnesota State University Moorhead
1987	Sloan Research Fellowship, Alfred P. Sloan Foundation
1992	Finalist, Computerworld Smithsonian Award, Image Graphics Laboratory
1993-94	Judge, Computerworld Smithsonian Awards
1999-2004	Packard Foundation Grant
2002-04	Councilor, Society for Neuroscience
2002-06	Georgia Research Alliance Eminent Scholar
2003	Weirsma Visiting Professor, Cal Tech, CA
2003	Distinguished Alumna Award, Minnesota State University Moorhead
2005-13	Javits Merit Award, NINDS
2010	Bauer Colloquium Speaker, Brandeis University, MA
2011	Neuroscience External Advisory Committee, Northwestern University
2012-19	Scientific Advisory Board, Max Planck Institute for Brain Research, Frankfurt, Germany
2014-16	Scientific Advisory Board, HHMI – Janelia Research Campus, Virginia
2014	Outstanding Speaker Award, American Association for Clinical Chemistry
2015-19	Scientific Advisory Board, Allen Institute for Brain Research, Seattle, WA
2015-17	Brain Research Foundation Fellow
2015-17	Texas Brain Initiative – UT at Austin
2016	Elected Fellow, AAAS
2016	Elected Co-Chair, Gordon Research Conference on Synaptic Transmission
2014-2017	Kavli Foundation, Brain Initiative Development
2017-2024	NSF – NeuroNex nanotechnology Hub Brain Initiative Grant
2018	Elected Chair, Gordon Research Conference on Synaptic Transmission
2018	Participant, Co-Author, Ernst Strüngmann Forum on Cerebral Cortex
2018	The Thomas Sargent Reese Inaugural Endowed Lecturer
2018	JCN-Wiley Sanford L. Palay Award in Structural Neuroscience
2020-	NSF – NeuroNex 2 – Multi-investigator grant
2020	Mika Salpeter Lifetime Achievement award from Soc. Neuroscience
2021	UT- Faculty Research Assignment Award
2022	Career Research Excellence Award, Co-op Hamilton Book Awards
2024	Elected Member of the National Academy of Sciences

Service:

National Institutes of Health and National Institutes of Mental health:

1990-95	Consultant, Neurology Study Section B - Program Project Grants
1992-95	Consultant, National Resource Center Grants
1996-97	Member, Cognitive Functional Neuroscience Review Committee, NIMH
1997-99	Member, Molecular and Cellular Developmental Neurosciences 1 Study Section, NIH
2000-	Ad Hoc Reviewer on multiple Study Sections
2006	Participant, NIH Blueprint Informatics Workshop, Linking Informatics of Neuroscience Communities
2008-10	Charter Member, Neurotechnology Study Section
2011-15	NIH Study Section Member, Synapses, Cytoskeleton and Trafficking
2014	Chair, NIH Study Section, Brain Initiative: Transformative Approaches for Cell-Type Classification in the Brain

2021 Co-Chair, for 5 NIH-DOE Brain Connectivity workshop series and Town Hall (https://brainconnectivityseries.com)

USA National Science Foundation:

1988- Ad Hoc Reviewer

Swiss National Science Foundation

2016 Grant Reviewer

Professional Societies:

Society for Neuroscience (SFN)

1976- Active Member number 000002259
1993 SFN: Organizer, Social on Neuroanatomical Methods,
1998 SFN: Chair and Speaker, Symposium on Dendritic Spines
2000-04 SFN: Councilor
2000 SFN: Member, Search Committee for new Executive Director of
2002-04 SFN: Co-chair Professional Development Working Group
2004-08 SFN: Founding member, Neuroinformatics Committee
2005-06 SFN: "Meet the Expert" Speaker at two SFN Annual meetings
2006 SFN: Chair and Speaker, Symposium: "How Synapse Structure Teaches Us about Function and Vice Versa".
1997-04 Women in Neuroscience (WIN)
2001 Chair, Mika Salpeter WIN Lifetime Achievement Award committee
2004 SFN: As a Councilor I fostered the WIN merger into the SFN working closely with Dr. Joan King, then president of WIN.
2013 SFN: Special Lecture, Society for Neuroscience International Meeting, San Diego
2016 SFN: Chair and Speaker, Symposium: "The Ultrastructural Basis of Synaptic Transmission and Plasticity"

Other Professional Societies and Functions:

1978- Sigma Xi
1980-1999 Association for Women in Science
1985-1999 New England Society for Electron Microscopy
1991- American Association of Anatomists
1991-1999 Microscopy Society of America
1993- American Association for University Women
1998 Organizing Chair, Keystone Symposium on Synapse Formation and Function
2000 Organizing Chair, Gordon Research Conference on Cell Biology of the Neuron
2002-06 Steering Committee, Gordon Research Conference on Neural Plasticity
2011- Member, American Physiological Society
2016-18 Organizing Vice-chair, Gordon Research Conference on Synaptic Transmission, 2018 - Chair
2016 Member, AAS Electorate Nominating Committee, Neuroscience

University of Texas at Austin:

2006- 2011	Chair, Graduate Student Admissions Committee – Institute for Neuroscience
2006-2011	Member, Executive Committee – Institute for Neuroscience
2006-	Member, Qualifying Exam committees - Institute for Neuroscience
2006-2011	Member, Search Committee – Center for Learning and Memory
2006-	Assistant Graduate Student Advisor – Institute for Neuroscience (INS)
2007-	Co-PI, Institute for Neuroscience Training Grant
2006-2009	Initiator and organizer, Institute for Neuroscience Faculty Research Lunches
2008-2009	Member, Search Committee – Director of the Dell Pediatric Research Center
2006	Member, Curriculum Committee – Institute for Neuroscience
2009, 12	Member, Post Tenure review Committees, Austin Riggs, Richard Aldrich
2010-12	Chair (2011) and Member, College of Natural Sciences, Promotion and Tenure Committee
2011	Member, Committee to advise Dean on New Section Chair
2011, 13	Steering committee, Austin Conference on Learning and Memory
2011-2013	Chair, Neuroscience Task force, and Strategic Planning Committee
2013	Member, Committee to advise Provost on reappointment of Dean, College of Liberal Arts
2013	Member, Curriculum Development Task force advisory to the Dean, College of Natural Sciences
2013	Member, UT- Dell Medical School Pre-Clinical Training Working Group
2013-15	Associate Chair for Undergraduate Education, Department of Neuroscience.
2015	Chair, Ad Hoc P and T committee for Flawn Endowed Chair
2015-	Member, Center for Learning and Memory training grant steering committee.
2015-	Member, Department Promotion and Tenure committee
2015	Member, Search Committee, Dept. Neuroscience Chair
2015	Member, Search Committee, Joint search for Computational Neuroscientist with the Department of Computer Science.
2016	Member, *Selection Panel for the 2017 Brain Research Foundation's Scientific Innovations Award*
2016-17	Member, Campus Concealed Carry Appeals Sub Committee
2018	Chair, UT-Neuroscience Departmental Faculty Review Committee
2020-21	Member, Search Committee for new faculty

Outside Advisory Boards and Committees:

2011 -13	*Northwestern University* – Neuroscience Department, External Advisory Board for Neuroscience of Information Storage Training Program, IL
2012 - 20	*Max Planck Institute for Brain Research* – Scientific Advisory Board, Frankfurt/Main, Germany
2014 -16	Janelia Farm Research Campus (HHMI) – Scientific Advisory Board, Ashburn, VA, USA
2015	*CalBrain* – California Brain Initiative, Advisory Board
2015 - 20	*Allen Brain Science Institute* - Scientific Advisory Board, Seattle, WA
2018 -	External Advisory Committee for the MBL Neurobiology Course, Woods Hole, MA
2019-	Scientific Advisory Board of the Cluster of Excellence "Multiscale Bioimaging" Georg-August_Universitat Gottingen, Gottingen, Germany
2021-	Advisory Committee for Dr. Vidhya Rangaraju, Research Group Leader, Neuroenergetics Lab, Max Planck Florida Institute for Neuroscience, Jupiter, Florida.

Georgia Regents University:

2004-06	Member, Steering Committee, Residency Program in Psychiatry
2004-06	Member, Steering Committee, Institute of Neuroscience
2004-06	Member, Executive Committee, Program in Neuroscience PhD
2004-06	Chair, Search Committee, Synapses and Cognitive Neuroscience Center
2002-06	Member, Leadership Council, Georgia Regents University Neuroscience Center of Excellence
2002-04	Member, Neuroscience Eminent Scholar Search Committee
2002-04	Judge, Postdoctoral Fellow Research Day Seminars
2002-04	Chair, Program in Neuroscience PhD Development Committee
2004-06	Member, Executive Committee, PhD Program in Neuroscience
2004-06	Member, Steering Committee, Institute for Neuroscience

Boston University:

1999-02	Member, Neuroscience Faculty Search Committee
2000-02	Chair, Neuroscience Seminar Series
2000-02	Member and then Chair, Biology Library Committee
2000-01	Co-Chair, Neuroscience and Cell Molecular Search Committee
2000-02	Member, Search Committee for Dean of the College of Arts and Sciences
2000-02	Member, Academic Promotions and Tenure Committee, Biology
2000-02	Member, Steering Committee, Biomedical Engineering Training Grant
2000-02	Member, Steering Committee, Whitaker Foundation Grant, Biomedical Engineering Department
2002	Member, "Faculty Roundtable" for Boston University View book

Harvard Medical School:

1987, 90, 93	Admissions Committee, Program in Neuroscience

Children's Hospital:

1989-92	Neurology Training Grant Executive Committee
1990-99	Leadership Role in establishing the Department of Research Computing, Member Steering Committee
1992, 94, 97	Search Committee Member for Director of Research Computing
1994-95	Enders Faculty Council, Alternate member for Neuroscience
1994	Neuroscience Seminar Series Coordinator
1991-99	Director, Image Graphics Core Laboratory, Children's Hospital
1994-99	Director, Electron Microscopy Core Laboratory, Department of Neurology/Neuroscience

Editorial Boards:

2002-21	Neuroinformatics
2002-	Hippocampus
2004-	Brain Cell Biology, Formerly Neurocytology
2007-2014	Associate Editor, Frontiers in Neuroanatomy
2014-	Journal of Comparative Neurology
2015-16	Guest Reviewing Editor, eLIFE
2020-23	Reviewing Editor, eNeuro

Journal Ad Hoc Reviewer:

1982-	Journal of Neuroscience Methods
1987-	Journal of Comparative Neurology
1989-	Brain Research
1990-	Journal of Neuroscience
1992-	Hippocampus
1993-	Science
1993-	Journal of Electron Microscopy Techniques
1994-	Proceedings National Academy of Sciences
1995-	Nature
1998-	Nature Neuroscience
1999-	Neuron
2004-	PLOS
2004-	Cerebral Cortex
2004-	Histology and histopathology
2004-	European Journal of Neuroscience
2015-	Scientific Reports (a Nature Publishing Group journal)
2023-	Frontiers in Synaptic Neuroscience

Grant Support:

Current:

2020–2025	PI, R01MH095980: Lifelong synaptic plasticity: from genesis to homeostasis to senescence. (~$400,000/year direct costs)
2020-2025	Lead PI, NSF NeuroNex #2014862: Enabling identification and impact of synaptic weight in functional networks. 4 co-PIs and total of 26 other investigators from US, UK, Germany, Canada. (US total budget, ~$4.2 million/year, ~17.5 million total).
2022-2025	Co-PI with Terrence J Sejnowski NSF2219979, 2219894: NCS-FO: Collaborative Research: Computational Analysis of Synaptic Nanodomains. (Total $732,000, $258,000 Harris)
2017-2024	PI, NSF Neurotechnology Hub #1707356 “Enhanced resolution for 3DEM analysis of synapses across brain regions and taxa”. Collaborative proposal with Texas Advanced Computing Center and The Salk Institute. (Total budget, $9,050,000). (In NCE).

Completed Projects (since 2005):

2012-2020	PI, Developmental Control of Synapse Structure with LTP. R01MH095980; R56MH095980
2014-2019	PI, Synapse growth and elimination in mature CNS. R01MH104319
2015 –2018	Co-I with Prof. Andrew Dunn, UT Brain seed grant: “Super resolution microscopy of dendritic spines with multiphoton mode mixing.”
2004 –2020	Robert Adron Harris and Kristen M. Harris (Co-PIs) “Pre-Doctoral Training in Interdisciplinary Neuroscience” 5T32DA018926-08, Training grant for the Institute for Neuroscience at the University of Texas at Austin.
1997 - 2017	PI, 3-D Structure and Function of Synapses in the Brain. R01 EB002170
2015 –2017	PI, Brain Research Foundation, Scientific Innovations Award, BRF SIA-2014-01. “Synaptome of a Memory”.
1984 –2013	PI, Spine & Synaptic Plasticity in Mature Hippocampus. Javits Investigator award (2005-2013) R01 NS21184

1996 –2010	PI, Ontogeny of Structure and Function at Hippocampal Synapses R01 NS033574
2005-2010	Robert K. Yu and Kristen Harris (Co-PIs): “Neurodegenerative Diseases and Neural Repair”, T32 NS045543
2006-2013	Recipient, Texas Emerging Technologies Fund, Daniel Johnston, PI,

Teaching Statement:

I was born to two university professors. My parents were dedicated, and innovative teachers and I attribute my own natural instincts for creating collaborative and successful learning environments to this heritage. My history as an educator demonstrates strategies that I have developed to work in teams and to facilitate collaborative efforts among budding scientists as my scientific research record demonstrates my ability to work collaboratively with my peers and mentors. This history demonstrates my commitment to fostering educational missions at UT-Austin and elsewhere. As outlined in my CV, I have sponsored numerous undergraduate and post-baccalaureate students, graduate students, postdoctoral fellows, research associates and visiting scientists. Hence, I present here a bit of what I have learned from that experience.

As a graduate student, I was a TA in an intense premedical biology course. I prepared the labs and discussion sections. Out of necessity I soon learned to manage a classroom full of students, each demanding personal attention. I began each period with a brief overview of the goals. Then I paired the students to work collaboratively, and I promised I would visit each pair at least twice per lab period. I told them to write down their questions and move on. Mind you, these were highly competitive premedical students and at first, they were not so sure that they wanted to share their knowledge with their neighbors. Then the most heartening thing happened – they began to answer all their own questions working with each other and even neighboring pairs, instead of running to me for answers. It gave me time to develop additional projects so that these first-year students and sophomores gave oral lab presentations that included reports from primary literature articles. This strategy transformed their study habits for the main course lectures and exams. Every student in my sections of the course earned a B+ or better without curving their grades. Among the 700 students in this demanding premed biology course, our section of 40 students had the highest average, by far.

So began my commitment to collaborative learning. I have honed my skills in medical school courses, at workshops, in seminar courses, in team taught classes and boot camps. I have developed a major course on the Neurobiology of Synapses that has become a substantial writing and lab course, Functional and Synaptic Neuroanatomy. This course maintains the collaborative learning environment while pushing students to improve their writing and ability to analyze and synthesize data that they collect in groups. Although they are responsible for submitting independent project reports and term papers, and they take independent exams, their peer reviews and collaborative study habits result in remarkable improvement over the semester. My Course Instructor Surveys at the end of each semester earn an overall 4.8-4.9 out of 5, despite complaints about the heavy workload. Simply put, this course can be transformative. The students tell me so as they give ovations at the end of the semester and as they organize pot-luck study sessions that last for whole weekends to finish their projects. Many join my laboratory to participate in our research efforts, while others request letters for medical school and postgraduate work and most go on to distinguished careers.

The Freshman Research Initiative, “Neuroscience of Synapses”, at UT-Austin was developed by a postdoctoral fellow in my laboratory. He began by assisting in my primary course, and then worked closely with me to refine the course so that freshman could be successful in contributing to meaningful research in laboratories on campus. Many of those students also decided to join my laboratory.

I have participated in the design of medical school curricula at Harvard, the Medical College of Georgia, and I have served on the curriculum development committee for the new Dell Medical

School in Austin. I have taken workshops with Dr. Ed Mazur, an expert in the flipped classroom. I have also taken a workshop on how to teach writing courses in a way that gives effective feedback without copious editing of student papers (an especially daunting task when my class size ballooned from 10 to 40 students). These workshops confirmed my general approaches to collaborative learning and have provided new tools that I continue to implement. During COVID times, I turned my lectures into on-line presentations that the students can study before and after class. Even though we have now returned to in person classes, they are required to listen to the lecture before class so that class time is used to discuss the components that were unclear or new ideas they have about synapses. New efforts include teaching them more formally about self-editing and giving useful peer reviews. These approaches are relevant also to workshops that I have organized for the NSF NeuroNex Brain Initiative where we expand and share knowledge about how to investigate synapses using modern electron microscopy and computational approaches to assess synaptic function.

Teaching Experience:

a) University Courses

1976-77	Premedical Biology, University of Illinois
1980	Functional Neuroanatomy, Northeastern Ohio Universities College of Medicine
1982	Workshop on Hippocampal Slices, Fred Haer Institute, Maine.
1987-88	Information Processing and Behavior, Harvard Medical School (HMS)
1988	Advanced Neurobiology, Program in Neuroscience, HMS.
1989-90	Introduction to Neuroscience Research, Program in Neuroscience, HMS
1990	Conduct of Science, Graduate Studies, Division of Medical Sciences, HMS
1992	Advanced Topics in Neurobiology, “Structure of Synaptic Function", HMS
2001	Neurobiology of the Synapse, Biology, BU
1999-2004	Selected lectures in Fundamental Neuroscience courses, BU, and Georgia Regents University
2008-2013	Neurobiology/Infrastructure of Synaptic Circuits, writing flag, UT-Austin (Implemented computer imaging laboratory and human brain dissections).
2009, 10, 14	Seminar in Neuroscience, UT-Austin
2013-15	Freshman Research Initiative – Neuroscience of Synapses, UT-Austin
2014-	Functional and Synaptic Neuroanatomy, UT-Austin (Writing flag and serial EM imaging lab where undergraduate students collect research data and often join our lab or other labs thereafter to complete their honors theses.)

b) Postdoctoral Fellows and Research or Visiting Professors:

2017-	Olga Ostrovskaya, PhD, Research Scientist: Develop new slice protocols for imaging and stimulating identified axons.
2016-	Lyndsey Kirk, PhD, Postdoctoral Fellow promoted to Research Associate (2022), PhD from the University of California, Davis. Synaptic Basis of Cognitive Decline in the Aging Brain.
2008-	Masaaki Kuwajima, PhD, Postdoctoral Fellow promoted to Research Associate (2013): Develop new electron microscopy and preparative approaches to localize LTP-specific molecules and understand their roles in ultrastructural synaptic plasticity.
1993-	Dr. Josef Spacek, Professor of Pathology, Charles University Medical Faculty, Hradec Kralove, Czech Rep. Fogarty Fellow and Visiting Professor, and Current Collaborator: Many discoveries regarding the ultrastructural composition of dendritic spines and their synapses. He provides tutorials

	and original research contributions to our Neuroinformatics Synapse database.
2022-23	Katy Pilarzyk, PhD, Postdoctoral Fellow (Obtained a position in Industry)
2009-2015	Guan Cao, PhD, Research, Scientist (NTT Assistant Professor), went first to Janelia Farms, now professional scientist in Boston, MA.
2011–15	Jared Bowden, PhD, Postdoctoral Fellow: Structural basis of LTP in the dentate gyrus of the awake and behaving rat. Research Educator: Freshman Research Initiative at UT-Austin became a Data Scientist.
2009–15	Deborah Watson, PhD, Postdoctoral Fellow: Background in the onset of development of hippocampal dependent behaviors; using ultrastructural approaches to development of LTP. Completed NRSA fellowship. Current Position: Research Scientist, QPS, LLC – Newark, Delaware
2012-14	Maria Beth Bell, PhD, Postdoctoral Fellow: Nascent zones as synapse building blocks at mature synapses. Current Position: Senior Data Scientist at Home Away, Austin, TX.
2004-12	Jennifer Bourne, PhD Postdoctoral Research Fellow, promoted to Research Associate (2010): Discovered structural synaptic scaling as a basis for synaptic plasticity in mature hippocampus. NIH Training Grant Fellowship and NIH R03 grant recipient. Became Research Scientist at University of Colorado, Boulder, Died in Tragic Car Accident, 2021 – I named and funded the Society for Neuroscience, Jennifer N. Bourne Prize in Brain Ultrastructure in her memory.
1999-2000	Carlos Portera-Cailliau, MD-PhD Neurology Fellow: investigated the role of dendritic filopodia in synapse formation in CA1. Became Associate Professor-in-Residence at the David Geffen School of Medicine at UCLA
2000-2001	Matthew Xu-Friedman, PhD, Visiting Postdoctoral Fellow, from Dr. Wade Regehr's laboratory at Harvard Medical School: Co-authored an elegant J. Neuroscience paper.
1997-2002	John Fiala, PhD, Research Assistant Professor, Postdoctoral Research Associate, developed our freely available reconstruction software (entitled "RECONSTRUCT").
1997-2002	Sergei Kirov, PhD, Research Assistant Professor, Postdoctoral Research Associate, recipient of an NIH – KO1 award. Became tenured Professor in Neurosurgery at the Medical College of Georgia.
1997-98	Gordon MG Shepherd, MD/PhD Postdoctoral/Neurology Fellow: Co-authored elegant paper demonstrating the variation and composition of presynaptic axons through 3-dimensional reconstructions. He is currently an Associate Professor in the Department of Physiology at Northwestern University.
1997-99	David Selig, MD, Postdoctoral Fellow: received NRSA to investigate structural basis of synaptic transmission and co-authored paper and then returned to medical practice.
1996-97	Viktor Popov, PhD, Visiting Professor: Senior Scientist at Institute of Cell Biophysics, Russian Academy of Sciences in Pushchino, Russia.
1991	Patricia Suppes, MD/PhD, Postdoctoral fellow: co-authored paper before assuming full-time clinical and research duties at the UT-Dallas.
1986-87	Frances Jensen, MD Postdoctoral Fellow: co-authored several papers, initially obtained K01 funding based on application written in my laboratory. Promoted to Full Professor in the Div. of Neuroscience, Dept. of Neurology, Children's Hospital, winner of an NIH Pioneer Award. In 2012, named

Professor and Chair, Department of Neurology, Perelman School of Medicine, University of Pennsylvania.

c) Predoctoral Graduate students:

2006- *Thesis advisor or Rotation supervisor, Graduate Students at UT- Austin*
- Fall 2023, Henry Garcia, PhD rotation student in Biochemistry
- current, Andrea Nam, PhD student in the INS, Thesis Advisor
- Ahmed Hassan, PhD student in Biomed. Engineer. (T), graduated 2020
- Seth Weisberg, PhD student in INS (T), graduated 2018
- Taylor A Clark, PhD student in INS (T), graduated 2018
- Heather Smith, MD/PhD student in INS (T), graduated 2015
- Michael Chirillo, MD/PhD student in INS (T), graduated 2015
- Ann Clemens, PhD student in INS (T), graduated 2013
  (Co-advisor, with Dr. Daniel Johnston),
- Larry Lindsey, MS in Electrical and Computer Engineering,
  graduated 2013 (Co-advisor, Dr. Alan Bovik)
- Maria Beth Bell, PhD student in INS (T), graduated 2012
- Andrea Haessly, PhD student in INS (R), graduated 2012
- Priyanka Godbole, MS student with Dr. Chandrajit Bajaj (R)
- Masson Weems, PhD student with Dr. Chandrajit Bajaj (R)

2006- *Visiting Students or Research Staff*
- Mohammad Samavat, PhD (2023), Salk Institute, CA
  From Laboratory of Dr. Terrance Sejnowski
- Cailey Bromer, earned PhD, Salk Institute, CA
  From Laboratory of Dr. Terrance Sejnowski
- Davi Bock, earned PhD, Harvard Medical School,
  From the laboratory of Dr. Clay Reid
- Cam Robinson, Staff Scientist, Duke University Medical Center,
  From the laboratory of Dr. Michael Ehlers
- Justin Kinney, earned PhD, Salk Institute, CA,
  From the laboratory of Dr. Terrance Sejnowski

2003-06 *Thesis (T) advisor or Rotation (R) supervisor, Graduate Students at the Georgia Regents University*
- Mark Witcher (T, MD/PhD student co-authored 2 papers, Current: Assistant Professor, Dept. Neuroscience, Functional Neurosurgery, Carilion Clinic Neurosurgery, Virginia Tech/Carilion Research Institute, Roanoke, VA).
- William Risher (PhD Neuroscience student – co-mentored with Sergei Kirov), currently Postdoctoral Fellow at Duke University.
- Jennifer Salgado (PhD Neuroscience student; co-authored paper in Neuron)
- Jackie Tilsner, Seungshin Ma, Vanessa Bundy (R, PhD Neuroscience)

2000-2006 Thesis advisor (T) or Rotation (R) supervisor, Graduate Students at Boston University (BU)
- Linnaea Ostroff (T, Ph.D. Prog. in Neuroscience BU, Postdoc with Joe LeDoux, Research Scientist Allen Brain Institute). Currently Research Faculty, NYU, New York.

- Mark Seid (T, PhD, Co-Advisor with Dr. James Traniello, BU; Major first author paper in J. Comp. Neurology). Became a Postdoctoral Fellow with Rüdiger Wehner in Switzerland; faculty at Smithsonian Tropical Research Institute, Panama, Became Assistant Professor, The University of Scranton, Pennsylvania.
- Linda Caparell (master's thesis advisor, Biology/Neuroscience at BU)
- Tom Giove (R, MCBB Program at BU)

1988-99 Thesis advisor (T) or Rotation (R) supervisor, Graduate Students at Harvard Medical School (HMS)

- Karin Sorra (T, Ph.D. Prog. In Neuroscience, Recipient Canadian foreign fellowship, several first author papers; Founder ArroScience)
- Marina Chicurel (R, Ph.D. Prog. in Neuroscience, Hughes Fellowship awarded while in my lab, first author paper)
- Paul Jackson (R, M.D. Ph.D. Prog. in Neuroscience, first author paper)
- Alo Basu (R, Ph.D., Prog. in Neuroscience)
- Alex Carter (R, MD/Ph.D., Prog. in Neuroscience)
- Bruce Peters (R, Ph.D. Prog. in Neuroscience)
- Mary Morris (R, Ph.D. Prog. in Neuroscience)
- Michael Levin (R, Ph.D., Cell, and Dev. Biol.)
- Gerri Martin (R, Ph.D. Prog. in Neuroscience)
- David MacMahon, a visiting graduate student from the University of Pittsburgh, co-authored a paper.

1993-2000 *Outside examiner for Ph.D. Thesis:*

- C. Woolley (B. McEwen, Advisor, Rockefeller Univ., New York, 1993).
- Member of an International Committee to examine 6 Ph.D. candidates in the Laboratory of Prof. Per Andersen, Univ. Oslo, Norway (1995), including M Trommald, M-B Moser, E Moser, and others.
- K. Leslie (G. Turringiano, Advisor, Brandeis Univ., Boston, MA, 2000)

c) Undergraduate Honors Students and Post-Bac Research Assistants:

University of Texas – Austin

2023-2024 New Undergraduates added to the Harris laboratory include: Sahana Datta, William Peschel, Nick Calzada, Ella Prasad, Dhivya Venkatraghavan, Jad Refaei, Megan George, Anton Forsman, Ashley Dickens, Nisha Vishag. These students are distributed among three major projects in the laboratory encompassing new understanding about synapse development and plasticity, computational neuroscience, aging, and electron microscopy tool development. At present the lab hosts 15 UT undergraduate students actively participating in research projects.

2022-curr Ayden Cavill and Esha Venkat (high school student) report directly to Vijay Venu, research assistant in computational neuroscience.

2020-curr Mahija Ginjunpalli, report directly to Masa Kuwajima, senior staff Researcher, and working on analyzing the ultrastructural basis of long-term synaptic plasticity in the hippocampal dentate gyrus.

2020-curr Sonia Singh, Adrienne Li, Anna Xaymongkhol, and Isha Jha assisting Masa Kuwajima towards publication of a transgenic rat model to study roles of the spine apparatus in learning and memory.

2022-curr	Julian Falco post bac research assistant developing PyReconstruct.
2022	Sidney Harris (freshman rotation).
2021,22	Priya Mahableshwarkar obtained fellowships from The Neuroscience Studies Foundation in Honor of Harvey and Judi Nudelman; designed to foster young women in neuroscience.
2020-21	Soummitra Anand, Kaelin Rubenzer, Connor McKee: In wake of COVID19, we accepted three additional BS Neuroscience undergraduate students, whose own labs have been shut down. These students worked remotely using skills learned in NEU466G on an ongoing project in the Harris Lab. The two women obtained fellowships from The Neuroscience Studies Foundation in Honor of Harvey and Judi Nudelman; designed to foster young women in neuroscience, and Connor was supported, NSF grant.
2020	Kaelin Rubenzer, Mahija Ginjunpalli, Mireya Mota and Soummitra Anand obtained fellowships from The Neuroscience Studies Foundation in Honor of Harvey and Judi Nudelman; designed to foster young women in neuroscience.
2020-23	Priya Mahableshwarkar, Sonia Singh, Adrienne Li, Anna Xaymongkhol, Everett Owens, and Isha Jha are assisting Masa Kuwajima and Katy Pilarzyk, a postdoc fellow, in the development of a transgenic rat model to study roles of the spine apparatus in learning and memory.
2015-curr	Dusten Hubbard, currently post-bac Research Assistant in Neuroscience, was Course Specialist in NEU466G.
2015-curr	Dakota Hanka, undergraduate research assistant, Neuroscience, currently post-bac position in the laboratory.
2019-21	Zean Aaron Luna, Course Specialist for NEU466G lab course and post-bac research assistant.
2013-19	Corey Haines, undergraduate research assistant, undergraduate Teaching Assistant for NEU466G lab course, and Freshman Research Initiative. 2017 Dean's Honored Undergraduate Award (given to less than 1% of those in the 20,000 students in the graduating class). Graduated from UTHS Houston Medical School with MD. In residency.
2015-21	Students who reported directly to Lyndsey Kirk, the senior Postdoctoral fellow in my laboratory include: post-bac research assistant Kyle Zatyko Teaching Assistant for NEU466G lab course and studying axon ultrastructural changes with LTP and Synapses in the aging brain. Four students recruited as first-year students, Mireya Mota, Tommy Liu, Vivek Mathesh, Julian Falco to help with behavioral analysis of aging rats. Past: Alia Pederson and Katie Hedgepath worked on identifying nascent zones in synapses in the dentate Gyrus and Gaby Perez (high school) worked to help identify and reconstruct synapses in the aging brain.
2015-17	Marshall Drake, undergraduate research assistant, Neuroscience, won fellowship to be the Course Writing Specialist for NEU466G lab course. 2017 Dean's Honored Undergraduate award (<1% of graduating class).
2016-18	Alexis Pederson, undergraduate research student, BS Neuroscience and Russian.
2015-17	Sindy Ventura, undergraduate research assistant Neuroscience, undergraduate Teaching Assistant for NEU466G lab course
2015-17	Masha Aseeva, undergraduate research assistant, Computer Science
2014-17	Paola Gonzalez, undergraduate research assistant, Neuroscience
2014-17	Kate Dembny, undergraduate research assistant, Neuroscience

2013-16 Mikayla Waters, undergraduate research assistant, undergraduate Teaching Assistant for NEU466G lab course, and Freshman Research Initiative. Winner of UT-Undergraduate research poster competitions ($500 prize, 2016). Currently, MD/PhD candidate UT-Houston.

2012 Michael Musslewhite, undergraduate research assistant.

2013 Fernanda Argudo, undergraduate research assistant, Neurobiology.

2010-13 Yelena Kulik, Honors Student, Twice Winner of UT-Undergraduate research poster competitions ($500 prize, 2013); earned her PhD at UCSF in Neuroscience; Dean's Honored Undergraduate (1 of 18 to sit on stage during graduation ceremonies).

- Ryan Ellis, Honors Student, Winner of Summer Research grant support; Freshman Research Initiative undergraduate teaching Assistant.
- Michael Chirillo, Research Assistant became MD/PhD student in INS
- Sean Behounek, Honors Student, went to in Medical School
- Amy Pohodich, Honors Student; Winner of UT-Undergraduate Summer Research Fellowship, and Poster Competition.

2002-04 Medical College of Georgia

- Anusha Mishra, Research Assistant, PhD student at the Univ. of Minnesota, co-authored 1 paper.
- Jeremy Smalley, Summer STAR student
- Jamie Hurlburt, Research Assistant (2 publications, DO medical School).

2000-02 *Boston University*

- Priya George, Biology honors student, co-authored a paper.
- James Cooney, Biology, Undergraduate Research Opportunity research grant (UROP), Work for Distinction – Honors Thesis on endosomes in dendrites, First author, J. Neurosci. 2002. Enrolled in Medical School.
- Victoria Hui, Biomedical Engineering, had a UROP in my lab
- Lara Petrak, now at Harvard Medical School imaging core.
- Alex Goddard completed Harvard Medical School PhD in Neuroscience.

1987-99 Harvard University

- Rachel Ventura (Went to Columbia, first authored paper)
- Beatrice Tsao (Radcliffe Project Grant, Medical School, NYU, co-authored 2 papers, now a practicing physician)
- Peter Sultan (Medical School, Cornell, NY, co-authored paper)
- Katrien Neukermans (Medical school, Johns Hopkins)
- Greg Belmont (Graduate school in Neuroscience, MIT)
- Andrew Nguyen (MD/Ph.D. Program, Univ. Calif., San Diego).

1996-98 *Judge and Mentor,* Center for Excellence in Education - The Research Science Institute Summer Program for Talented High School Students at Mass. Institute of Technology, Sponsored Ms. Connie Kim in my laboratory during this program.

Regional, National and International Seminars and Contributions

1985-97 Gave 43 invited seminars.

1998 Organizer, Boston Area Hippocampus Club – January 1998 Meeting

Organizer, Keystone Symposium on Synapse Formation and Function.
Discussant, NIH workshop on Brain Molecular Anatomy Project
Speaker, SUNY Health Science Center
Speaker, Spring Meeting on the Human Brain Project
Speaker, Gordon Conference on the Cell Biology of the Neuron
Lecturer, Cold Spring Harbor: Brain Development & Function
Lecturer, Cold Spring Harbor: Imaging Structure and Function in the Nervous system
Lecturer, Neurobiology Course, Marine Biological Laboratories, Woods Hole MA
Symposium Organizer and Speaker: Dendritic Spines, Society for Neuroscience

1999 Lecturer, Harvard Medical School Course in Neuroanatomy
Speaker, Northeastern Ohio College of Medicine
Speaker, Mount Sinai Medical School
Speaker, Baylor College of Medicine
Speaker, Boston University Neuroscience Day
Speaker, Biology Department Retreat
Chair of session, Gordon Conference on Neural Plasticity
Speaker, Massachusetts Institute of Technology, Brain, and Cognitive Neuroscience

2000 Speaker, Harvard Medical School, Neurobiology Seminar Series
Speaker, NYU - Neuroscience Seminar
Organizer and Speaker, Boston Area Hippocampus Club
Chair, Gordon Conference on the Cell Biology of the Neuron
Lecturer, Marine Biological Laboratory Summer Neurobiology Course
Speaker, Cold Spring Harbor, Neuroscience Seminars
Speaker, Georgia Regents University

2001 Speaker, Gordon Research Conference on Excitatory Amino Acids - Italy
Speaker, Conference on Data Basing in the Brain, Norway
Speaker, Gordon Research Conference on Neuroplasticity, Rhode Island
Lecturer, Marine Biological Laboratory Summer Neurobiology Course
Speaker, Brown University, Neuroscience, Dept., RI
Speaker, Cognitive and Neural Systems Dept., Boston University

2002 Keynote Speaker, Wash. Univ. Neuroscience Retreat, St. Louis
Speaker, Anatomy and Neurobiology Department, Boston University
Speaker, Winter Conference on Brain Research, Snow Mass, Colorado
Helen Molinari Memorial Lecturer, Albany, NY
Speaker, Neurobiology and Behavior, University of California, Irvine, CA
Speaker, Columbia Neuroscience, NY
Speaker, Georgia Regents University
Speaker, University of Pittsburgh
Speaker, Gordon Research Conference on Synaptic Transmission, New Hampshire
Speaker, NIDA Satellite Symposium, Frontiers in Addiction Research
Speaker, Human Brain Project Symposium, Society for Neuroscience

2003 Speaker, AAAS meeting in Denver, CO.
Speaker, Department of Neurobiology, Yale University
Weirsma Visiting Professor, California Institute of Technology, Pasadena, CA
Speaker, MIT Center for Learning and Memory, MA
Speaker, 30th Anniversary: Discovery of LTP, Meeting Royal Society in London
Speaker, Satellite Symposium on Synaptogenesis, Austrian Neuroscience Association, Vienna

Speaker, Symposium on the Molecular Dynamics of Synapse Assembly and Plasticity, Intl. Brain Research Org. Meeting, Prague Czech Republic
Speaker, University of Maryland, Baltimore
Speaker, Rutgers University, New Jersey
Speaker, Human Brain Project, Satellite Symposium, Society for Neuroscience Meetings, New Orleans
Speaker, Emory University, Atlanta

2004 Speaker, Synapse: Molecular Mechanisms of Plasticity, Symposium to celebrate opening of the Porter Neuroscience Research Center at the NIH
Speaker, Gordon Research Conference: “Cell Biology of the Neuron”, New Hampshire
Speaker, University of Maryland Baltimore, Baltimore, MD
Speaker, 14th Neuropharmacology conference on "The Cytoskeleton & Neuronal Plasticity" San Diego, CA

2005 Speaker, UCLA Joint Seminar in Neurosciences Series, University of California, Los Angeles
Speaker, Emory University, Yerkes Primate Center, Atlanta, GA
Speaker, “Ultrastructure of dendritic spines and long-term potentiation”, University of Texas, Austin, TX
Speaker, University of Washington, Seattle, WA (I)
Speaker, Cold Spring Harbor Meeting on Learning and Memory, CSHL, New York
Speaker, Commencement, Minnesota State University, Moorhead Minnesota
Course Lecturer, Neurobiology Summer Course Lectures, Woods Hole, MA
Speaker, Gordon Research Conference, Excitatory Amino Acids, Aussois, France

2006 Speaker, Winter Conference on Learning and Memory, Park City, Utah
Speaker, Neuroscience Seminar, Stanford University, CA
Speaker, Neuroscience 2006 Symposium, Neuroscience Dept. Farmington CT
Speaker, Cold Spring Harbor Labs - Meeting on Channels, Receptors, and Synapses
Speaker, Neuroscience Seminar Series, UBC, Vancouver
Speaker, Brain Research Centre Research Day UBC, Vancouver
Speaker, Neuroscience Institute, University of Michigan, Ann Arbor, MI
Course Lecturer, MBL Neurobiology Course, Woods Hole, MA
Speaker, Institute of Neuroscience Seminar Series, UT-Austin, TX
Speaker, 16th Neuropharmacology conference “LTP: Forty Unforgettable Years” Satellite meeting at the Society for Neuroscience, Atlanta.
Symposium Chair and Speaker, "How Synapse Structure Teaches Us about Function, and Vice Versa" Society for Neuroscience
Invited Participant in an event at the Society for Neuroscience headquarters co-sponsored by the Spanish Embassy to commemorate the Centennial of the 1906 Nobel Prize shared by Cajal and Golgi.

2007 Symposium Chair, Structural Plasticity underlying Learning and Memory Mechanisms: Winter Conference on Learning and Memory, Park city, Utah
Speaker, Structural Plasticity of Dendrites, Gordon Research Conference on Dendrites: Molecules, Structure, and Function, Ventura Beach, CA
Speaker, Brown University, Providence, RI
Speaker, Yale University, New Haven, CT
Speaker, "Neuronal morphological plasticity: Mechanism and Meaning, "Foundation des Treilles in Tourtour, France
Symposium Speaker and Author: Structural and Functional Organization of the Synapse, Iowa City, IA

Co-organizer, conference on “High-Throughput Neuroanatomy”, Howard Hughes Medical Institute, Janelia Farm Research Campus, MD
Speaker, conference on “Translation at the Synapse”, Howard Hughes Medical Institute, Janelia Farm Research Campus, MD

2008 Course Lecturer: Neurobiology Summer Course at the Marine Biological Laboratories, Woods Hole, MA
Speaker, First World Neuroinformatics Congress, Stockholm Sweden
Speaker, 66th Harden Conference on Ion channels and synaptic function, Chester, England
Speaker, Texas A and M University Neuroscience Seminar Series
Keynote Symposium Speaker, Grass Lectureship, Front Range Neuroscience, Fort Collins, CO

2009 Speaker, Grass Traveling Scientist Program, UT- Dallas Neuroscience group
NIMH Training Grant Workshop
Plenary Speaker, CoLab Mathematics Workshop, UT – Austin
Speaker, New York University School of Medicine
Distinguished Speaker, Department of Physiology Retreat, UT- San Antonio
Speaker, University of Chicago
Co-Organizer, Max Planck Gesellshaft - Janelia Farm Meeting on Dense Neural-Circuit Reconstruction, Berlin, Max Planck Society

2010 Speaker and Organizer of Session, Winter Conference on Neuroplasticity
Speaker, Structural Plasticity in the Mammalian Brain, Janelia
Speaker, Department of Neurobiology and Anatomy, UT-Houston
Speaker, Department of Neurology, UT- Southwestern
Public Speaker and Course Lecturer: Neurobiology Summer Course at the Marine Biological Laboratories, Woods Hole, MA
Bauer Colloquium Speaker, Brandeis University, Waltham, MA

2011 Speaker, Gordon Research Conference on Dendrites, Ventura, CA
Speaker and Co-Chair, Austin Conference on Learning and Memory
Speaker, Princeton Neuroscience, Princeton NJ
Speaker, Nansen Symposium, Oslo Norway
Speaker, Sloan-Schwartz Conf. on Theoretical & Computational Neurobiology
Speaker, High Resolution Circuit Reconstruction, Janelia Farm, VA
Speaker, Northwestern University, Chicago (Evans), IL
Speaker and Workshop Organizer, Univ. Otago, Dunedin, New Zealand

2012 Speaker, Dendrites: Substrates for Information Processing, Janelia Farm, VA
Speaker, Neuroscience Department, University of California – Davis
Speaker, Neuroscience Spring Symposium, Univ. Michigan, Ann Arbor, MI
Speaker, Neuroscience Lectures Series, Max Planck Institute for Brain Research and the International Research School, Frankfurt Germany
Speaker, University of Bergen, Bergen, Norway
Speaker, Gordon Research Conference on Excitatory Synaptic Transmission, Waterville Valley, NH
Speaker, Duke University, Raleigh/Durham, NC
Speaker, Vollum Institute, Oregon Health Sciences University, Portland, OR

2013 Speaker, University of Texas Neuroscience Seminar Series, Austin, Texas
Speaker, University of California, Santa Barbara
Speaker, Architects of the Mind, World Science Festival, New York
http://worldsciencefestival.com/events/architects_of_the_mind
Special Lecture, Society for Neuroscience International Meeting, San Diego

2014 Online Speaker, Bioconference Live Neuroscience Event, American Association for Clinical Chemistry, INC.
Speaker, Virginia Tech Carilion Research Institute, Roanoke, VA
Speaker, Dendrites 2014, Foundation for Research and Technology-Hellas (Forth), Heraklion, Crete, Greece
Speaker, Participant, Department of Energy and Kavli Foundation Workshop regarding the BRAIN initiative, Washington, DC
Speaker and Graduate Student Seminar advisor and participant, Gordon Research Conference on Excitatory Synaptic Transmission, Waterville Valley, NH
Speaker, Connectomics 2014 sponsored by the Max-Planck Institute and Janelia Farms, Berlin, Germany
Speaker, Seminar in Neuroscience, Max Planck Institute of Neurobiology, University of Munich, Munich, Germany
Panel Member, Brain Mapping, New Yorker Science Festival, New York, NY
Speaker, Seminar Series, Allen Institute for Brain Research, Seattle, WA

2015 Speaker, Nonlinear Dynamics Seminar Series, UT-Austin, Dept. Physics
Speaker, Gordon Research Conference on Dendrites, Ventura, CA
Speaker, California Institute of Technology, Pasadena, CA
Speaker, Lecture and Life Path, Neuroscience Roadmap Scholars, University of Alabama, Birmingham AL
Speaker, Neuroimaging Seminar, Marine Biological Lab., Woods Hole MA
Speaker, Forty Years of Structural Neuroscience at the MBL – a symposium in honor of Tom Reese, Woods Hole MA
Speaker, Tiputini Field Station, Ecuador

2016 Speaker, Bordeaux Neurocampus, France, “Silent synaptic growth and the augmentation of hippocampal plasticity”
Speaker, Neuroscience Department, Institute de Biologie de l’Ecole Normale Superieure, Paris France
Speaker, Ecole Polytechnique Federale de Lausanne, Lausanne, Switzerland
Speaker, Fingerlanduv Dept. Pathology, Medical Faculty of Charles University in Hradec Kralove, Czech Republic.
Speaker, Department of Neuroscience, UT Southwestern
Speaker, Symposium: “Francis Crick: The Astonishing Hypothesis” – Rockefeller University, New York
Speaker, Conference, High-Resolution Circuit Reconstruction, HHMI Janelia Research Campus
Speaker, Center for Neuroscience, UC Davis, California
Speaker, Conference, “Molecular Mechanisms in the Synapse” Conference, HHMI Janelia Research campus
Vice-chair, Gordon Research Conference, Synaptic Transmission (Chair-elect, 2018), Waterville Valley, NH
Faculty Speaker, Laboratory of Synapse Structure and Function “Synaptome of Memory”, Institute for Neuroscience Graduate Student Bootcamp.
Speaker, Department of Neuroscience, Einstein College of Medicine, NYC, NY
Featured speaker, International Conferences on Brain Informatics & Health (BIH'16) Omaha, NE
Speaker, Dept. Neurobiology and Anatomy, UC, Irvine
Keynote speaker, Nano in Neuroscience and Engineering session; NSF Nanoscale Science and Engineering Grantees Conference, VA.

Symposium Chair and Speaker, “The Ultrastructural Basis of Synaptic Transmission and Plasticity”, Soc. for Neuroscience, San Diego

2017 Speaker, Winter Conference on Brain Research, Montana
Speaker, Neuroscience, Max Planck Institute, Gottingen
Speaker, German Neuroscience Symposium, Gottingen
Speaker, Neuroscience, UC-San Diego
Speaker, Sloan-Schwartz Seminar Series, The Salk Institute
Speaker, Neurophotonics Meeting, Bordeaux, France

2018 Speaker, Winter Conference on Brain Research, Whistler, Canada
Speaker, Baylor College of Medicine, Houston, TX
Participant, Ernst Strüngmann Forum on Cerebral Cortex, Frankfurt, Germany
Speaker, Case Western Reserve University, Cleveland, OH
Keynote, Dorris Neuroscience Center, Founder’s Day Celebration, Scripps Institute, San Diego, CA
The Thomas Sargent Reese Inaugural Endowed Lecture, Marine Biological Laboratory, Woods Hole, MA
Speaker, FORTH Dendrites 2018 Spotlight on molecules, structure and function, Heraklion, Crete, Greece
Organizer, Speaker, NeuroNex Workshop, Texas Advanced Computing Center
Chair, Gordon Conference on Synaptic Transmission, obtained 50% representation for women speakers, and 4 under-represented minority fellowships to support travel and other logistics.
Speaker – NSF-NeuroNex, Brain Initiative Symposium, San Diego

2019:
Speaker – Winter Conference on Brain Research, Snowmass Colorado
Speaker – Gordon Research Conference on Dendrites, Ventura, CA
Speaker – Connectomics Meeting, Berlin, Germany
Speaker – Sloan-Swartz Center for Theoretical Neurobiology at the Salk Institute
Speaker – CRCNS2019 PI Meeting at UT-Austin
Distinguished Lecturer in Neurobiology - Univ. of Pittsburgh School of Medicine
Speaker – Max-Planck-Institut fur Experimentelle Medizin (MPIem) Symposium on Quantitative Synaptology
Invited Speaker – SfN Minisymposium on the Brain Initiative Chicago
Speaker – NeuroNex1 investigatory meeting, Chicago

2020: Cancelled invitations due to COVID
Speaker – Winter Conference on Brain Research, Big Sky Montana
Brain Initiative Investigators meeting; Gordon Conference on Synaptic transmission (Italy); Dendrites Meeting (Organizer, Crete); 50th Anniversary Symposium for the MBL Neurobiology Course (Woods Hole); Iowa Neuroscience Institute Synapse Workshop; Celebration of Tom Reese’s career (NIH, Bethesda).

2020 Virtual Talks:
Institute for Neuroscience: “Learning from Synapse Structure” (Aug. 11)
Tower Fellows – UT at Austin “Synaptic Odyssey” (Nov. 04)
Brain Initiative: “Enhanced Resolution for 3DEM Analysis of Synapses” (Nov. 17)
NSF: NeuroNex third meeting – Report on our Grants (Oct. 23)

2021-22 Virtual talks:
Co-chair: NIH-DOE Brain Connectivity 5 workshop series – prepared agenda, invited speakers, participated in all sessions (3-4 hours/day each on: February 5,

17, March 5, 17, 31, 2021) and provided formal talk with overview of the first 4 workshops to introduce the Town Hall (March 31, 2021)

Speaker – British Neuroscience Association Festival "Impact of local postsynaptic and presynaptic resources on synaptic plasticity" (April 13, 2022)

Speaker – International Neuroinformatics Coordinating Facility Conference (April 23, 2022)

2022 In Person Talks

Speaker - Winter Conference on Brain Research, "Structure of Enhanced Synaptic Transmission after LTP". Snowmass Colorado (01/29–02/05/2022)

Co-Organizer and Speaker: "Structural synaptic plasticity provides a mechanism for spaced learning." Dendrites 2022: Dendritic anatomy, molecules, and function. Talk title: Heraklion, Crete, (05/22-26/2022)

Speaker "Future of Connectomics: Determine when and where to dive deep into Synaptic Weight" – Connectomics 2022, Berlin, Germany (05/29-06/01/2022)

Speaker "Structural synaptic plasticity provides a mechanism for spaced learning"– International Behavioral Neuroscience Society Meeting. Glasgow, Scotland (06/07-06/11/2022)

Speaker – "Structural synaptic plasticity provides a mechanism for spaced learning" University Medical Center and Max Planck Institute for Multidisciplinary Sciences, Gottingen, Germany (06/15/2022)

Speaker - "Structural synaptic plasticity provides a mechanism for spaced learning" Max Planck Institute for Brain Research, Frankfurt, Germany (06/16/2022)

Speaker – "Structural synaptic plasticity provides a mechanism for spaced learning". Gordon Research Conference on Synaptic transmission. LU, Italy (Renaissance Tuscany Il Ciocco) (06/19/2022).

Speaker – "How the 1980 Neurobiology course launched my career!" Symposium at the 50th anniversary of the Marine Biological laboratory Neurobiology Course. Woods Hole, Massachusetts. (07/16/2022)

Speaker – "Structural synaptic plasticity provides a mechanism for spaced learning." Salk Institute for Biological Studies, La Jolla, CA. (07/28/2022)

Speaker – "Structural synaptic plasticity provides a mechanism for spaced learning." Institute of Science and Technology Austria 09/19/2022:

Speaker – "Structural synaptic plasticity provides a mechanism for spaced learning." Iowa Neuroscience Institute Synapse Workshop. Iowa City, IA 09/22/2022

Speaker – MD Andersen Distinguished Blaffer Lecture Series

2023:

Speaker – "Filling and Building Synaptic Nascent Zones" Winter Conference on Brain Research, Snowbird Utah (01/2023)

Speaker – "Synaptic Mechanisms of Spaced Learning" CERVO Brain Research Centre, Quebec City, Canada (02/2023)

Discussion Leader – "Dendrites", Gordon Research Conference, Barga, Italy (03/2023)

Speaker – "Synaptic Mechanisms of LTP Underlying Spaced Learning" Symposium, Max Planck, Jupiter, FL (03/2023)

Organizer – Workshop for the NSF, NeuroNex, tools teams. TAAC, UT-Austin (05/2023)

Speaker – Basic Neuroscience of Synapses and Synaptic Mechanisms of Spaced Learning", Women in Neuroscience, UT-Austin (06/2023)

Speaker – Symposium on Synaptic Nanocolumns, Society for Neuroscience meeting, Washington DC (11/2023)

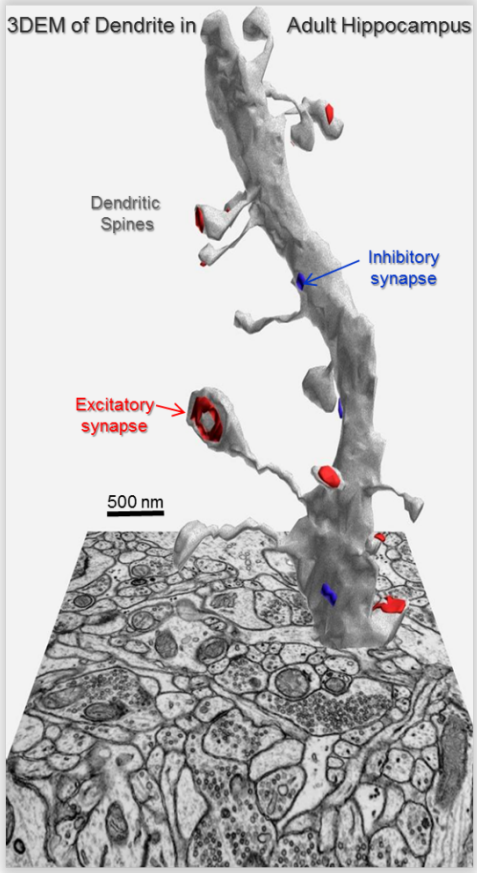
Speaker – LTP50 celebration of the discovery Long-term potentiation, London, UK (11/2023)

2024 Speaker – Panel session on dendritic spines – Winter Conference on Brain Research, Breckenridge, CO. (01/2024)

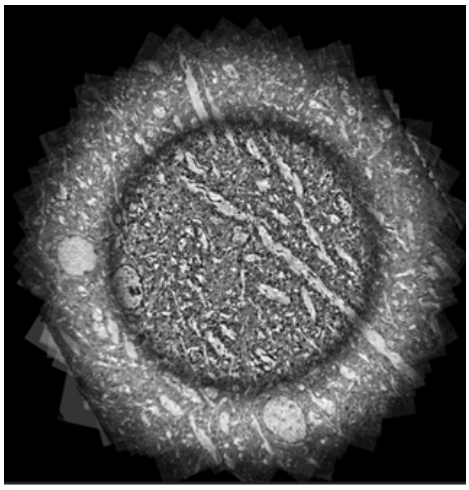
Summary of Research

A chronological description of our work is presented in the recent 50th Anniversary edition of the Society for Neuroscience entitled “Synaptic Odyssey” (Harris, 2020), and at our Lab website (https://synapseweb.clm.utexas.edu/harris-lab-publications).

A fundamental goal of modern neuroscience is to understand the neuronal mechanisms of learning and memory that underlie our acquisition of new behaviors. It has long been recognized that learning a new fact or performing a new behavior must involve a change in the nervous system. Prime candidates for the crucial changes are synapses that transfer signals between neurons. The dominant hypothesis has been that long-lasting changes in the number or structure of synapses are the substrate of memory. Although supporting evidence has accumulated, clear proof of this hypothesis has been elusive. As with every theory, careful experimentation at the appropriate scale is necessary for proof or rejection. Synapses are complex, yet tiny structures, and measurement of their dimensions and identification of their components requires the nanometer resolution of electron microscopy. For this purpose, we have pioneered computerized three-dimensional reconstruction from serial electron microscopy (3DEM) to understand how synapse structure and composition serve brain function (e.g., Harris and Stevens, 1988, 1989; Fiala and Harris, 2001; synapseweb.clm.utexas.edu). Building on that foundation, we study the ways that changes in the synapses (plasticity) could establish new memories and preserve them. Our 3DEM methods have been adopted worldwide and they have helped to launch the current renaissance in synaptic biology as well as synaptic circuitry, namely ‘connectomics’. The synaptic basis of a memory, sensation, or behavior is quite different from the circuit map of a brain region. Specific experiences probably involve a subset of specific synapses within the circuit. Our goal is to identify the critical synapses and find out how they work. Interpreting and sharing this basic information as we do at our website (synapses.clm.utexas.edu) and our NSF NeuroNex (Brain Initiative) funded site 3Dem.org at the Texas Advanced Computing Center (TACC), is crucial for the design of effective treatments to prevent brain dysfunction that leads to mental retardation and illness.



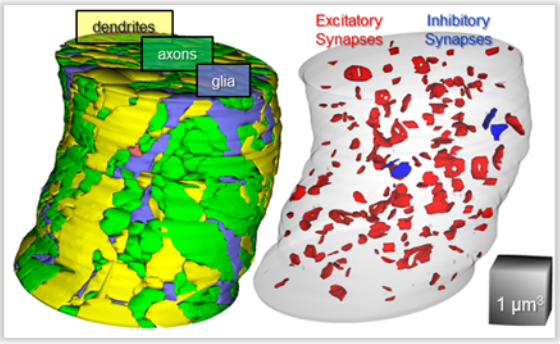
SynapseWEB, Kristen Harris, PI
http://synapseweb.clm.utexas.edu


SEM tomogram, work in progress.

This NSF funding allows us to continue developing new tools for tomography on the scanning electron microscopy (SEM) to give us better z resolution. The figure illustrates work in progress showing projection of seventy tilt-corrected and affine-aligned images of fixed and embedded 250nm thick sections of rat hippocampus acquired as forward-scatter transmission signals from a low-voltage scanning electron microscope. Individual "petal" images have a unique combination of tilt and rotation based on a spherical Fibonacci spiral. The central darker circular area (about 50um diameter) is sampled by the full set of images at 2 nm lateral pixel

dimension. These preliminary projections are used to evaluate the data set for use in a much more refined alignment process and eventual tomographic computation for a third, axial dimension yielding near-isotropic voxels to be viewed and analyzed in arbitrary orientation. We have multiple teams on our NeuroNex grant working in concert to build new alignment, auto segmentation and analytical tools, that are rapidly released for public use at 3DEM.org and Github. We develop workshops to showcase and teach the tools and are working with the 26 member labs of this project to prepare new understanding of synaptic weights and plasticity at molecular, subcellular and connectome levels.

We were the first group to develop and share a computer-assisted 3D reconstruction system (Reconstruct). Reconstruct is used in our laboratory, in the classroom, and throughout the world as demonstrated by the images from citations at SynapseWeb. We have worked with Zeiss to develop a scanning electron microscope operating in the transmission mode (tSEM) that provides cost-effective and high-resolution imaging of very large fields (Kuwajima et al., 2013). The tSEM also provides automatic image collection that facilitates the labor-intensive process of serial EM imaging. Our shared data are a cornerstone of modern tool development to map synaptic connectivity and function throughout the brain (e. g. Harris et al., 2015).



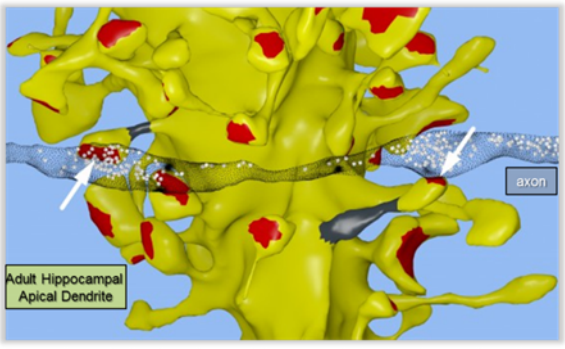
Full volume reconstructions. Harris et al., 2015

Here, I provide a few examples of results from our work on synaptic potency and plasticity.

Understanding the structural basis of synaptic potency

Synaptic potency has been predicted from the size of the synapse. We found that synapse size is perfectly correlated with the number of neurotransmitter vesicles in the presynaptic axon (Harris and Stevens 1988, 89; Lisman and Harris, 1993). However, synaptic potency can also be influenced by the availability of other presynaptic resources, such as mitochondria (Shepherd and Harris, 1998; Smith et al., 2016). Mitochondria support synaptic transmission through the production of ATP, sequestration of calcium, and synthesis of glutamate, among other vital functions. Surprisingly, we found that less than 50% of hippocampal CA1 presynaptic boutons contain mitochondria. We found that boutons with mitochondria have more synaptic vesicles and larger postsynaptic partners suggesting they are more potent than those without presynaptic mitochondria.

Upon reconstruction of every synapse, dendrite, axon, and glial process in representative samples of adult hippocampus, we learned that only twenty percent of axon-dendrite contact points make synapses (Mishchenko et al., 2010). Thus, contact alone was not sufficient to trigger the formation of synapses or their stabilization. These reconstructions also provided a natural experiment to test what constitutes structurally significant differences in the potency among synapses (Sorra and Harris, 1993; Harris, 1995; Bartol, Bromer et al., 2015; Bromer et al., 2018). We found that pairs of spines receiving input from the same axon have nearly identical synapse sizes, spine head volumes, and presynaptic vesicle numbers. These parameters were uncorrelated in non-coupled spines receiving input from different axons. Assuming a pair of dendritic spines coupled to the same presynaptic axon had a more similar activation history



Pre-post coupled spines (arrows) have equal structural synaptic potency. Bartol et al. 2015

than un-coupled spines, we found, using signal detection theory, that 26 unique synaptic potencies occur in the overall distribution of excitatory synapses. This means that hippocampal synapses could store extensive amounts of information (~4.7 bits), far more than previously estimated.

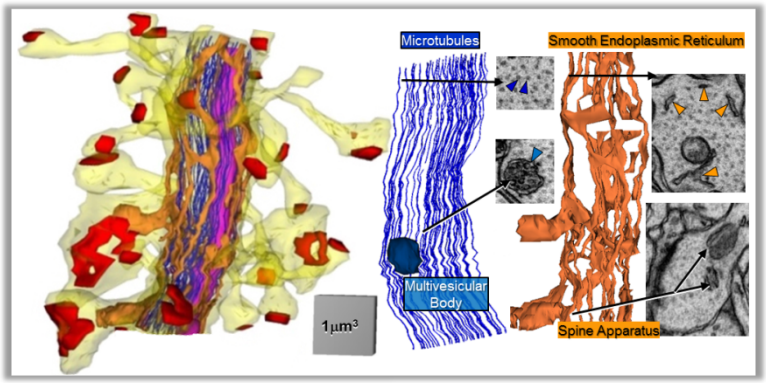
Glia were once thought to provide the 'glue' that held the nervous system together. We have shown that they are present at the borders of a subset of synapses and those synapses are larger than their neighbors without adjacent glial processes (Ventura and Harris, 1999; Witcher et al., 2007; Witcher et al., 2010). Thus, glial processes provide dynamic third partners that also regulate synaptic potency.

In these and other studies we discovered fundamental principles governing synapses along mature dendrites. Mature dendrites can either support many small dendritic spine synapses or a few large spine synapses (Bourne and Harris, 2011, 2012; Bell et al., 2014). In fact, the total synaptic area per unit length of dendrite is the same for each of these configurations. Competition for basic resources could explain this constancy principle for combined synaptic potency. It raises the question of what constitutes the minimal functional unit in the brain.

Dendritic spine clusters as functional units

In the past, it was widely assumed that a single dendritic spine or synapse is the minimal functional or computational unit in the brain. Our work suggests that clusters of dendritic spines are the more likely unit as they share or compete for resources in the dendrite. Microtubules form tracks that deliver molecules and membrane bound organelles throughout neuronal dendrites. We have shown that spine density is proportional to microtubule number, and both decrease when dendrites branch and taper with distance from the neuronal cell body; hence, an important component of our experimental studies is to restrict analyses to dendrites of comparable caliber (Fiala et al., 2003; Bourne and Harris, 2011; Harris et al., 2021).

Smooth endoplasmic reticulum (SER) is the largest membrane-bound organelle in cells. SER serves multiple functions including the regulation of intracellular calcium, lipid membrane synthesis, and trafficking of various proteins. Our initial 3DEM work demonstrated that the number of dendritic spines in a local cluster is much greater where the shaft SER is abundant, than in neighboring regions of the same dendrite with low SER (Spacek and Harris, 1997). These findings motivated an extensive collaboration with Dr. Michael Ehler's laboratory (Cui-Wang et al., 2012). We showed that when SER is bound to microtubules, the SER forms elongated tubules. We found that when the SER-to-microtubule binding protein (CLIMP63) becomes phosphorylated, the SER is released, and it assumes a more branched and complex morphology. Where the SER complexity is high, resources such as glutamate receptors traveling on the SER accumulate locally and, thus, can support greater spine density. Our studies show further that SER is dynamic in response to synaptic activation and ultimately to long-term potentiation (Chirillo et al., 2015, 2018).



Subcellular components of dendrites. Harris et al. 2015

The sorting endosome of the dendrite may also regulate spine clustering. We discovered that it occurs just once per ten microns along dendrites and rarely inside dendritic spines; although the products of sorting endosomes–recycling vesicles–were common throughout spines and dendrites (Cooney et al., 2002). Sorting endosomes are responsible for determining which proteins and lipids should be recycled and which should be destroyed via multivesicular bodies targeting the lysosomal system. We showed that each sorting endosome serves ~10-20 dendritic spines and could provide

local resources that determine which spines are eliminated and which are preserved or enlarged during growth and activation (Park et al., 2006; Kulik et al., 2019).

Other essential ultrastructural components that we have studied participate in the initiation, maintenance, and growth of synapses but only occur in about 10-15 percent of dendritic spines even during development (Harris et al., 1992; Spacek and Harris, 1997; Fiala et al., 1998). For example, both polyribosomes, which provide local protein synthesis, and the spine apparatus, which contains complex laminated SER and Golgi-related molecules serving post-translational modification of proteins, occur in about 10-15 percent of spines. Furthermore, it is extremely rare that one spine contains all the subcellular components at once (Cooney et al., 2002). These nonuniformly distributed core subcellular structures could provide a basis for local dendritic spine clustering.

Studies of plasticity as mechanisms of learning and memory

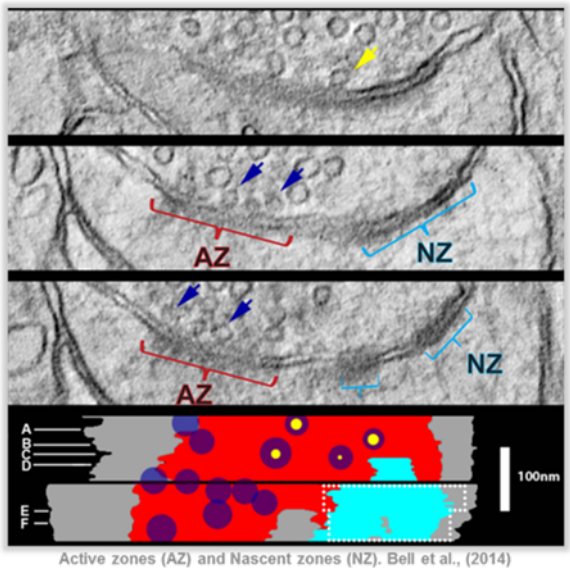
Next, we consider examples from our work on how synaptic potency and the regulation of spine clustering could control synaptic plasticity.

We have used long term potentiation (LTP) as a model system to understand the mechanisms of synaptic plasticity in the hippocampus, a central brain region necessary for learning and memory. LTP is a form of synaptic plasticity that involves an increase in synaptic potency resulting from specific patterns of activation. We have shown that the potentiated response can last for minutes, hours, days or longer, depending on the age, strain, and species of the animal, and the exact induction paradigm (Harris and Teyler, 1983, 1984, Teyler et al., 1989; Jackson et al., 1993; Cao and Harris, 2012; Bowden et al., 2012; Ostrovskaya et al., 2019). A favored hypothesis is that dendritic spines are necessary to compartmentalize key subcellular components and molecules that foster changes in strength at specific synapses. In support of this hypothesis, we discovered that immature hippocampal neurons are not able to maintain potentiation lasting more than an hour until after dendritic spines develop (postnatal day 12 in rats, Fiala et al., 2001; Kirov et al., 2004; Cao and Harris, 2012). Furthermore, recent molecular modeling from our 3DEM reveals fast calcium transients in dendritic spines that are missed by calcium indicator dyes that buffer calcium during live imaging (Bartol, Keller et al., 2015).

Brain slices are popular model systems to study LTP and other forms of plasticity because they provide access and control over synapse function in a relatively intact circuitry. We developed and systematically improved the reliability of brain ultrastructure in these slices for 3DEM analyses (Jensen and Harris, 1989; Fiala et al., 2003). In the process, we discovered that adult hippocampal dendrites respond to cold conditions by rapid elimination of dendritic spines followed by excessive spinogenesis within a few minutes of rewarming, a process that was exacerbated if synaptic transmission was blocked during recovery (Kirov and Harris, 1999; Kirov et al., 2004).

Our recent findings show intriguing possibilities for identifying circuits involved in learning and for understanding mechanisms of memory. We have shown that initially saturated LTP can be subsequently augmented if more than ninety minutes elapse between episodes of LTP-inducing stimulation (Cao and Harris, 2014). Furthermore, once 4 hours have elapsed, the augmentation becomes nearly 100% reliable. Interestingly, the exact time course is age, strain, and species specific. These findings support the hypothesis that spaced episodes of LTP engage neuronal mechanisms that could mediate the well-known advantage of spaced over massed learning.

Using 3DEM, we have discovered several changes in synapse structure that manifest over time after the initial saturation of LTP. Comparisons have been made between postnatal day 15, a pre-weaning age during peak synaptogenesis (Watson et al., 2016), and adult rats 55-70 days old after intrinsic synaptogenesis has plateaued (Bourne and Harris, 2011, Bell et al., 2014). We demonstrated LTP-related increases in synapse number at P15, whereas in the adults, synapses enlarged at the expense of spinogenesis.



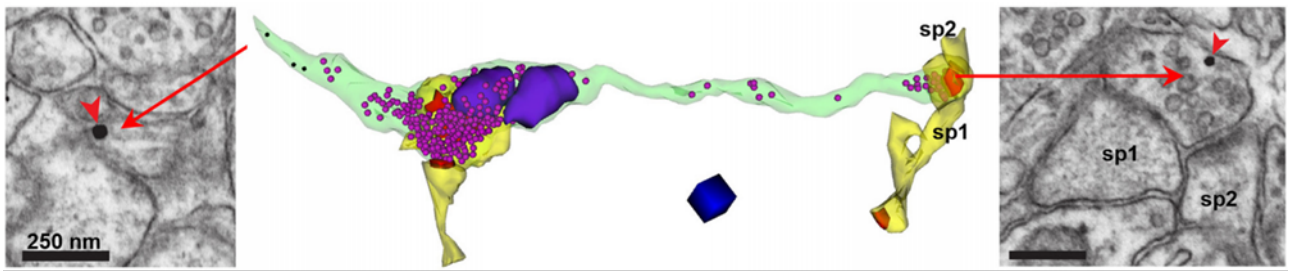
Active zones (AZ) and Nascent zones (NZ). Bell et al., (2014)

Importantly, we found that in adults, many synapses have nascent zones, which are dynamic regions that have a postsynaptic density but lack the presynaptic vesicles normally found at active zones (Bell et al., 2014). Shortly after the induction of LTP, presynaptic varicosities recruit small dense core vesicles (Sorra et al., 2006), and then the nascent zones acquire presynaptic vesicles, thereby converting them to active zones. By 2 hours after the initial saturation of LTP, nascent zones return, making them available for subsequent plasticity in the form of augmented LTP (Cao and Harris, 2014). These results show dynamic interchange of active and nascent regions within the synapse that contribute to rapid changes in synaptic potency.

Mitochondria support synaptic transmission through production of ATP, sequestration of calcium, synthesis of glutamate, and other vital functions. As indicated above, less than 50% of hippocampal CA1 presynaptic boutons contain mitochondria; hence, we wondered whether synapses without mitochondria can sustain changes in efficacy (Smith et al., 2016). To address this question, we analyzed synapses from postnatal day 15 (P15) and adult rat hippocampus that had undergone theta-burst stimulation to produce long-term potentiation (TBS-LTP) and compared them to control or no stimulation. At 30 and 120 minutes after TBS-LTP, vesicles were decreased only in presynaptic boutons that contained mitochondria at P15, and vesicle decrement was greatest in adult boutons containing mitochondria. Presynaptic mitochondrial cristae were widened, suggesting a sustained energy demand. Thus, mitochondrial proximity reflected enhanced vesicle mobilization well after potentiation reached asymptote, in parallel with the apparently silent addition of new dendritic spines at P15 or the silent enlargement of synapses via the addition of nascent zones in adults. Recent work demonstrates that the sustained vesicle loss reflects the use of a subpopulation of vesicles in the growth of the surround presynaptic bouton, which parallels synapse enlargement in adult hippocampus (Kirk et al., 2018 Soc. For Neuroscience Abstract).

Our recent work addresses the impact of large spines on their neighbors. Do the larger spines out compete or collaborate with their smaller neighbors to garner resources for synapse growth and clustering along dendrites? Our findings suggest that small dendritic spines cluster around neighboring spines containing a spine apparatus. We hypothesize that the enhanced complexity of SER in the spine apparatus could trap resources in the vicinity of those spines and their immediate neighbors (Cui-Wang et al., 2012; Chirillo et al., 2015, 2018). Polyribosomes are elevated soon after the induction of LTP using a theta-burst pattern (Ostroff et al., 2002; Bourne and Harris, 2011). In the developing hippocampus at P15, the polyribosomes distribute to new spines following LTP. In contrast, polyribosome abundance declines with time, as the spine apparatus grows (Chirillo et al., 2015, 2019). These findings suggest that growth of the spine apparatus might enhance post-translational modification of the locally synthesized proteins in adult synapses, whereas in the absence of a spine apparatus in the P15 hippocampus, the polyribosomes are engaged in building new spines (Ostroff et al., 2018).

Since the beginning, I have longed for a means to identify activated synapses at the ultrastructural level. In the past, we have interpreted outcomes by comparing populations of synapses with different activation histories, but the question always remained regarding exactly which synapses had been activated. For the LTP studies, the samples were near large concentric bipolar electrodes, so it is reasonable to assume that most of the synapses were activated differentially by the control and experimental stimulation paradigms. We have recently developed a new approach that should allow us to extend these findings along identified axons. We developed a recombinant adeno associated virus construct that expresses channelrhodopsin2 and mAPEX2 (Kuwajima et al., 2020). We proved that high frequency optical activation specific to the labeled axons produces late-phase LTP. In slices fixed with our standard protocol, tyramide signal amplification catalyzed by mAPEX2 deposited Alexa Fluor dye in the targeted axons. The dye-containing axons were identified after embedding by immunogold labeling in a subset of thin sections in 3DEM series. In tSEM images of an axon containing immunogold labeling, we could easily identify the stimulated axons and their subcellular contents, including synaptic vesicles, mitochondria, and synapses associated with postsynaptic dendritic spines. With this approach, we can discover whether the patterns of synaptic plasticity revealed through differential population analyses are specific to the activated spines.



Labeling light-activated axons for 3DEM (Kuwajima et al., 2020).

We continue to work with our collaborators to explore the precision and variance of synaptic weights across brain regions, species, and ultimately in humans to understand the impact of brain disease on information storage capacity (Samavat et al., 2019, 2022, 2024, Fang et al., 2021, Litvina et al., 2019). We are deepening our understanding of the structural components of synaptic plasticity (Jung et al., 2021); developmental synaptogenesis and its role in LTP (Harris, 2020; Ostrovskaya et al., 2020); and expanding our understanding to aging synapses (Kirk et al., 2018, 2019). We have come to understand that dendritic spines can be dually innervated by excitatory and inhibitory syanpses, and through this relationship we have precise control over activation and plasticity (Kleinjan et al., 2023). We have begun to expand our knowledge to the marmoset brain through an ongoing collaborations (Glavis-Bloom et al., 2023). Most recently, I have been honored to participate in the 50th anniversary of LTP and to have our new model accepted after review by the founders of the field (Harris et al., 2024). Please join us as we share the ongoing odyssey (Harris, 2020) at SynapseWeb and 3DEM.org.

Mentoring Statement:

I am a woman scientist and professor with tenure about to turn 70. I have often been the only woman in the room during my career. Diversity, equity, and inclusion mean to me that representation on a committee, in the classroom, at conferences, in positions of power, and funding opportunities will reflect the population of women and under-represented minorities that are in the population of scientists in my field – synaptic neuroscience. Ultimately, this representation will reflect the population in general who seek to work in our field. In the 40 years since I began, my specific field has become almost 50% women, certainly at the graduate and

early professional levels. However, I remain among a much smaller fraction represented at the higher levels, and this must change.

How do I prioritize and value mentoring in my teaching?

I teach an upper division course in synapses that is a lab course that meets once a week for 4 hours. It also has an intensive writing flag. Over the years I have developed several mechanisms to encourage acceptance and inclusion in my learning environment. On the first day of class, I ask students to spend 15-20 minutes interviewing another classmate that they do not already know well. I give them a set of questions they can ask. Then, they go to the front of the classroom to introduce each other in these pairs. This strategy makes it much easier for everyone to engage, than if, for example, they had to stand up and talk about themselves. Throughout the semester, students are expected to give impromptu presentations, to work in pairs or groups in the lab, to help one another first before asking for help from my TAs or me. They prepare literature summaries together and I mix them up repeatedly to allow them to know more than just their neighbors. I have found that their shared experience means that they write better papers, produce higher quality answers on their quizzes and hold one another accountable for excellence no matter what their backgrounds. While this strategy is not explicitly designed to prioritize diversity, it certainly results in a diverse, equitable and inclusive learning environment.

How have you shown commitment to inclusive mentoring beyond your classroom?

I recently received the Mika Salpeter Lifetime Achievement award from the Society for Neuroscience with a membership of more than 40,000 scientists. This award goes to scholars in neuroscience who have advanced the careers of women and URMs in neuroscience. I have mentored more than 85 students, postdocs, and junior scientists; many have been women and URMs and gone on to careers in academia, medicine, and industry. I was also responsible for writing and creating the diversity statement for the SFN when I served on council. This statement produced an expectation that the conference chairs, speakers, and participants were drawn from diverse backgrounds, genders, levels of professional development, and geographical locales. Anyone proposing a symposium or conference to be hosted at the SfN meeting now must articulate exactly how the participants were chosen, and to demonstrate diversity. If not, the program committee sends back the proposal to gain diversity. The years following implementation of that program saw a huge increase from less than 10% to about 50% of all symposia chairs and participants including women and UMNs and people at different levels of their careers. When on the SfN council, I was also instrumental in creating the Professional Development Committee – targeting women and URMs and people at all levels. In addition, I also helped to invigorate a formal nominating committee, and the next four presidents of SfN were all women. This diversity has had a hugely positive impact on the meeting.

More recent experiences include:

1) Post COVID, reopening my laboratory to the Nudelman Women in Neuroscience summer scholars dedicated to women, in particular women of color, to experience mentored research.
2) I have attended all of Leonard Moore's lectures on Black History (and earned a DEI badge for it). This series brought to my attention areas of white privilege that have been explicitly closed to people of color and widened the inequity gap. For example, I was completely unaware of the rules against banks providing low or no interest loans to returning black WWII veterans that were used to purchase homes that ultimately built substantially more inter-generational wealth for white families. This and the many other inequities help to explain why hard work alone is not sufficient to get ahead in the current USA environment. My husband and I make substantial contributions to organizations that seek to improve this situation and to help figure out appropriate reparations.

3) When asked to serve important leadership roles, I routinely suggest my junior colleagues. Recently, for example, I was asked to co-chair a major meeting for the NSF NeuroNex. Instead, I suggested a former female graduate student who is now an assistant professor. She did a terrific job. As part of that workshop, she created several DEI sessions based on the 2015 NRC report to encourage new ways to achieve diversity, equity, and inclusiveness in team science.
4) My Postdocs help to create a diverse lab as well, hiring or seeking undergraduate research volunteers to help with their research – two of whom are UMNs and have stayed on in the lab.
5) In summer 2021, we hosted 4 iSTEM URM high school students. Four senior members of my staff co-mentored the students, providing journal clubs and one-on-one training.

How do I envision my commitment to mentoring will develop in the future?

I have co-chaired a series of 5 workshops for a joint venture by the NIH and DOE to support the Brain Initiative with the hopes of using National Labs that are supported by the DOE to facilitate this work. The purpose of these workshops is to figure out how best to leverage NIH and DOE resources to obtain a complete map of a mammalian brain at the nanometer scale of synapses. I and my co-chair chose 10 co-leads (2 for each of the 5 workshops). Each workshop had 1 woman and 1 man and/or under-represented minority as co-leads. The co-leads of each session met with us and helped us to choose 10-15 speakers to obtain diverse representation across the spectrum of gender, ethnicity, backgrounds, skills, knowledge, level in career etc. Ultimately a white paper and final 'town hall' will be held to advise NIH-DOE on how to proceed. This diverse representation has helped to ensure that the whole neuroscience community of all backgrounds can provide important input on how to proceed on this 5–10-year endeavor that will have a huge impact on knowledge about the brain. As I am asked often to participate in such organizational efforts, I plan to continue similar strategies of inclusiveness to make use of the broad range of talent in our field.

Locally, I have hosted members of the University Leadership Network in my lab, and plan to continue to host talented students of diverse ethnicities in the lab from this group and others aiming to increase the number of under-represented minorities throughout academia. Once COVID is over, I plan to work with another UT faculty member who is himself URM, to improve the environment for promotion and hiring of URM faculty into higher ranks. I also have served and plan to continue service on search committees in our department explicitly to improve mentoring and hiring of a diverse faculty.

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Salk Adjunct Service/Contributions Form

Name: Kristen M. Harris **Appointment Start Date:**
Sponsors: John Reynolds, Terry Sejno

To be eligible for appointment and reappointment in the Adjunct series, appointees are expected to be engaged in **at least two** Institute-related activities outlined below. If you are being considered for your first Adjunct Professor appointment, provide information about your plans to engage in the Salk community and select any of the activities you would be interested in below. If you are being considered for reappointment, select your ongoing activities and give a brief summary of your engagement in each activity during the past appointment period. Also provide a summary of your plans to engage in the Salk activities during the next appointment period.

Salk Activities (list the course/seminar titles, committees, and student names if known)
** Please note research collaborations with a Salk Faculty sponsor(s) do not qualify as Institute-related activities expected for an Adjunct position*

- ☒ Giving Seminars, such as those hosted by Sponsors or by the Institute
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- ☐ Participating in Salk's outreach and educational efforts to recruit underrepresented minority student applicants
- ☒ Consulting on Salk scientific initiatives or multi-PI grants
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- ☒ Promoting award and nomination opportunities for Salk Faculty
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- ☐ Other

Salk Service Summary & Plans: Describe your plans to engage in the activities marked above during the next appointment period (i.e.: Salk Course or Seminar Titles, names of Student or Faculty review committee, description of contributions to grants, etc. if unable to fit above). If you are being considered for reappointment, also describe your engagement in the Salk activities during the last appointment period. You may attach a supplemental letter with these activities as needed.

Past Service that I have performed as a Salk Adjunct professor:
1) Co-PI on grants with Terry Sejnowski, Uri Manor, and John Reynolds involving way more than collaborations, but many in person visits and discussions.
2) Gave formal seminar(s) during my 1-6 week visits at the Salk, where I led and participated in regular lab meetings, advised students (Mohammad Samavat) and Postdoctoral or Research Fellows (Guadalupe Garcia and Courtney Glavis-Bloom).
I will continue to give workshops and seminars at the Salk during my visits, and remotely through our NeuroNex project from NSF.

I plan to continue mentoring Guadalupe during her postdoctoral years and Mohammad as he searches for positions and finishes writing his papers.

I also mentor Vijay Venu Thiyagarajan who is co-mentored by Uri Manor at the UCSD now.
I serve on Sammy Weiser Novak's PhD thesis committee.
I will visit Salk for at least 10 days / year to participate in lab meetings and consider joint projects and teach faculty members our protocols.
I will be available by request for reviewing faculty, and promoting award and nomination opportunities for Salk faculty.