THE EVELYN F. McKNIGHT BRAIN® INSTITUTE
UNIVERSITY OF ALABAMA AT BIRMINGHAM
Preserving memory, enhancing life

Annual Report

2017

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THE EVELYN F. McKNIGHT BRAIN INSTITUTE®
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Report Period: 2017
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The University of Alabama at Birmingham

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ANNUAL REPORT
2017

McKnight Brain Research Foundation Report
The Evelyn F. McKnight Brain Institute
The University of Alabama at Birmingham

INSTITUTE DIRECTOR'S OVERALL REPORT

The University of Alabama at Birmingham (UAB) McKnight Brain Institute (MBI) began a significant transition in 2017. In a strategic effort to come into greater alignment with principles regarding clinical application as stated in the agreement with the McKnight Brain Research Foundation and UAB, a national search culminated on June 1, 2017, with the appointment of Ronald M. Lazar, PhD, as the new Director of the UAB McKnight Brain Institute and the holder of Evelyn F. McKnight Endowed Chair in Learning and Memory in Aging. He came to UAB from the Department of Neurology at the Columbia University Medical Center in New York with more than 20 years of experience and 19 past and present NIH grants as a clinical neuroscientist, focused on cognitive resilience and recovery in aging.

Within UAB, Dr. Lazar's vision is to build upon the already-existing strengths in basic and translational neuroscience by establishing new relationships with clinical departments, working toward the establishment of a vertically-integrated enterprise encompassing molecular science to clinical trials. To facilitate this larger focus, the UAB-MBI was moved to the Department of Neurology in the School of Medicine. Over June-August, Dr. Lazar met with each UAB McKnight faculty member to gain insights into past practices and future goals. The UAB McKnight faculty was expanded by 50%, mainly by outreach to clinical departments, such as geriatric medicine, exercise medicine, cardiovascular medicine, pulmonology, clinical psychiatry, nuclear medicine, among others. Moreover, he added a biostatistician to bolster the ability to generate federal grant applications to meet new requirements for robust and reproducible data. In addition, he initiated a pilot grant program in which basic and applied scientists will collaborate to execute small, innovative studies whose preliminary data would lead to federal applications. To help foster McKnight MBI inter-institutional relationships, Dr. Lazar had important conversations over the summer period with each member of the leadership at the Univ of Arizona, the Univ of Florida and the Univ of Miami. Discussions included plans for the 10th Annual Inter-Institutional Meeting to be held in Birmingham in April 2018, including a more focused "pre-meeting" with topics reflecting to some extent the recent position papers by the National Academies and the American Heart Association/American Stroke Association. In addition, inter-institutional collaborations to be pursued between UAB and the other Institutes involve age-related neuroinflammation, the role of exercise in mitigating the effects of aging, and age-related changes in cerebral blood flow.

The scientific productivity of UAB faculty continued to flourish, with more than 200 peer-reviewed publications in high-impact journals, many of which are listed below. Among the highlights, Dr. Herskowitz and his lab showed in post-mortem analysis that despite the presence of Alzheimer's disease (AD) pathology, those who were cognitively intact had dendritic spine density no different than controls, but those with AD pathology and dementia had significantly reduced spine density. These findings provide new support for a mechanism underlying cognitive resilience. Dr. Lazar and his colleagues at Columbia reported that alterations in cerebral blood flow in otherwise asymptomatic individuals with carotid artery disease was associated with cortical thinning in the vascular territory supplied by the affected vessel. His recently funded NIH grant will determine whether carotid revascularization will improve cognition among those with baseline cognitive decline. Drs. Gerstenecker, Triebel and Martin studied financial capacity among older adults who represented the cognitive spectrum from normal cognitive aging to mild cognitive

impairment. They were able to extract four skill-based factors, which can serve as clinical metrics for potential financial changes during aging and targets for intervention. Dr. Austad and colleagues published on the development of a specific pathogen free marmoset colony, which will present a unique opportunity to examine aging in one of the smallest and shortest-lived primates. Dr. Visscher and her human visual group showed that increased use of peripheral vision is associated with functional connectivity in brain imaging between peripheral primary visual cortex and functionally specialized areas of visual processing, with potential clinical application among those with age-related vision changes. Dr. Visscher's group has also enrolled 17 participants in the MBAR registry.

Additional Highlights:

- Dr. Erik Roberson continues in his role as Co-Director of the UAB MBI. Dr. Roberson is the Patsy W. and Charles A. Collat Endowed Professor of Neuroscience, Director of the Alzheimer's Disease Center and Co-Director, Center for Neurodegeneration and Experimental Therapeutics.

  The Roberson lab studies the neurobiology of age-related cognitive changes, especially Alzheimer's disease and frontotemporal dementia (FTD), using mouse models to understand the cellular and molecular mechanisms of these disorders and identify new therapeutic strategies. Dr. Roberson is active in clinical research, patient care, leading clinical trials, and caring for patients with memory disorders and dementia. As a physician-scientist working at the interface between basic science animal model studies and human clinical research, Dr. Roberson helps focus the translational research of the MBI.

- The *Annals of Neurology* published Dr. Jeremy Herskowitz's work, "Dendritic spines provide cognitive resilience against Alzheimer's disease." Neuroimaging and other biomarker assays suggest that the pathological processes of Alzheimer's disease (AD) begin years prior to clinical dementia onset. Observations provide cellular evidence to support the hypothesis that dendritic spine plasticity is a mechanism of cognitive resilience that protects older individuals with AD pathology from developing dementia. Appendix G.

- An American Heart Association panel, including two experts from UAB, says the same healthy habits that can help ward off heart disease or stroke can also help prevent cognitive decline. Drs. Ronald Lazar and Virginia Howard believe a healthy lifestyle benefits the brain as much as the rest of the body. Appendix A.

- Addressing UAB's strengths in both research and clinical medicine, UAB Magazine published "Missing Memories: Healing patients and caregivers in the present; investigating prevention strategies for the future." Building new relationships between basic scientists and clinical scientists to study age-related memory decline and cognitive decline is a top priority. Appendix B.

- Linda Overstreet-Wadiche, PhD, and Jacques Wadiche, PhD, are working on neural networking and are learning how synapses change when new neurons are formed. The goal is to understand how the flow of electrical signals through brain circuits gives rise to perception, action, thought, learning and memories. Appendix C

- The first McKnight Scientific Dialogues symposium was held on December 7, 2017, with eight McKnight Brain faculty members representing four collaborations between basic and clinical neurosocience. Terrific feedback has been received, not only about the content, but also about the

nature of and excitement generated by the synergism between bench and clinical investigators. Research and clinical collaborations hold one of the keys to the future of the UAB McKnight Brain Institute. Appendix D

- Vladimir Parpura, MD, PhD, has been honored with his election as a 2017 Fellow of the American Association for the Advancement of Science. Recipients are selected to honor their scientifically or socially distsinguished efforts to advance science or it applications. Parpura's election notes his "distinguished contributions to the field of neuroscience, particularly for discovery of gliotransmission."

- Collaborations between the McKnight Brain Institutes at UAB, The University of Florida and The University of Arizona have resulted in a publication in the December 2017 edition in *Frontiers in Aging Neuroscience.* Drs. Lara Ianov and Jeremy Day, et al., published "Hippocampal Transcriptomic Profiles: Subfield Vulnerability to Age and Cognitive Impairment." https://www.frontiersin.org/articles/10.3389/fnagi.2017.00383/full

- The McKnight Brain Aging Registry (MBAR) study is well underway. Recruitment and the data acquisition are in progress. The tremendous investment in organization across sites to harmonize data acquisition of neuropsychological data, computerized behavioral data of several types, tissue of several types from blood draws, and seven different kinds of MRI data have uniquely been able to harmonize data from four different sites, which have undergone quality control and are similar enough to be compared across sites. The protocol involves two visits at which behavioral testing (neuropsychological testing and other behavioral tests including the NIH toolbox) is performed. During one of these visits, blood is acquired from the participants. On the third visit, the participants undergo an extensive MRI battery. The study has created an interdisciplinary infrastructure, including organizing neurologists to be available on time for participants, blood draws, recruiting potential participants, running MRI scans, and quality checking all the data. This machinery, which took great care to build, is running smoothly and recruiting at UAB is robust. We have 17 participants who have fully completed the extensive battery. To facilitate enrollment, along with other standard recruitment methods, we regularly visit local senior centers and have a second large-scale postcard recruitment campaign scheduled after the holidays. The four sites continue to have weekly telephone calls during which we discuss ongoing quality assurance issues to ensure compatibility across sites. The first outcome analyses looking at aggregate data across sites is scheduled for early 2018.

  The MBAR study will provide tremendous opportunities for learning more about cognitive aging, and UAB MBI investigators have already begun planning ways to leverage the study. Dr. Erik Roberson is exploring partnerships with the UAB Alzheimer's Disease Center program that would allow for longitudinal follow-up of MBAR participants, as well as neuropathological examination of their brains at death. The four sites are planning an across-site NIH grant submission for 2018. We're excited to be a part of understanding the healthy aging brain.

- The Civitan International Neuroimaging Laboratory (CINL), located on the first floor of UAB Highlands Hospital, houses a Siemens Prisma 3T whole body scanner for structural and functional, brain and body imaging. It is operated as a University core facility, and is of great value to McKnight investigators. It provides a state-of-the-art imaging facility to study human brain function and its relationship to memory and aging.

- The CIRC Neurodevelopmental Bioinformatics Initiative has established the dedicated expertise

and infrastructure necessary for the application of genomic/epigenomic techniques to studies related to neurodevelopmental disorders, cognitive impairment and aging. This support is now available for the MBI faculty, postdocs and students.

1. Summary of Scientific Achievements since Last Report

Individual McKnight Investigators' scientific accomplishments are noted in a separate section. The next few paragraphs highlight a few of the principal discoveries from the Institute this year.

- One of the highlights includes Dr. Jeremy Herskowitz's work which was published in the *Annals of Neurology*, "Dendritic spines provide cognitive resilience against Alzheimer's disease," which suggests that the pathological processes of Alzheimer's disease (AD) begin years prior to clinical dementia onset. Observations provide cellular evidence to support the hypothesis that dendritic spine plasticity is a mechanism of cognitive resilience that protects older individuals with AD pathology from developing dementia. Appendix G.

- Dr. Lazar and his former colleagues at Columbia showed that a reduction in cerebral blood flow in either the left or right internal carotid artery is associated with cortical thinning in the brain region supplied by that vessel, even in the absence of frank stroke. In this publication in PLoSOne, carotid thickness was measured with an innovative method using arterial spin labeling, and cerebral hemodynamics was assessed with transcranial Doppler ultrasonography. The implications for cognition will take place at the end of patient follow-up in 2018.

- Dr. Visscher's lab observed plasticity in participants who have age-related macular degeneration that is different from plasticity in participants with juvenile forms of the disease. They see robust increases in cortical thickness associated with increased use of peripheral vision in AMD subjects – but not JMD subjects. Both groups have similar visual experience and behaviors, suggesting that each group adopts different mechanisms for plasticity. These findings provide intriguing evidence that different forms of plasticity are available to younger vs. older adults, but more work is needed.

2. Publications in Peer Reviewed Journals

The publication rate from the UAB McKnight Brain Institute was very successful with investigators publishing a total of 203 research papers, reviews, and commentaries in peer-reviewed journals during 2017.

3. Publications (Other)

Successful research was documented in two books and four book chapters.

4. Presentations at Scientific Meetings (Also Includes Invited Research Seminars)

Investigators presented their research at various institutions and also at national meetings. Over 78 presentations were given by key faculty representing the UAB McKnight Brain Institute.

New Scientific Dialogues program was a huge success with various speakers sharing their research with others. Appendix D

Seminar series continues with presentations by various speakers. Appendix E

5. Presentations at Public (Non-Scientific) Meetings or Events

Community service continues with McKnight key representatives speaking at over 27 meetings.

6. Awards and Honors

- Neurobiologist Vladimir Parpura, MD, PhD, selected as a 2017 Fellow of the American Association for the Advancement of Science
- Gwendalyn King, PhD, awarded the Graduate Biomedical Sciences Outstanding Service Award
- Dr. Vladimir Parpura, selected as the 2017 McNulty Civitan Scientist
- Dr. Virginia Bradley, UAB Department of Medicine Research Excellence Award
- Dr. Cristin Gavin, Honors College Faculty Fellow
- Dr. David Knight, UAB Dean's Award for Excellence in Mentorship
- Dr. Kristina Visscher, Graduate School Dean's Award for Excellence in Mentorship
- Dr. Kristina Visscher, Kavli, National Academy of Sciences Frontiers in Science Fellow
- Dr. Linda Wadiche, appointed to Neurodevelopment Faculty of 1000

7. Faculty

For faculty bios, see Appendix F.

8. Trainees

A. Post-doctoral, residents,

9

B. Pre-doctoral students –

21

C. Other students -

11

9. Clinical/Translational Programs

A. New Programs

Dr. Virginia Bradley is working with the UAB Alzheimer's Disease Center in the Outreach and Recruitment Core, which develops partnership with community and patient populations for engagement in the aims and research of the Alzheimer's Disease Center.

Additional new programs are noted in the Chair Report below.

B. Update on Existing Clinical Studies

Dr. Bradley continues her work with the Center for Translational Research on Aging and Mobility, as well as her collaboration with CARDIA, which is a multisite study in which cognitive testing and brain MRIs were measured.

Additional clinical studies are noted in the Chair Report.

10. Technology transfer

A. Patent Applications

None.

B. Revenue Generated from Technology

Not applicable

11. Budget Update

A full financial report is included in the Finance Section.

12. Educational Programs Focusing on Age-Related Memory Loss

A. Scientific

- **"**New Scientific Dialogues" December 7, 2017– Appendix D
- Seminar Series – Appendix E

B. Public

Throughout the year, faculty members represented the McKnight Brain Institute by participating in speaking engagements to various civic groups at NeuroScience Café events and Civitan Club meetings.

13. Collaborative Programs with other McKnight Institutes, Institutions and Research Programs

In addition to the Collaborative Programs mentioned in the Chair Report below, Drs. Virginia Bradley and Kristina Visscher continue their work with the McKnight Brain Aging Resistry. Dr. Jeremy Day is working with the University of Arizona and the University of Florida.

14. Collaborative Programs with Non McKnight Institutes, Institutions and Research Programs

Investigators have identified inter and intra institutional collaborations locally, nationally, and internally. Additional programs are noted in the Chair Report Below.

15. Briefly describe plans for future research and/or clinical initiatives.

(See Chair Report Below)

16. If applicable, please provide endowment investments results for the report period.

See Finance report.

17. Were any funds used for a Prohibited Purpose during the report period?

No

18. Do you recommend any modification to the Purpose or mandates in the Gift Agreement?

No

19. Did all activities during the report period further the Purpose?

Yes

20. Please describe any negative events (loss of personnel, space, budget, etc.) that occurred during the report period and the possible impact on carrying out the Gift Agreement.

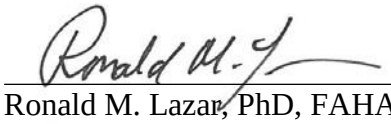
No negative events to report.

21. Please provide any general comments or thoughts not covered elsewhere – a response is not required. Please respond only if you would like to add something not covered elsewhere.

22. What do you consider your most important scientific achievement this year?

Dr. Jeremy Herskowitz's research which was published in the *Annals of Neurology,* "Dendritic spines provide cognitive resilience against Alzheimer's disease" is outstanding. Neuroimaging and other biomarker assays suggest that the pathological processes of Alzheimer's disease (AD) begin years prior to clinical dementia onset. See Appendix G.

23. Signature, date, and title of person submitting report



Date: *1/11/2018*

Ronald M. Lazar, PhD, FAHA, FAAN
Professor
Evelyn F. McKnight Endowed Chair for Learning and Memory in Aging
Director, McKnight Brain Research Institute
Director, Division of Neuropsychology
Department of Neurology

Date: *1/11/2018*

Erik D. Roberson, MD, PhD
Associate Professor
Charles M. Collat Professor of Neurology
Co-Director, Evelyn F. McKnight Brain Institute
UAB School of Medicine

FINANCE

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INVESTMENT REPORT

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MCKNIGHT CHAIR'S REPORT

McKNIGHT CHAIR'S REPORT

1. Summary of scientific achievements since last report

Dr. Lazar and his former colleagues at Columbia showed that a reduction in cerebral blood flow in either the left or right internal carotid artery is associated with cortical thinning in the brain region supplied by that vessel, even in the absence of frank stroke. In this publication in PLoSOne, carotid thickness was measured with an innovative method using arterial spin labeling, and cerebral hemodynamics was assessed with transcranial Doppler ultrasonography. The implications for cognition will take place at the end of patient follow-up in 2018.

2. Publications in peer reviewed journals

Lazar Publications (2017 Peer-Review only)

1. Kapadia, S.R., Kodali,, S., Makkar, R., Mehran, R., **Lazar, R.M.,** Virmani, R., Anwaruddin, S., Thourani, V.H., Nazif, T. Mangner, Woitek, F., Krishnaswamy, A., Mick, S., McCabe, J.M., Lowell, L., Zajarias, A., Wilson, Y., Szeto, W.Y., Svensson, L., Alu, M.C. MS, White, Kraemer, C., Parhizgar, A., Leon, M.B., Linke, A. Embolic Protection During Transcatheter Aortic Valve Replacement, Journal of the American College of Cardiology. 2017 Jan 31;69(4):367-377, PMID: 27815101

2. Mokin, M., Zivadinov, R., Dwyer, M.G., **Lazar, R.M.**, Hopkins, L.N., Siddiqui, A.H. Transcatheter Aortic Valve Replacement – Perioperative Stroke and Beyond. Expert Review of Neurotherapeutics, 2017 Apr;17(4):327-334. PMID: 27786568

3. Cramer, S.C., Wolf, S.L., Adams Jr, H.P., Chen, D., Dromerick, A.W., Dunning, K., Ellerbe, C., Grande, A., Janis, S., Lansberg, M.G., **Lazar, R.M.**, PhD, Palesch, Y.Y., Pautler, M., Richards, L., Roth, E., Savitz, S.I., Wechsler, L.R., Wintermark, M., Broderick, J.P. Stroke Recovery & Rehabilitation Research: Issues, Opportunities, and NIH StrokeNet, Stroke. 2017 Mar;48(3):813-819. PMID:28174324

4. Lansky, A.J., Messé, S.R., Brickman, A.M., Dwyer, M., van der Worp, B., **Lazar, R.M.,** Pietras, C.G., Abrams, K.J., McFadden, E., Petersen, N.H., Browndyke, J., Prendergast, B., Ng, V.G., Cutlip, D.E., Kapadia, S., Krucoff, M.W., Linke, A., Moy, C.S., Schofer, J., van Es, G.A., Virmani, R., JPopma. J., Parides, M., Kodali, S., Bilello, M., Akar, J., Furie, K.L., Gress, D., Voros, S., Moses, J., Greer, D., Forrest, J.K. **,** Holmes, D., Kappetein, A.P., Mack, M., Baumbach, A.M.D. Standardized Neurologic Endpoints for Cardiovascular Clinical Trials: An Academic Research Consortium Initiative (NeuroARC), Eur Heart J. 2017 Feb 7. [Epub ahead of print] PMID: 28171522, and J Am Coll Cardiol. 2017 Feb 14;69(6):679-691.
PMID: 28183511

5. Yaghi, S., Herber, C., Boehme, A.K., Andrews, H., Willey, J.Z., Rostanski, S., Khan, M., Marshall, R.S., **Lazar, R.M.**, Boden-Albala, B. NIHSS score Components Predict Infarct Volume in Minor Ischemic Stroke. Journal of Neuroimaging. 2017, [Epub ahead of print] PMID: 28066971

6. Pavol, M.K., Stein, J., Kabir, F.M., Yip, J., Sorkin, L.Y., Marshall, R.S., **Lazar, R.M.** Understanding the connection between cognitive impairment and mobility; what can be gained by neuropsychology assessment? Rehabil Res Pract. 2017;2017. Epub 2017 Apr 27. PMID: 28536658.

7. Howard, V.J., Meschia, J.F., Lal, B.K., Turan, T.N., Roubin, G.S., Brown, R.D., Voeks, J.H., Barrett, K.M., Demaerschalk, B.M., Huston, J., **Lazar, R.M.,** Moore, W.S., Wadley, V.G., Chaturvedi, S., Moy, C.S., Chimowitz, M., Howard, G., Brott, T.G. Carotid revascularization and medical management for asymptomatic carotid stenosis: Protocol of the CREST-2 Clinical Trials, International Journal of Stroke. 2017;12(7):770- 778. [PMID: 28462683]

8. Cukierman-Yaffe, T., Gerstein, H.C., Miller, M.E., Launer, L.J., Williamson, J., Horowitz, K., Ismail-Beigi, F., **Lazar, R.M**. Cognitive function predicts incident CVD in people with diabetes: an analysis from the ACCORD-MIND study, J Clin Endocrinol Metab. 2017 Jun 1. doi: 10.1210/jc.2016-3480. [Epub ahead of print] PMID: 28575229.

9. Lazar, R.M., Boehme, A.K. Aphasia as a predictor of stroke outcome. Journal of the American College of Cardiology, Curr Neurol Neurosci Rep. 2017 Sep 19;17(11):83.
PMID: 28929424.
10. Gorelick PB, Furie KL, Iadecola C, Smith EE, Waddy SP, Lloyd-Jones DM, Bae HJ, Bauman MA, Dichgans M, Duncan PW, Girgus M, Howard VJ, **Lazar RM**, Seshadri S, Testai FD, van Gaal S, Yaffe K, Wasiak H, Zerna C; American Heart Association/American Stroke Association. Defining Optimal Brain Health in Adults: A Presidential Advisory From the American Heart Association/American Stroke Association. Stroke. 2017 Oct;48(10):e284-e303.
PMID: 28883125
11. Agarwal S, Presciutti A, Roth W, Matthews E, Rodriguez A, Roh DJ, Park S, Claassen J, **Lazar RM**. Crit Care Med. 2017 Nov 10. [Epub ahead of print] PMID: 29135522
12. Lazar, R.M., Pavol, M., Browndyke, J., Bormann, Dwyer, M.G., Kraemer, C., White, R., Zivadinov,R., Wertheimer, J.C., Thöne-Otto, A., Ravdin, L.D., Naugle,R., Mechanic-Hamilton, D., Garmoe.W.S., Stringer. A.Y., Bender, H.A., Kapadia, S.R., Susheel Kodali, S.K., Ghanem, A., Linke, A., Mehran, R., Virmani, R., Nazif, T., Parhizgar, A., Leon, M.B.et al. Neurocognition and Cerebral lesion burden in High Risk Patients before Undergoing TAVR: The Sentinel Trial, Insights from the Sentinel Trial, Journal of the American College of Cardiology, 2017, in press.
13. Marshall, R.S., Asllani, I., Pavol, M.A., Slattery, P., Cheung, Y.C., **Lazar R.M**. Regional Altered cerebral hemodyamics and cortical thinning in asymptomatic carotid artery stenosis, PLOS-One, 2017, in press.

3. Publications (other)

Dunn, L.E., Willey, J.Z., Lazar RM. Neuroprotection for Mechanical Circulatory Support. 2017. In Neuroprotection in Critical Care and Perioperative Medicine. Reich, D.L., Mayer, S.A., Uysal, S. (Eds.), New York: Oxford, pp 211-223.

4. Presentations at scientific meetings

Meschia JF, Lal BK, Howard G, Roubin G, Brown RD Jr, Barrett KM, Chaturvedi S, Chimowitz M, Demaerschalk BM, Howard VJ, Huston III J, **Lazar R**, Moore W, Moy C, Turan T, Voeks J, Brott TG, for the CREST-2 Investigators. Carotid Revascularization and Medical Management for Asymptomatic Carotid Stenosis: CREST-2 Update. International Stroke Conference, 2017. Stroke. 2017.

Barrett KM, Meschia JF, Lal BK, Howard G, Roubin G, Brown RD Jr, Chaturvedi S, Chimowitz M, Demaerschalk BM, Howard VJ, Huston III J, **Lazar RM**, Moore W, Moy C, Turan TN, Voeks J, Brott TG, for the CREST-2 Investigators. Carotid Revascularization and Medical Management for Asymptomatic Carotid Stenosis: CREST-2 Update. American Academy of Neurology Meeting, 2017. Neurology. 2017.

Meschia JF, Lal BK, Howard G, Roubin G, Brown RD Jr, Barrett KM, Chaturvedi S, Chimowitz M, Demaerschalk BM, Howard VJ, Huston III J, **Lazar R**, Moore W, Moy C, Turan T, Voeks J, Brott TG, for the CREST-2 Investigators. Carotid Revascularization and Medical Management for Asymptomatic Carotid Stenosis: CREST-2 Update. American Neurological Association Annual Meeting, 2017. Ann Neurol. 2017.

Turan TN, Voeks J, Barrett KM, Brown, Jr RD, Chaturvedi S, Chimowitz M, Demaerschalk B, Emmady P, Howard G, Howard VJ, Huston J III, Jones M, Lal BK, **Lazar RM,** Meschia JF, Moore W, Moy CS, Roldan AM, Roubin GS, Brott TG for the CREST-2 Investigators. Relationship Between Risk Factor Control and Physician Specialty in the CREST2 Trial. International Stoke Conference, 2018. Stroke. 2018.

Marshall, R.S., Asllani, I., Pavol, M.A., Slattery, P., Cheung, Y.C., **Lazar, R.M**. Regional Hypoperfusion is Associated with Cortical Thinning in Asymptomatic Carotid Artery Disease, International Stroke Conference 2017.

Pavol, M.A., Sundheim, K.M., Festa, J.R., Cheung, Y.K., Slane, K., **Lazar, R.M.,** Marshall, R.S. Cognition Independently Affects Quality of Life in Carotid Occlusive Disease. International Stroke Conference 2017.

5. Presentations at public (non-scientific) meetings or events
Due to relocating to Birmingham, public speaking engagements have been limited, however, invitations to future events are anticipated.

6. Awards (other)
On June 1, 2017, joined UAB as director of the Evelyn F. McKnight Brain Institute in the School of Medicine and holds the Evelyn F. McKnight Endowed Chair for Learning and Memory in Aging in the Department of Neurology.

7. CV
See Appendix F

8. Trainees
   a. Post doctoral - 2 (UAB) 1 (Columbia)
   b. Pre-doctoral - 1 (UAB)
   c. Other

9. Clinical/translational programs
   a. New programs
   - Pilot study to determine the extent to which aerobic exercise in otherwise healthy, elderly individuals improves cerebral vasodilatory capacity.
   - New study to evaluate cerebral vasodilatory capacity and cerebral oxygen utilization in elderly patients who have NYHA Stage 2 vs Stage 3 heart failure.
   - Pilot studies to compare intracerebral inflammation in patients discharged following admission for myocardial infarction vs those evaluated with stable angina.

   b. Update on existing clinical studies
   - **1 R01 NS076277-01A1 (Lazar/Marshall)**
     NIH/NIND. Blood Flow and Cognition in Asymptomatic Carotid Artery Disease.
     This project studies the relationship of four measures of cerebral hemodynamics and cognitive function in patients with asymptomatic carotid artery disease. We completed enrollment for both patients and controls. We published an important paper (Marshall et al, PLoS One. 2017 Dec 14;12(12):e0189727), showing that asymptomatic carotid stenosis produces loss of cortical thickness in the regions supplied by the affected arterial circulation, and that this effect is affected by measures of cerebral hemodynamics. Collaboratiobn is between UAB and Columbia.

   - **1 U01 NS080168-01A1 (PI: Brott; Cognitive Core PI: Lazar)**
     NIH/NINDS CREST-2 Clinical Coordinating Center.
     The goal of this project is to assess if contemporary medical therapy is not inferior to contemporary revascularization (carotid endarterectomy or carotid angioplasty/stenting) plus best medical therapy in patients with $\geq$ 70% asymptomatic carotid stenosis. The cognitive substudy is to assess whether medical therapy alone is non-inferior to revascularization to maintain the level of cognitive function at 4 years of follow-up. We submitted an abstract to the

American Academic of Neurology describing the cognitive profile of the first 200 randomized patients, demonstrating cognitive decline in the absence of stroke. Collaboratiobn is among UAB, Columbia, Mayo Clinic and UMaryland.

- **1R21NS096972-01A1 (Lazar/Kodali)**
  NIH/NINDS/NIA Cerebral Hemodynamics and Neurocognition in Aortic Valve Disease.
  The goal of this project is to determine whether severe aortic stenosis is associated with impaired cerebral hemodynamics and, in turn, impaired cognition, and whether valve replacement is associated with improved cerebral hemodynamics and improved cognition. This grant was successfully transferred to UAB, and enrollment was resumed in September 2017. We have enrolled 12 new patients. Collaboration is between UAB and Columbia.

- **R01NS097876 (Lazar, Marshall, Liebeskind, Connolly**
  NIH/NINDS Carotid Revascularization and Medical Management for Asymptomatic Carotid Stenosis Trial - Hemodynamics
  The purpose of this project is to determine whether there is a subset of patients with carotid stenosis who have MRI-detected cerebral hemodynamic compromise and associated cognitive decline, and whether revascularization will be associated with improved hemodynamics and improved cognition. This new grant was funded just as Dr. Lazar arrived at UAB, and clinical site training has taken place for 150 investigators and coordinators across the US. The first enrollment will take place in January 20178. (Collaboration is among UAB, Columbia and UCLA).

10. Technology transfer
    a. Patents applications - None
    b. Revenue generated from technology – N/A

11. Budget update
    A full financial report is included in the Finance Section.

12. Educational programs focusing on age related memory loss
    a. Scientific – " New Science Dialogues" Appendix D
    b. Public - None

13. Collaborative programs with other McKnight Institutes, institutions and research programs
    Dr. Lazar is a neuropsychologist with broad interests in aging and vascular disease with emphases on reversible causes of cognitive decline, risk-factor modifications to promote cognitive resiliency. Collaborations with the other McKnight Institutes is anticipated with enthusiasm.

14. Collaborative program with non McKnight Institutes, institutions and research programs

    Grants/Contracts (2017-present)
    Present Support
    1 R01 NS097876-01A1 (Lazar, Marshall, Liebeskind, Connolly) 4/1/2017 – 3/31/2022)
    NIH/NINDS
    Carotid Revascularization and Medical Management for Asymptomatic Carotid Stenosis Trial - Hemodynamics (CREST-H) The goal of this study is to determine whether patients with asymptomatic carotid stenosis who have cerebral hemodynamic compromise and cognitive impairment will improve after revascularization.

1 U01 NS080168-01A1 (Brott) 7/1/2013 – 6/30/2021
NIH/NINDS
CREST-2 Clinical Coordinating Center.
This goal of this project is to assess if contemporary medical therapy is not inferior to contemporary revascularization (carotid endarterectomy or carotid angioplasty/stenting) plus best medical therapy in patients with ≥ 70% asymptomatic carotid stenosis. The cognitive aim is to assess whether medical therapy alone is non-inferior to revascularization to maintain the level of cognitive function at 4 years of follow-up.
Role: Co-I and Cognitive Core PI.

1R21NS096972-01A1 (Lazar/Kodali) 8/1/2016 – 7/31/2018
NIH/NINDS/NIA
Cerebral Hemodynamics and Neurocognition in Severe Aortic Valve Disease.
The goal of this project is to determine whether severe aortic stenosis is associated with impaired cerebral hemodynamics and, in turn, impaired cognition, and whether valve replacement is associated with improved cerebral hemodynamics and improved cognition.

1 R21 DK104105-01A1 (Walker) 7/1/2015 – 6/30/2018
NIH/NIDDK
Primary Hyperparathyroidism: Neurocognitive Features.
The goal of this project is to determine whether primary hyperparathyroidism results in reduced cerebral vasomotor reactivity (VMR) that contributes to cognitive dysfunction, and whether reduced VRM can be reversed with surgical intervention.
Role: Co-I

1 R01 NS076277-01A1 (Lazar/Marshall) 4/1/2012-3/31/2018
NIH/NINDS
Blood Flow and Cognition in Asymptomatic Carotid Artery Disease.
This project studies the relationship of four measures of cerebral hemodynamics and cognitive function in patients with asymptomatic carotid artery disease.

Past Support
5 U54 NS081765-02 (Ogedegbe/Williams) 10/1/2012 – 9/30/2017

NIH/NINDS

The goal of this grant is to establish a Center for Stroke Disparities Solutions as a consortium between 3 academic institutions (NYU School of Medicine; Columbia University Medical Center; and SUNY Downstate Medical School); 5 stroke centers and a practice-based research network of primary care practices within New York City's (NYC) Health and Hospital Corporation; the Research Division of the Hebrew Home at Riverdale and the Visiting Nurse Service of NY. The target communities are Black and Hispanic residents of NYC.

Role: Co-I

1 U10NS086728-01 (Marshall) 9/30/2013 – 5/31/2017NIH/NINDS
New York Stroke Trials Network of Columbia and Cornell (NYCCSTN)
The goal of this program is to establish an infrastructure that would maximize stroke clinical trial enrollment in studies targeted to acute treatment, primary and secondary stroke prevention and stroke recovery.
Role: Co-I and Rehabilitation Core Leader

PENDING

U24NS107223 (Gropen, Lazar, Harrigan) 09/01/2018 – 8/31/2023
0.24 Calendar Mons NIH/NINDS Yr. 1
Direct Costs $213,313

The goal of the StrokeBelt StrokeNet is to establish a Regional Coordinating Center to facilitate Stroke research in the Southeastern States of Alabama and Mississippi. This infrastructure will provide research opportunities in acute stroke treatment, primary and secondary prevention, and post-stroke rehabilitation for an underserved, high-risk stroke population.

15. Briefly describe plans for future research and/or clinical initiatives

The future of the UAB McKnight Brain Institute is bright as new focus has begun with new research and clinical initiatives. There's a pilot study to determine the extent to which aerobic exercise in otherwise healthy, elderly individuals improves cerebral vasodilatory capacity. A new study has begun to evaluate cerebral vasodilatory capacity and cerebral oxygen utilization in elderly patients who have NYHA Stage 2 vs Stage 3 heart failure. Pilot studies are anticipated to compare intracerebral inflammation in patients discharged following admission for myocardial infarction vs those evaluated with stable angina.

LISTING OF INVESTIGATORS AND INDIVIDUAL FACULTY REPORTS

LISTING OF INVESTIGATORS

Professors

Ronald M. Lazar, PhD, FAHA, FAAN
Professor
Evelyn F. McKnight Endowed Chair for Learning and Memory in Aging
Director, McKnight Brain Research Institute
Director, Division of Neuropsychology
Department of Neurology
Area of Interest: Cognitive Resilience and Recovery in Aging, Cerebral hemodynamics, Neurovascular Disease.

Steve Austad, PhD
Professor and Chair, Department of Biology
Area of Interest: Molecular and organismal biology of aging

Karlene Ball, PhD
Professor and Chair, Department of Psychology
Area of Interest: Aging-related cognitive function

Etty (Tika) Benveniste, PhD
Senior Associate Dean for Research Administration, SOM
Associate Vice President for Medicine and Basic Sciences
Charlene A. Jones Endowed Chair in Neuroimmunology
Professor, Department of Cell, Developmental and Integrative Biology
Co-Director, UAB Multiple Sclerosis Center
Associate Director, Basic Science Research • Comprehensive Cancer Center

Michael Brenner, PhD
Professor Emeritus, Department of Neurobiology
Area of Interest: Glial cell biology, Alexander Disease

Cynthia J. Brown, MD, MSPH
Professor
Director, Division of Gerontology,Geriatrics and Palliative Care
Comprehensive Center for Healthy Aging
Area of Interest: quality of life for the aging through research, education and clinical care

Lynn Dobrunz, PhD
Professor, Department of Neurobiology
Area of Interest: Regulation of short-term synaptic plasticity in the hippocampus

Lloyd J. Edwards, PhD
Professor and Chair
Department of Biostatistics
Area of Interest: Conducting statistical research in linear and generalized linear mixed model methodology, longitudinal data analysis, health disparities, cardiovascular disease, neuroscience, and clinical trials design and analysis

Paul Gamlin, PhD
Professor, Department of Ophthalmology
Area of Interest: Cell biology and systems neuroscience of vision and visual disorders

David Geldmacher, MD
Professor, Collat Scholar, Department of Neurology
Area of Interest: Aging-related memory disorders and visual cognition in AD.

John Hablitz, PhD
Professor
Interim Chair, Department of Neurobiology
Area of Interest: Modulation of excitability in neocortial circuits

Adrianne Lahti, MD
Patrick H. Linton Professor
Director, Division of Behavioral Neurobiology
Co-director, Alabama Advanced Imaging Consortium
Area of Interest: Neuroimaging

Seth Landefeld, MD
Professor and Chair
Department of Medicine
Area of Interest: Geriatrics and Health Care Research

Robin Lester, PhD
Professor, Department of Neurobiology
Area of Interest: Nicotinic receptors in CNS function

Lori McMahon, PhD
Professor and Dean, Graduate School
Professor, Department of Physiology/Biophysics Director,
UAB Comprehensive Neuroscience Center
Area of Interest: Hormonal control of synaptic plasticity in aging

James H. Meador-Woodruff, MD
Professor and Chair, Department of Psychiatry and Behavioral Neurobiology
Area of Interest: Cellular alterations of neural circuitry and molecular expression in psychiatric illnesses

Vlad Parpura, MD, PhD
Professor, Department of Neurobiology
Area of Interest: Imaging approaches to investigating synaptic and glial cell function

Lucas Pozzo-Miller, PhD
Professor, Department of Neurobiology
Area of Interest: Mechanisms controlling dendritic spine morphology

Sumanth D. Prabhu, MD
Mary G. Waters Chair of Cardiovascular Medicine

Professor of Medicine and Cell, Developmental, and Integrative Biology
Area of Interest: cardiovascular disease

Michael Sagg, MD
Division of Infectious Diseases
Director, The William C. Gorgas Center for Geographic Medicine
Director, Center for AIDS Research
Areas of Interest: Infectious Diseases, HIV/AIDS, Blood Equality, Hepatitis, Antiretroviral Therapy

David Standaert, MD, PhD
John N. Whitaker Professor and Chair of Neurology
Interim Director, McKnight Brain Institute
Director, Division of Movement Disorders
Area of Interest: Aging, Neurodegeneration, and Translational Neuroscience

Anne Theibert, PhD
Professor, Department of Neurobiology
Director, UAB Undergraduate Neuroscience B.S. Program
Area of Interest: PI-3-Kinase signal transduction in neuronal cell biology

Erobo Ubogu, PhD
Professor, Department of Neurology
Director of the Neuromuscular Division of Neurology
Area of Interest: Inflammatory neuropathies

Associate Professors

Virginia Wadley Bradley, PhD
Associate Professor, Division of Gerontology, Geriatrics, and Palliative Care
Director, Dementia Care Research Program
Associate Director, Edward R. Roybal Center for Translational Research on Aging and Mobility
Area of Interest: Mild Cognitive Impairment, Alzheimer's disease, comorbid cerebrovascular disease

Matt Goldberg, PhD (Recruited from UT Southwestern)
Associate Professor, Neurology
Area of Interest: Mechanisms of neurodegeneration

Alecia Gross, PhD
Associate Professor, Department of Vision Sciences
Area of Interest: Signal transduction mechanisms in the CNS

David Knight, PhD
Associate Professor, Department of Psychology
Area of Interest: Human imaging approached to investigating memory

Farah Lubin, PhD
Associate Professor, Department of Neurobiology
Area of Interest: Signal transduction mechanisms in memory and memory disorders

Roy C. Martin, PhD
Associate Professor, Department of Neurology

Area of Interest: Neuropsychology

Kazu Nakazawa, PhD
Associate Professor, Department of Psychiatry
Area of Interest: Epigenetics and cognition

Linda Overstreet-Wadiche, PhD
Associate Professor, Department of Neurobiology
Area of Interest: Adult neurogenesis in the dentate gyrus

Erik Roberson, MD, PhD
Associate Professor, Department of Neurology
Patsy W. and Charles A. collat Professor of Neuroscience
Director, Alzheimer's Disease Center
Co-Director, UAB Center for Neurodegeneration and Experimental Therapeutics
Co-Director, McKnight Brain Institute
Area of Interest: Aging-related memory disorders

Kristina Visscher, PhD
Assistant Professor, Department of Neurobiology
Co-director, Civitan International Neuroimaging Laboratory
Area of Interest: Human imaging approaches to investigating memory.

Jacques Wadiche, PhD
Associate Professor, Department of Neurobiology
Area of Interest: Synaptic plasticity and function in the cerebellum

Scott Wilson, PhD
Associate Professor, Department of Neurobiology
Area of Interest: The ubiquitin/proteasome system in neuronal function

Assistant Professors

Mark Bolding, PhD
Assistant Professor, Division of Advanced Medical Imaging Research
Area of Interest: Visual cognition, MRI, and neuroimaging

Jeremy Day, PhD
Assistant Professor, Department of Neurobiology
Area of Interest: Epigenetic mechanisms in memory formation.
Cristin Gavin, PhD
Assistant Professor, Department of Neurobiology
Co-director, Undergraduate Neuroscience Program
Co-director, Post baccalaureate Research Education Program
Area of Interest: Cellular and molecular mechanisms of structural and functional plasticity

Adam Gerstenecker, PhD
Assistant Professor, Department of Neurology
Area of Interest: Functional activity, decisional capacity, and cognition in persons with cognitive impairment and dementia.

Michelle Gray, PhD
Assistant Professor, Dixon Scholar, Department of Neurology
Area of Interest: Neurogenetics, glial function, and Huntington's disease
Jeremy Herskowitz, PhD
Assistant Professor, Department of Neurology
Area of Interest: Amyloid beta effects on neurons.

Gwen King, PhD
Assistant Professor, Department of Neurobiology
Area of Interest: Memory and aging, Klotho proteins in aging and cognition

Scott Phillips, PhD
Assistant Professor, Department of Neurobiology
Area of Interest: Neurogenetics, neurobiochemistry

Kristen Triebel, PsyD
Assistant Professor, Department of Neurology
Area of Interest: Neuropsychology

INDIVIDUAL INVESTIGATORS' REPORTS

1. **Summary of Scientific Achievements**

Austad, Steve

1. This year we verified that the lysate from muscle of the bivalve mollusc, Arctica islandica, contained some molecule or molecules (not a heat shock protein) that made human Aβ resistant to aggregation. Will be applying for NIH funds to follow up to try to identify the molecule(s).
2. This year we also finally published on the development specific-pathogen-free marmoset colony, which should be excellent for numerous neurological aging studies. Marmosets are one of the smallest primates and the shortest-lived, meaning that individual animals can be followed from maturity to old age in the course of a single 5 year grant period.

Day, Jeremy

1. Published manuscript detailing gene expression changes in hippocampus following contextual fear memory using genome-wide sequencing approaches (Duke, et al., 2017).
2. Discovered molecular function for non-coding RNAs called enhancer RNAs in activity-dependent gene regulation.
3. Discovered dopamine-regulated gene that controls learned behavioral responses to drugs of abuse.

Gamlin, Paul

Significant progress has been made in the following research areas over the past 12 months.

1. Study of the neural control of the near triad of vergence, accommodation, and pupil constriction in non-human primates (NHPs);
2. Study of the role of ipRGCs in pupillary responses and circadian rhythms in NHPs;
3. Development of AAV-based gene delivery techniques in NHPs to introduce genes into the brain and retina for basic research and therapeutic purposes.

Gavin, Cristin

The NIH R25 PREP Program identifies, recruits, and prepares up to 8 scholars a year from groups underrepresented in STEM research fields. The year-long program provides intensive research training and a series of academic experiences to prepare them for entry into high quality doctoral graduate programs in the U.S. UAB's success rate is currently higher than the average of PREP programs nationwide (~70%, ~63%, respectively). We are currently receiving bridge funding for the 2017-2018 class and received a score of 25 on our most recent resubmission. Our program officer believes this is a competitive number for renewal, though we won't know until December if there is NIH funding available for this initiative.

Geldmacher, David

1. Continued study of distance-accessible personalized coaching for dementia caregivers to reduce caregiver burden and improve quality of life
2. Began systematic assessment of clock drawing tests in clinical tauopathy populations

Gerstenecker, Adam

Served as coinvestigator on two funded projects and a coinvestigator on four submitted grants that are awaiting scoring. Published in peer-review journals.

Goldberg, Matthew

1. Role of alpha-synuclein in neurodegeneration linked to mitochondrial autophagy: Analyzed cohorts of wild-type and PINK1 knockout rats 4 weeks after stereotaxic injection of monomeric alpha synuclein or pre-formed fibrils. Determined that PINK1 deficiency increases susceptibility to formation of protein inclusions similar to Lewy bodies associated with cognitive decline (manuscript in preparation).
2. Mechanisms of PINK1 knockout rat neurodegeneration and locomotor dysfunction. We have significantly advanced our understanding of PINK1 knockout rat phenotypes and obtained data for multiple additional grants. We identified significant neuroinflammation and are seeking to determine if the neuroinflammation is a cause or a consequence of PINK1 knockout rat neurodegeneration (or repair).
3. Analysis of Parkin activity in vivo: We have obtained knockin mice bearing a Parkin activating mutation. We have developed DNA constructs, assays and other tools to measure PINK1 and Parkin activity in cultured primary neurons and cell lines.

Gray, Michelle

1. The Gray Laboratory is focused on generating and characterizing mouse models of neurodegenerative diseases and movement disorders. Huntington's Disease (HD) is characterized by psychiatric, cognitive and movement deficits. In studies of Huntington's Disease (HD), they have shown a significant contribution of astrocytes expressing the mutated protein to HD pathogenesis.
2. They have also undertaken the challenge of generating a mouse model for the rare X-Linked Dystonia and Parkinsonism/ Dystonia 3 (XDP/DYT3) movement disorder. The Gray Lab has generated two models for use in studying this disease.

Gross, Alecia

1. The Gross Lab has discovered key ciliary proteins and mechanisms that are involved in protein trafficking and disk formation in the sensory cilium of photoreceptors. Using transgenic tadpoles, conditional and congenital knock-in and knock-out mice and polarized tissue culture cells as the model systems to carry out the studies.
2. Three manuscripts are out under review (two submitted- PLOS ONE and IOVS, one re-submitted after review- Experimental Eye Research).

King, Gwendolyn

1. Developed a klotho conditional knockout, and this year brought the first progeny with brain specific loss of klotho protein. Found the first evidence that a single protein secreted from the choroid plexus can influence hippocampal function. These data were described as "holy grail" level by a collaborator and leader in the field.
2. A manuscript characterizing the effect of klotho on adult neurogenesis is under revision with a conditional acceptance after a very long 1.5 year struggle at several journals. This publication is seminal, showing a klotho specific effect upon both up and downregulation of the protein.
3. The lab's first graduate student defended her thesis and is moving to a postdoc at a renowned lab in stem cell biology at the University of Michigan. A second graduate student is seeking permission to write his thesis at the next committee meeting. Work from these two students is anticipated to result in 4 additional publications this year.

Knight, David

The Knight Lab at UAB has been productive with 5 peer-reviewed publications and 8 poster presentations at scientific meetings. In addition, Dr. Knight received the Dean's Award for Excellence in Mentorship.

Martin, Roy

1. NSF EPSCoR grant (UAB Site PI: Szaflarski) RII Track-2 FEC: Probing and Understanding the Brain: Micro and Macro Dynamics of Seizure and Memory Networks," submitted by Louisiana Tech University to the National Science Foundation EPSCoR's Research Infrastructure Improvement Track-2 solicitation.
2. NIH grant "noninvasive biomarkers to advance emerging DBS electrode technologies in Parkinson's disease" (PI: Walker)

Nakazawa, Kazu

A current version of the dopamine hypothesis of schizophrenia posits that striatal hyperdopaminergia contributes to positive symptoms, and frontal cortical hypodopaminergia contributes to negative symptoms and cognitive dysfunctions. The Nakazawa Lab hypothesized that dopamine malfunction could be secondary to altered glutamatergic function, particularly N-methyl-D-aspartate receptor (NMDAR) hypofunction. To the end, they found abnormal dopamine release phenotypes in several mutant strains.

1. In line with the prevailing view that dopamine in anterior cingulate cortex (ACC) plays a role in evaluating effort-cost for engaging in actions, the Lab found that tail-suspension triggered dopamine release in ACC of wild-type mice (measured by in vivo microdialysis); it was severely attenuated in the conditional Gad1 (encoding ghad67) mutant mice, in which cortical GABA level is reduced.
2. The Lab also found amphetamine-stimulated dopamine release deficits in mPFC in a mouse strain in which NMDAR essential subunit Grin1 is deleted in a subset of GABA neurons. Notably, the same mutants showed exacerbated amphetamine-induced dopamine release in nucleus accumbens shell.

Pozzo-Miller, Lucas

1. Demonstration that homeostatic synaptic plasticity is impaired in *Mecp2* knockout neurons due to lower levels of EEA1, an endosomal protein involved in synaptic AMPAR recycling. Increasing EEA1 levels in *Mecp2* KO neurons restores homeostatic synaptic plasticity. Published in *Journal of Physiology (London)*, with an accompanying Perspective commentary.
2. Demonstration that a BDNF mimetic with partial agonist activity at TrkB receptors improves hippocampal-dependent spatial memory by rebalancing network activity and promoting synaptic plasticity at excitatory hippocampal synapses. Published in *Disease Models & Mechanisms*, with an accompanying press release.
3. Demonstration that hippocampal dysfunction in *Mecp2* knockout mice spreads to the medial prefrontal cortex via a direct monosynaptic projection, altering network activity and social behaviors. In preparation.

Standaert, David

1. Several important studies linking neuroinflammation to Parkinson disease were published. These includes the paper by Harms et al., showing that in a mouse model there is entry of peripheral monocytes into the brain in response to abnormal alpha-synuclein, and the Gendelman et al. study which explored the use of GMCSF to modify the phenotype of T cells in patients with Parkinson disease.

2. An important new mechanism was discovered that regulates the activity of cholinergic neurons in brain, involving the interaction of dopamine D2 receptors with beta-arresting signaling (Scarduzio et al.)

Ubogu, Eroboghene

1. Deduction of the adult human blood-nerve barrier transcriptome

2. Completion of project elucidating role of GDNF in blood-nerve barrier recovery in vitro and in vivo

3. Development of an in vitro hydraulic conductivity model to study blood-nerve barrier transendothelial fluid flux

4. Significant progress in elucidating molecular determinants of HIV+ leukocyte trafficking across the blood-nerve barrier

5. Significant progress in developing a conditional MHC Class II knockout mouse

6. Collaborative work deducing the neuromuscular phenotype seen in PINK 1 knockout rats (animal model of Parkinson's disease)

7. Completion of clinical trials in chronic inflammatory demyelinating polyradiculoneuropathy, Lambert Eaton myasthenic syndrome and myasthenia gravis

Visscher, Kristina

1. Developed and maintained UAB's McKnight Brain Aging Registry – 17 participants over the age of 85 have completed so far, with extensive MRI, behavioral data including neuropsychological data and the NIH toolbox, and blood based biomarkers.

2. Plasticity observed in participants who have age-related macular degeneration is different from plasticity in participants with juvenile forms of the disease. Robust increases are seen in cortical thickness associated with increased use of peripheral vision in AMD subjects – but not JMD subjects. Because both groups have similar visual experience and behaviors, this suggests that each group adopts different mechanisms for plasticity. This is intriguing evidence that different forms of plasticity are available to younger vs. older adults, but more work is needed. (Defenderfer, in progress)

3. Increased use of peripheral vision for everyday tasks is associated with increased functional connectivity between peripheral V1 and functionally specialized visual areas

High visual acuity in central vision is vital for everyday tasks such as recognizing faces and reading words; with central vision loss, such as in macular degeneration, individuals must rely more heavily on peripheral vision to do things like recognizing faces and reading words. Previous work from our lab demonstrates that increased reliance on peripheral vision is associated with increased cortical thickness in areas of primary visual cortex (V1) that process peripheral vision. Because macular degeneration patients rely heavily on peripheral vision, we hypothesized that areas of V1 involved in peripheral vision would possess enhanced functional connectivity to visual areas that are important for tasks that are typically performed with central vision. For example, Fusiform Face Area (FFA) is specialized for face processing, while Visual Word Form Area (VWFA) is specialized for processing written language. To test this hypothesis, we used fMRI in 10 macular degeneration patients and matched controls in order to measure resting-state functional connectivity between peripheral V1 and functionally specialized visual areas. These

functionally specialized areas were defined based on meta-analyses. Consistent with our hypothesis, macular degeneration patients showed stronger connectivity from peripheral V1 to functionally specialized visual regions, compared to healthy controls. This association likely reflects increased use of peripheral vision for everyday visual tasks. Overall, these results suggest that connectivity between visual cortex and higher order brain regions is influenced by the degree to which certain parts of the visual field are used. Together, these findings demonstrate a stable form of network plasticity that is observable at rest, even when no faces or words are present. Furthermore, these findings help provide insight into the nature of visual cortical plasticity in the adult brain, a stage well beyond the "critical period" for visual development. (Fleming, in progress)

2. Publications in Peer Reviewed Journals

Austad, Steve

1. Hoffman JM, O'Neill DG, Creevy KE, Austad SN. 2017. Do female dogs age differently than male dogs? Journals of Gerontology: Biological Science and Medical Sciences. May 2 epub ahead of print. DOI: 10.1093/gerona/glx061. PMCID: in process.

2. Zhang N, Valentine J, Zhou Y, Zhang Y, Bhattacharya A, Walsh ME, Fischer K, Austad S, Osmulski PA, Gaczynska ME, Shoelson S, Van Remmen H, Chen Y, Liang H, Musi N. 2017. Sustained NFκB inhibition improves insulin sensitivity but is detrimental to muscle health. *Aging Cell* 16(4):847-858. DOI: 10.1111/acel.12613. PMC55406420.

3. Austad SN (2017). Sex differences in health and longevity. In *Hazzard's Geriatric Medicine and Gerontology*, 7th Edition. J Halter, J Ouslander, S Studenski, K High, S Asthana, C Ritchie, and M Supiano (Eds.) McGraw-Hill: New York. Chapter 8 (pp 133-147). ISBN-13: 978-0-07-183345-5.

4. Schenkelaars Q, Tomczyk S, Wenger Y, Edundayo K, Girard V, Buzgariu W, Austad S, Galliot B. (2017). *Hydra*, a model system for deciphering the mechanisms of aging and resistance to aging. *Handbook of Models for Human Aging*, 2nd Ed., PM Conn (ed.). Academic Press: Cambridge, MA.

Benveniste, Tika

1. Lai, Y., Tsai, J., Tseng, Y., Wu, M., Liu, W., Lam, H., Yu, J., Nozell, S.E., and Benveniste, E.N. 2017. Small G proteins Rac GTPases regulate the maintenance of glioblastoma stem-like cells. Oncotarget. 75(15) S 4219-4237.

2. Rowse, A.L., Gibson, S.A., Meares, G.P., Rajbhandari, R., Nozell, S.E., Dees, K.J., Hjelmeland, A.B., McFarland, B.C., and Benveniste, E.N. 2017. Protein kinase CK2 is important for the function of glioblastoma brain tumor initiating cells. J. Neuro Oncol. 132(2):219-229.

3. Klein, R. S., Voskuhl, R., Segal, B. M., Dittel, B. N., Lane, T. E., Bethea, J. R., Carson, M. J., Colton, C., Rosi, S., Anderson, A., Piccio, L., Goverman, J. M., Benveniste, E. N., and Cross, A. H. 2017. Speaking out about gender imbalance in invited speakers improves diversity: an example in neuroimmunology. Nature Immunol. 18(5): 475-478.

4. Gibson, S.A., Yang, W., Yan, Z., Liu, Y., Rowse, A., Weinmann, A. S., Qin, H., and E.N. Benveniste. 2017. Protein kinase CK2 controls the fate between Th17 cell and regulatory T cell differentiation. J. Immunol. 198: 4244-4254.

Manuscripts in preparation

1. Meares, G.P., Rajbhandari, R., Gerigk, M., Tien, C-L., Chang, C., Fehling, S.C., Rowse, A., Mulhern, K.C., Gray, G.K., Berbari, N.F., Benveniste, E.N., and Nozell, S.E. 2017. MicroRNA-31 is required for maintaining astrocyte identity. Under revision.

2. Harms, A.S., Thome, A.D., Liu, Y., Yu, H., Li, X., Volpicelli-Daley, L.A., Benveniste, E.N., Qin, H., and Standaert, D.G. 2017. Peripheral monocyte entry is required for alpha-synuclein induced inflammation and neurodegeneration. Under review.
3. Gibson, S. A., Yang, W., Yan, Z., Qin, H., and E.N. Benveniste. 2017. CK2 Controls Th17 and Regulatory T Cell Differentiation Through Inhibition of FoxO1. Submitted.
4..Gibson, S. A., and E. N. Benveniste. 2017. Protein kinase CK2: An emerging regulator of immunity. Trends in Immunol. In preparation.

Bradley, Virginia Wadley

1. Zhu W, Wadley VG, Howard VJ, Hutto B, Blair SN, Hooker SP. Objectively Measured Physical Activity and Cognitive Function in Older Adults. Medical Science Sports Exercise. 2017 Jan;49(1):47-53. PMID: 27580146
2. Howard G, Safford MM, Moy CS, Howard VJ, Kleindorfer DO, Unverzagt FW, Soliman EZ, Flaherty ML, McClure LA, Lackland DT, Wadley VG, Pulley L, Cushman M. Racial Differences in the Incidence of Cardiovascular Risk Factors in Older Black and White Adults. Journal American Geriatric Society 2017 Jan; 65(1):83-90. doi: 10.1111/jgs.14472.
3. Vance DE, Fazeli PL, Shacka JJ, Nicholson WC, McKie P, Raper JL, Azuero A, Wadley V, Ball KK. Testing a computerized cognitive training protocol in adults aging with HIV-Associated Neurocognitive Disorders: an RCT in the southern United States. Journal of Medical Internet Research Protocols 2017 Apr; 6(4), e68. DOI: 10.2196/resprot.6625; PMID: 28446421
4. Lassen-Greene, C.L., Steward, K., Okonkwo, O., Porter, E., Crowe, M., Vance, D.E., Griffith, H.R., Ball, K., Marson, D.C., Wadley, V.G. Mild Cognitive Impairment and changes in everyday function over time: the importance of evaluating both speed and accuracy. Journal of Geriatric Psychiatry and Neurology 2017 Jul; 30(4):220-227. Doi: 10.1177/0891988717711807. PMID: 28639877.
5. Howard VJ, Meschia JF, Lal BK, Turan TN, Roubin GS, Brown RD, Voeks JH, Barrett KM Jr, Demaerschalk BM, Huston J III, Lazar RM, Moore WS, Wadley VG, Chaturvedi S, Moy CS, Chimowitz M, Howard G, Brott TG on behalf of the Crest-2 Study. Carotid revascularization and medical management for asymptomatic carotid stenosis: protocol of the CREST-2 clinical trials. International Journal of Stroke 2017 Jan 1:1747493017706238. Doi: 10.1177/1747493017706238. PMID: 28462683.
6. Huisingh C, Levitan E, Irvin R, Maclennan P, Wadley V, Owsley C. Visual Sensory and Visual-Cognitive Function and Rate of Crash and Near-Crash Involvement among Older Drivers Using Naturalistic Driving Data. Investigative Ophthalmology and Visual Science 2017 Jun 1; 58(7):2959-2967. Doi:10.1167/iovs. 17-21482. PMID: 28605807.
7. Berlowitz DR, Foy CG, Kazis LE, Bolin LP, Conroy MB, Fitzpatrick P, Gure TR, Kimmel PL, Kirchner K, Morisky DE, Newman J, Olney C, Oparil S, Pajewski NM, Powell J, Ramsey T, Simmons DL, Snyder J, Supiano MA, Weiner DE, Whittle J; SPRINT Research Group. New England Journal of Medicine 2017 Aug 24;377(8):733-744. Doi: 10.1056/NEJMoa1611179. PMID: 28834483.
8. Fujishiro K, MacDonald LA, Crowe M, McClure LA, Howard VJ, Wadley VG. The role of occupation in explaining cognitive functioning in later life: Education and occupational complexity in a US national sample of black and white men and women. Journal of Gerontology Series B: Social Sciences 21 August 2017, https://doi.org/10.1093/geronb/gbx112
9. Mefford MT, Rosenson RS, Cushman M, Farkouh ME, McClure LA, Wadley VG, Irvin MR, Bittner VA, Safford MM, Somaratne R, Monda KL, Muntner P, Levitan EB. PCSK9 Variants, LDL-Cholesterol, and Neurocognitive Impairment: The REasons for Geographic and Racial Differences in Stroke (REGARDS) Study. Circulation. 2017 Nov 16. pii: CIRCULATIONAHA.117.029785. doi: 10.1161/CIRCULATIONAHA. 117.029785. [Epub ahead of print] PMID: 29146683

Brown, Cynthia

1. Dermody G, Sawyer P, Kennedy R, Brown CJ. ED Utilization and Self-Reported Symptoms in Community-Dwelling Older Adults. *J Emerg Nurs*. 2017 Jan;43(1):57-69. PMID: 28131350.
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Standaert, David

Publications in peer reviewed journals

1. Amara, A. W., Walker, H. C., Joop, A., Cutter, G., DeWolfe, J. L., Harding, S. M., and Standaert, D. G. (2017) Effects of subthalamic nucleus deep brain stimulation on objective sleep outcomes in Parkinson's disease. Mov Disord Clin Pract 4, 183-190

2. Birchall, E. L., Walker, H. C., Cutter, G., Guthrie, S., Joop, A., Memon, R. A., Watts, R. L., Standaert, D. G., and Amara, A. W. (2017) The effect of unilateral subthalamic nucleus deep brain stimulation on depression in Parkinson's disease. Brain Stimul 10, 651-656

3. Bluett, B., Litvan, I., Cheng, S., Juncos, J., Riley, D. E., Standaert, D. G., Reich, S. G., Hall, D. A., Kluger, B., Shprecher, D., Marras, C., Jankovic, J., and study, E. P. (2017) Understanding falls in progressive supranuclear palsy. Parkinsonism Relat Disord 35, 75-81

4. Espay, A. J., Schwarzschild, M. A., Tanner, C. M., Fernandez, H. H., Simon, D. K., Leverenz, J. B., Merola, A., Chen-Plotkin, A., Brundin, P., Kauffman, M. A., Erro, R., Kieburtz, K., Woo, D., Macklin, E. A., Standaert, D. G., and Lang, A. E. (2017) Biomarker-driven phenotyping in Parkinson's disease: A translational missing link in disease-modifying clinical trials. Mov Disord 32, 319-324

5. Figge, D. A., and Standaert, D. G. (2017) Dysregulation of BET proteins in levodopa-induced dyskinesia. Neurobiol Dis 102, 125-132

6. Gendelman, H. E., Zhang, Y., Santamaria, P., Olson, K. E., Schutt, C. R., Bhatti, D., Shetty, B. L. D., Lu, Y., Estes, K. A., Standaert, D. G., Heinrichs-Graham, E., Larson, L., Meza, J. L., Follett, M., Forsberg, E., Siuzdak, G., Wilson, T. W., Peterson, C., and Mosley, R. L. (2017) Evaluation of the safety and immunomodulatory effects of sargramostim in a randomized, double-blind phase 1 clinical Parkinson's disease trial. NPJ Parkinsons Dis 3, 10

7. Gerstenecker, A., Roberson, E. D., Schellenberg, G. D., Standaert, D. G., Shprecher, D. R., Kluger, B. M., and Litvan, I. (2017) Genetic influences on cognition in progressive supranuclear palsy. Mov Disord

8. Harms, A. S., Thome, A. D., Yan, Z., Schonhoff, A. M., Williams, G. P., Li, X., Liu, Y., Qin, H., Benveniste, E. N., and Standaert, D. G. (2017) Peripheral monocyte entry is required for alpha-

Synuclein induced inflammation and neurodegeneration in a model of Parkinson disease. Exp Neurol 300, 179-187

9. Kelley, K. D., Peavy, G., Edland, S., Rogers, W., Riley, D. E., Bordelon, Y., Standaert, D., Reich, S. G., and Litvan, I. (2017) The Role of Stress as a Risk Factor for Progressive Supranuclear Palsy. J Parkinsons Dis 7, 377-383

10. Obeso, J. A., Stamelou, M., Goetz, C. G., Poewe, W., Lang, A. E., Weintraub, D., Burn, D., Halliday, G. M., Bezard, E., Przedborski, S., Lehericy, S., Brooks, D. J., Rothwell, J. C., Hallett, M., DeLong, M. R., Marras, C., Tanner, C. M., Ross, G. W., Langston, J. W., Klein, C., Bonifati, V., Jankovic, J., Lozano, A. M., Deuschl, G., Bergman, H., Tolosa, E., Rodriguez-Violante, M., Fahn, S., Postuma, R. B., Berg, D., Marek, K., Standaert, D. G., Surmeier, D. J., Olanow, C. W., Kordower, J. H., Calabresi, P., Schapira, A. H. V., and Stoessl, A. J. (2017) Past, present, and future of Parkinson's disease: A special essay on the 200th Anniversary of the Shaking Palsy. Mov Disord 32, 1264-1310

11. Scarduzio, M., Zimmerman, C. N., Jaunarajs, K. L., Wang, Q., Standaert, D. G., and McMahon, L. L. (2017) Strength of cholinergic tone dictates the polarity of dopamine D2 receptor modulation of striatal cholinergic interneuron excitability in DYT1 dystonia. Exp Neurol 295, 162-175

12. Standaert, D. G. (2017) What would Dr. James Parkinson think today? Mutations in beta-glucocerebrosidase and risk of Parkinson's disease. Mov Disord 32, 1341-1342

13. Zimmerman, C. N., Eskow Jaunarajs, K. L., Meringolo, M., Rizzo, F. R., Santoro, M., Standaert, D. G., and Pisani, A. (2017) Evaluation of AZD1446 as a Therapeutic in DYT1 Dystonia. Front Syst Neurosci 11, 43

Triebel, Kristen

1. Niccolai, L. M., Triebel, K. L., Gerstenecker, A., McPherson, T. O., Cutter, G., Martin, R. C., and Marson, D. C. Neurocognitive predictors of declining financial capacity in persons with mild cognitive impairment due to Alzheimer's disease. Clinical Gerontologist 2017; 40(1): 14-23. doi: 10.1080/07317115.2016.1228022. PMID: 28452629 PMCID: PMC5412082

2. Steward, K., Novack, T., Kennedy, R., Crowe, M., Marson, D., and Triebel, K. L. The Wechsler Test of Adult Reading (WTAR) as a measure of premorbid intelligence following traumatic brain injury. Archives of Clinical Neuropsychology 2017; 32(1): 98-103. doi: 10.1093/arclin/acw081. PMID: 27799224.

3. Steward, K. A., Kennedy, R., Novack, T. A., Crowe, M., Marson, D. C., and Triebel, K. L. The role of cognitive reserve in recovery from traumatic brain injury. Journal of Head Trauma and Rehabilitation 2017 May 17. doi: 10.1097/HTR.0000000000000325. [Epub ahead of print] PMID: 28520675

4. Gerstenecker, A., Myers, T, Lowry, K, Martin, R.C., Triebel, K., Bashir, K., & Marson, D. C. (in press). Financial capacity and its cognitive predictors in multiple sclerosis. Archives of Clinical Neuropsychology. Epub ahead of print; 2017 May 13:1-8. doi: 10.1093/arclin/acx039. PMID: 28505336

Manuscripts in press:

5. Gerstenecker, A., Triebel, K., Martin, R., Bashir, K., & Marson, D. C. (in press). Medical Decision-Making Capacity and its Cognitive Predictors in Multiple Sclerosis. Journal of the Neurological Sciences.

6. Gerstenecker, A., Triebel, K. L., Eakin, A., Martin, R., & Marson, D. (in press). Exploring the factor structure of financial capacity in cognitively normal and impaired older adults. Clinical Gerontologist.

7. Meneses, K., Benz, R., Bail, J., Vo J., Triebel, K., Fazeli, P., Frank, J., & Vance, D. (in press) Speed of processing in middle-aged and older breast cancer survivors (SOAR): Results of a randomized controlled pilot. Breast Cancer Research and Treatment.

Ubogu, Eroboghene

1. Helton ES, Palladino SP, Ubogu EE. A novel method for measuring hydraulic conductivity at the human blood-nerve barrier in vitro. *Microvascular Research* 2017; 109:1-6 (on-line version: DOI: 10.1016/j.mvr.2016.08.005, published on August 31st, 2016).
2. Bosetti F, Galis ZS, Bynoe MS et al; on behalf of the "Small Blood Vessels: Big Health Problems" Workshop Participants. "Small Blood Vessels: Big Health Problems?": Scientific Recommendations of the National Institutes of Health Workshop. *Journal of the American Heart Association* 2016;5: e004389 (DOI: 10.1161/JAHA.116.004389).
3. Dong C, Greathouse KM, Beacham RL, Palladino SP, Helton ES, Ubogu EE. Fibronectin connecting segment-1 peptide inhibits pathogenic leukocyte trafficking and inflammatory demyelination in experimental models of chronic inflammatory demyelinating polyradiculoneuropathy. *Experimental Neurology* 2017; 292: 35-45 (on-line version: DOI: 10.1016/j.expneurol.2017.02.012, published February 16th, 2017).
4. van Schaik IN, Bril V, van Geloven N, Hartung HP, Lewis RA, Sobue G, Lawo JP, Praus M, Mielke O, Durn BL, Cornblath DR, Merkies ISJ; PATH study group. Subcutaneous immunoglobulin for maintenance treatment in chronic inflammatory demyelinating polyneuropathy (PATH): a randomised, double-blind, placebo-controlled, phase 3 trial. *Lancet Neurology* 2017 (DOI: 10.1016/S1474-4422(17)30378-2, published November 6th, 2017).
5. Palladino SP, Helton ES, Jain P, Dong C, Crowley MR, Crossman DK, Ubogu EE. The human blood-nerve barrier transcriptome. *Scientific Reports* 2017 (*In press*; accepted for publication on November 24th, 2017)

Visscher, Kristina

1. Bowman, A., Griffis, J., Visscher, K., Dobbins, A., Gawne, T., Difrancesco, M, Szaflarski, J, (2017) Relationship between alpha rhythm and the default mode network: An EEG-fMRI study Journal of Clinical Neurophysiology, (2017).

Wadiche, Jacques

Nietz AK, Vaden JH, Coddington LT, Overstreet-Wadiche L, Wadiche JI. (2017) Non-synaptic signaling from cerebellar climbing fibers modulates Golgi cell activity. eLife 6: e29215

Adlaf EW, Vaden RJ, Niver AJ, Manuel AF, Onyilo VC, Araujo MT, Dieni CV, Vo HT, King GD, Wadiche JI, Overstreet-Wadiche L (2017) Adult-born neurons modify excitatory synaptic transmission to existing neurons. eLife 6: e19886

Wadiche, Linda

1. Adlaf EW, Vaden RJ, Niver AJ, Manuel AF, Onyilo VC, Araujo MT, Dieni CV, Vo HT, King GD, Wadiche JI, Overstreet-Wadiche L. Adult-born neurons modify excitatory synaptic transmission to existing neurons. Elife. 2017 Jan 30;6. pii: e19886 *Recommended by Faculty of 1000
2. Laszczyk AM, Fox-Quick S, Vo HT, Nettles D, Pugh PC, Overstreet-Wadiche L, King GD. (2017) Klotho regulates postnatal neurogenesis and protects against age-related spatial memory loss. *Neurobiology of Aging*, 59:41-54.
3. Nietz AK, Vaden JH, Coddington LT, Overstreet-Wadiche L, Wadiche JI. (2017) Non-synaptic signaling from cerebellar climbing fibers modulates Golgi cell activity. Elife. 2017 Oct 13;6. pii: e29215

3. Publications (Other)

Austad, Steve

1. Austad SN (2017). Sex differences in health and longevity. In Hazzard's Geriatric Medicine and Gerontology, 7th Edition. J Halter, J Ouslander, S Studenski, K High, S Asthana, C Ritchie, and M Supiano (Eds.) McGraw-Hill: New York. Chapter 8 (pp 133-147). ISBN-13: 978-0-07-183345-5.
2. Schenkelaars Q, Tomczyk S, Wenger Y, Edundayo K, Girard V, Buzgariu W, Austad S, Galliot B. (2017). Hydra, a model system for deciphering the mechanisms of aging and resistance to aging. Handbook of Models for Human Aging, 2nd Ed., PM Conn (ed.). Academic Press: Cambridge, MA.

Gerstenecker, Adam

1. Gerstenecker, A. Neurobehavioral aspects of multiple sclerosis. In: Greenamyre J. T., editor-in-chief. MedLink Neurology. San Diego: MeLink Corporation. Available at www.medlink.com. Last updated: August 2017.
2. Triebel, K. L., Gerstenecker, A., & Marson, D. C. (in press). Financial and Medical Decision Making Capacity in MCI and Dementia. In G. Smith & S. Farias (Eds.), *APA Handbook of Dementia.* Washington DC: APA Books.
3. Gerstenecker, A., Triebel, K. L., & Marson, D. C. (in review). Medico-legal capacities in Mild Cognitive Impairment. In R. W. Parks, R. Zec, M. Bondi, & A. Jefferson (Eds.), *Neuropsychology of Alzheimer's Disease and Other Dementias.* New York, NY: Oxford University Press.

Knight, David

Book

Anticipation and Medicine

Harnett NG, Wood KH, Wheelock MD, Knight AJ, Knight DC

Nadin M, editor. Cham, Switzerland: Springer International Publishing; 2017. Anticipation and the Neural Response to Threat; p219-228

Nakazawa, Kazu

1. Nakazawa K Dentate Mossy Cell and Pattern Separation. Neuron 93, 465-467 [PMID: 28182899]
2. Nakazawa K Electrophysiological evidence for defective fast-spiking GABAergic neurons in a schizophrenia model. Acta Physiologica, DOI: 10.1111/apha.12817 [PMID: 27987262]

Triebel, Kristen

Book chapters in press:

1. Triebel, K. L., Gerstenecker, A., & Marson, D. C. (in press). Financial and Medical Decision Making Capacity in MCI and Dementia. In G. Smith & S. Farias (Eds.), *APA Handbook of Dementia.* Washington DC: APA Books.

2. Gerstenecker, A., Triebel, K. L., & Marson, D. C. (in press). Medico-legal capacities in Mild Cognitive Impairment. In R. W. Parks, R. Zec, M. Bondi, & A. Jefferson (Eds.), *Neuropsychology of Alzheimer's Disease and Other Dementias.* New York, NY: Oxford University Press.

4. **Presentations at scientific meetings**

Austad, Steve

1. Keynote Address. 2nd Scripps Florida Symposium on the Biology of Aging. The Scripps Research Institute, Jupiter, FL.
2. Invited speaker. 8th Aquatic Animal Models of Human Disease Conference. Birmingham, AL
3. Plenary speaker. Annual Women's Health Initiative Annual Meeting. Columbus, OH
4. Invited speaker. MIXiii Biomed. 16th National Life Science & Technology Week. Tel Aviv, Israel
5. Invited speaker and moderator. American Aging Association Annual Pre-meeting Conference. New York City, NY
6. Invited speaker. American Aging Association Annual Meeting. New York City, NY
7. Course Faculty. 25th Annual Summer Training Course in Experimental Aging Research. University of Washington, Seattle, WA
8. Course Faculty. National Institute on Aging's Butler-Williams Scholarship Program. Bethesda, MD
9. Session Chair and Speaker. A Cross-Species and Cross-National Examination of Sex Differences in Healthy Aging. 21st IAGG World Congress of Gerontology and Geriatrics. San Francisco, CA
10. Invited speaker. National Institute on Aging/McKnight Brain Institute-sponsored Cognitive Aging Summit III. Bethesda, MD.

Benveniste, Tika

1. Invited Speaker, Gordon Research Conference, Neuroimmune Communication in Health and Disease, Ventura, California, January 15-20, 2017
2. Invited Judge, ACTRIMS Meeting, Orlando, Florida, February 23-25, 2017
3. Invited Speaker, Council for Faculty and Academic Societies (CFAS) Annual Meeting "Faculty of Tomorrow's Academic Health Center", "Discovery Science in the Biomedical Research Center", Orlando, Florida, March 9-11, 2017
4. Organizer, UAB Multiple Sclerosis Symposium, Birmingham, Alabama, June 1-2, 2017
5. Invited Speaker, Synthetic Immunity Conference, Sante Fe, New Mexico, July 10-17, 2017
6. Invited Speaker, Johns Hopkins University, School of Medicine, Baltimore, Maryland, December 5, 2017

Bradley, Virginia Wadley

1. Mefford, M., Muntner, P.M., Rosenson, R., Cushman, M., Farkouh, M., McClure, L.A., Wadley, V.G., Safford, M.M., Somaratne, R., Monda, K., Levitan, E.B. PCSK9 Variants and neurocognitive impairment: data from the REasons for Geographic and Racial Differences in Stroke (REGARDS) study. Presented at the American College of Cardiology's 66th Annual Scientific Session & Expo in Washington, DC, March, 2017.
2. Passler JS, Kennedy RE, Crowe M, Clay OJ, Howard VJ, Wadley VG. The relationship of cognitive decline and impairment to the AD8 and activities of daily living in the REGARDS sample. Accepted for presentation at the 46th annual meeting of the International Neuropsychological Society, Washington, DC, February, 2018.

Day, Jeremy

1. Symposium Speaker, 25th World Congress of Psychiatric Genetics (Orlando, FL)
2. Seminar speaker, Emory University, Department of Human Genetics
3. Seminar speaker, University of California at Irvine, Department of Anatomy and Neurobiology
4. Discussion Leader, Gordon Research Conference on Catecholamines
5. Seminar speaker, University of Minnesota, Department of Neuroscience
6. Symposium Speaker, 19th annual Genes, Brain, and Behavior Conference (Madrid, Spain)

7. Symposium Speaker, UAB Department of Psychiatry Annual Research Symposium
8. Seminar Speaker, University of Pennsylvania, Mahoney Institute for Neurosciences
9. Seminar Speaker, Tulane University, Department of Cell and Molecular Biology
10. Seminar Speaker, Purdue University, Department of Biochemistry

Gamlin, Paul

1. Immunotoxin-induced ablation of ipRGCs. 32nd International Pupil Colloquium, Morges, Switzerland – September 2017
2. "Intrinsically-photosensitive Ganglion cells: Anatomy, physiology and behavioral roles", University of Pisa, Pisa, Italy – September 2017

Gavin, Cristin

NIH Training and Workforce Development Program Directors Meeting, June 2017
Baltimore, MD; Title: The Postbaccalaureate Research Education Program at the University of Alabama at Birmingham

Geldmacher, David

1. Qureshi I, Grundman M, Tirucherai G, Bechtold C, Ahlijanian M, Kolaitis G, Golbe LI, Honig LS, Isaacson S, Grossman M, McFarland NR, Litvan I, Geldmacher DS, Xie T, Bordelon Y. Multiple Ascending Dose Study of the Tau-Directed Monoclonal Antibody BMS-986168 in Patients with Progressive Supranuclear Palsy. Presented at 2017 Clinical Trials in Alzheimer';s Disease Annual Meeting, Boston, November 2017
2. Nguyen M, Pilonieta G, Geldmacher DS. Family Quality of Life and Caregiver Self-Efficacy Among African-American Families. Poster presented at the Alzheimer's Association International Conference, London, UK, July 2017
3. Mehra N, Pilonieta G, Geldmacher DS. Comparison of Two Brief Cognitive Screening Tests and Relationship to Subjective Cognitive Complaints in a Primary Care Setting. Poster presented at the Alzheimer's Association International Conference, London, UK, July 2017
4. Perez SR, Pilonieta G, Hammond J, Geldmacher DS. Alabama Brief Cognitive Screener Scores Predict Level of Impairment in Instrumental Activities of Daily Living in Dementia with Lewy Bodies and other Parkinsonian Syndromes, Presented at AD/PD 2017, the 13th International Conference on Alzheimer's and Parkinson's Diseases and Related Neurological Disorders, Vienna, Austria, March 2017
5. Perez SR, Pilonieta G, Hammond J, Geldmacher DS. The Clock Drawing Test Serves as a Time Saving Surrogate for the Alabama Brief Cognitive Screener, Presented at AD/PD 2017, the 13th International Conference on Alzheimer's and Parkinson's Diseases and Related Neurological Disorders, Vienna, Austria, March 2017

Gerstenecker, Adam

1. Del Bene, V., Niccolai, L., Gerstenecker, A., Triebel, K., Martin, R., & Marson, D. C. (2018, February). *Verbal memory decline on the California Verbal Learning Test-II (CVLT-II) in APOE4 gene carriers: A replication study*. Poster to be presented at the Annual Meeting of the International Neuropsychological Society, Washington, D.C.
2. Del Bene, V., Niccolai, L., Gerstenecker, A., Triebel, K., Martin, R., & Marson, D. C. (2018, February). *Financial capacity deficits in patients with amnestic and non-amnestic forms of mild cognitive impairment*. Poster to be presented at the Annual Meeting of the International Neuropsychological Society, Washington, D.C.
3. Niccolai, L., Del Bene, V., Gerstenecker, A., Triebel, K., Martin, R., & Marson, D. C. (2018, February). *Trail-Making Test performances of patients with amnestic and non-amnestic MCI.*

Poster to be presented at the Annual Meeting of the International Neuropsychological Society, Washington, D.C.

4. Swanson, C. J., Marson, D. C., McPherson, T., Gerstenecker, A., & Logovinsky, V. (2017). The Financial Capacity Instrument—Short Form Is a Novel, Performance-Based Measure that May Help Differentiate MCI and Mild AD Populations in Clinical Trials. To be presented at the annual the Alzheimer's Association International Conference. London, England.
5. Wood, K., Memon, R., Reid, M. A., Joop, A., Pilkington, J., Harnett, N. G., DeRamus, T. P., Gerstenecker, A., Triebel, K., Bamman, M., & Amara, A. W. (2017). *Hippocampal neurochemistry is associated with cognitive performance in patients with Parkinson's disease.* To be presented at the annual Movement Disorders Society: Neuroimaging in Parkinson's Disease and Related Disorders Symposium. Calgary, Alberta, Canada.

Goldberg, Matthew

1. Creed, RB and Goldberg MS, Analysis of neuropathology in Pink1 knockout rats induced by Alpha-synuclein preformed fibrils, Society for Neuroscience Annual meeting.
2. L. J. Mcmeekin, E. E. Ubogu, G. C. Rowe, Y. Tang, A. M. Schonhoff, A. F. Manuel, A. Long, N. Bryant, N. K. Mokha, A. M. Rizwan, M. V. King, R. B. Creed, S. M. Wilson, M. S. Goldberg; Behavioral, histological and electrophysiological analysis of PINK1 knockout rats, Society for Neuroscience Annual meeting.

Gray, Michelle

1. Cardiac Arrythmias in BACHD Huntington's disease mouse model. Comprehensive Cardiovascular Center 6th Annual Symposium, University of Alabama at Birmingham, September 2017.
2. Huntington's Disease research update. Huntington's Disease Research Symposium, Huntington's Disease Society of America, Annual Meeting, Schaumburg, IL, June 2017.
3. Modeling X-Linked Dystonia Parkinsonism using BAC transgenesis. Collaborative Center for X-Linked Dystonia/Parkinsonism Research. Boston, MA, May 2017.

Gross, Alecia

Paper presentation at Association for Research in Vision and Ophthalmology (ARVO) 2017 Annual meeting, Baltimore, MD

Herskowitz, Jeremy

1. Boros BD, Gentry EG, Birchall EL, Gearing M, **Herskowitz JH**. Structural remodeling of dendritic spines provides cognitive resilience against Alzheimer's disease pathology. *Alzheimer's Association International Conference*. London, England, 2017.

2. Volpicelli-Daley LA, Froula JM, Henderson BW, Gonzales J, Vaden JH, Dib AG, Overstreet-Wadiche L, **Herskowitz JH**. Neuronal defects caused by early formation of alpha-synuclein inclusions. *Society for Neuroscience*. Washington, DC, 2017.

3. Henderson BW, **Herskowitz JH**. Amyloid-β induces dendritic degeneration by altering Rho kinase (ROCK) signaling in Alzheimer's disease. *Society for Neuroscience*. Washington, DC, 2017.

4. Boros BD, Gentry EG, Birchall EL, Gearing M, **Herskowitz JH**. Dendritic spine structural remodeling provides cognitive resilience against Alzheimer's disease pathology. *Society for Neuroscience*. Washington, DC, 2017.

King, Gwen

1. American Society for Neurochemistry Annual Meeting 2017. "Klotho regulates postnatal neurogenesis and protects against age-related loss of dentate gyrus function." Little Rock, AK March 18-22, 2017. Abstract among top 12 of 115 abstracts submitted

2. Civitan International/Simpson-Ramsey Neurodevelopment Symposium. "Adult Neurogenesis and Klotho". UAB Hill Center, Birmingham AL April 20, 2017
3. Nathan Shock Center Symposium on the Basic Biology of Aging. "Klotho regulates postnatal neurogenesis and protects against age-related loss of dentate gyrus function." UAB Hill Center, Birmingham, AL March 15th, 2017

Knight, David

1. Goodman, A. M., Wheelock M. D., Harnett, N. G., Hurst, D. R., Orem, T. R., Deshpande, G., Mrug, S., & Knight, D. C. (2017). Stress-induced changes in effective connectivity during the emotional response to threat. Poster presented at the 47th Annual Meeting of the Society for Neuroscience. Washington, D.C.
2. Harnett, N. G., Ference, E. W., Wood, K. H., Reid, M. A., Wheelock, M. D., Lahti, A. C., Knight, A. J., & Knight, D. C. (2017). Human Functional, Structural, and Biochemical Neuroimaging of Acute Post-Traumatic Stress. Poster presented at the 47th Annual Meeting of the Society for Neuroscience. Washington, D.C.
3. Bell, K., Harnett, N. G., Goodman, A. M., Mrug, S., Schuster, M. A., Elliot, M. N., Tortolero, S. R., & Knight, D. C. (2017). The influence of environment during adolescence on white matter structure. Poster presented at the 47th Annual Meeting of the Society for Neuroscience. Washington, D.C.
4. Purcell, J. B., Goodman, A. M., Harnett, N. G., Mrug, S., Elliott, M.N., Tortolero Emery, S., Schuster, M. A., Knight, D. C. (2017). Investigating the effects of violence exposure, physical abuse, and sexual abuse on brain activity following exposure to psychosocial stress. Poster presented at the 47th Annual Meeting of the Society for Neuroscience. Washington, D.C.
5. Davis, E. S., Goodman, A. M., Orem, T. R., Wheelock, M. D., Harnett, N. G., Mrug, S., Knight, D. C. (2017). Self-reported stress, violence exposure, and neural activity. Presented at Society for Neuroscience Annual Conference, Washington, D.C.
6. Dark, H. E., Harnett, N. G., Goodman, A. M., Wheelock, M. D., Mrug, S., Schuster, M. A., Elliott, M. N., Tortolero, S., Knight, D. C. (2017). Affective style modulates the relationship between cumulative violence exposure and change in functional connectivity after stress-induction. Presented at Society for Neuroscience Annual Conference, Washington, DC.
7. Zhang, Y., Taub, E., Salibi, N., Uswatte, G., Maudsley, A. A., Sheriff, S., Womble, B., Mark, V. W., Knight, D. C. (2017). Comparison of reproducibility of Single Voxel Spectroscopy and Whole Brain Magnetic Resonance Spectroscopy Imaging in hippocampi at 3T. Presented at Society for Neuroscience Annual Conference, Washington, DC.
8. Zhang, Y., Taub, E., Salibi, N., Uswatte, G., Maudsley, A. A., Sheriff, S., Womble, B., Mark, V. W., Knight, D. C. (2017). Comparison of reproducibility of Single Voxel Spectroscopy and Whole Brain Magnetic Resonance Spectroscopy Imaging in motor cortices at 3T. American Society of Neurorehabilitation Annual Meeting, Washington DC.

Nakazawa, Kazu

1. "Dysfunction of GABAergic interneurons and neuropsychiatric illnesses", at MIT Colloquium on the Brain and Cognition in Department of Brain and Cognitive Sciences at MIT, Cambridge, MA, October 12, 2017.
2. "Cortical hypodopaminergia vs striatal hyperdopaminergia revisited in an NMDAR hypofunction model of schizophrenia", at Symposium: "Alterations in NRG/ErbB and NMDA signaling may contribute to brain region-specific dopamine dysbalance in schizophrenia" at International Congress on Schizophrenia Research (ICOSR) 2017, San Diego.

Pozzo-Miller, Lucas

1. Speaker at the Gordon Research Conference on "*Excitatory Synapses and Brain Function"*. Les Diablerets, Switzerland.
2. Distinguished institute-wide speaker, Instituto Ferreyra, CONICET, Córdoba, Argentina.
3. Speaker in the *Translational Science* session at the 14th Meeting of *RettSyndrome.org*, Chicago, IL.

Standaert, David

1. Harvard/Longwood Neurology Grand Rounds Lecture, "Neuroinflamation in Parkinson Disease", Boston, MA
2. Neurology Grand Rounds, UAB Department of Neurology, "Treatment of Parkinson Disease: Past, Present and Future."
3. MDS-PAS Congress, chair for Plenary Session 1103; *Update on Parkinson's* Disease Therapeutics
4. MDS-PAS Congress "Controversies: Immunotherapies"
5. MDS-PAS Congress "Parallel Session 3203; *Inflammation, Infections and* Immunity in Movement Disorders"
6. American Society for Experimental Neurotherapeutics (ASENT), Washington, DC, featured speaker, "Parkinson disease."
7. 5th Annual Shaping the Management of Parkinson's Disease: Debating the Most Controversial Diagnostic and Therapeutic Issues, ST. Petersburg, FL – speaker, "Biomarkers"
8. Parkinson's disease and alpha-synuclein: preparing for neuroprotection, University of Barcelona, Speaker
9. 6th Biennal meeting on Dystonia, Rome, Italy – speaker
10. MDS Course for Neurology Residents, "Parkinson Disease: Etiology and Pathogenesis" (speaker, course co-organizer)

Ubogu, Eroboghene

The Human Blood-Nerve Barrier: Clinical and Translational Aspects. Session: The Neurovascular Unit and Specialized Neural Barriers in Disease: The Blood-Nerve Barrier. "The Impact of the Central Nervous System Sanctuary Mediated by the Neurovascular Unit in Neurologic Disease". The 23rd Annual Blood-Brain Barrier Consortium Meeting in collaboration with the International Brain Barriers Society, Skamania Lodge, Stevenson, Washington, March 2nd, 2017.

5. **Presentations at public (non-scientific) meetings or events**

Austad, Steve

1. Invited speaker. Stanford Center on Longevity 10th Anniversary Celebration. Palo Alto, CA.
2. Invited speaker. National Institute on Aging Taskforce on Minority Aging and Health Disparities. Bethesda, MD
3. Invited Seminar. Reynolds Oklahoma Center on Aging, University of Oklahoma Health Sciences Center, Oklahoma City, OK.
4. Invited Seminar. University of Oklahoma, Department of Biology. Norman, OK.
5. Invited speaker. Investment for Cures 2017. New York City, NY
6. Course Faculty. 25th Annual Summer Training Course in Experimental Aging Research. University of Washington, Seattle, WA
7. Course Faculty. National Institute on Aging's Butler-Williams Scholarship Program. Bethesda, MD

Gavin, Cristin
2017 Summer Science Institute (CORD) – student recruiting; presented twice to high school students about student and faculty research in the Undergraduate Neuroscience Program
UAB Undergraduate Student Recruitment for UAB Admissions, UAB Night, Keynote speaker at Huntsville and Nashville events

Geldmacher, David
1. Identifying Non-Alzheimer causes of Memory Loss. Huntsville Hospital Annual Neuroscience Conference, Huntsville, AL , April 2017
2. Research in Alzheimer's Disease. Alzheimer's of Central Alabama Annual "Alzheimer's in Alabama" caregiver conference. Birmingham AL, September 2017
3. Alzheimer's Update. Caregiver Conference, Alzheimer's Association (Huntsville Office), Anniston, AL, August 2017
4. Alzheimer's and dementia. Osher Lifelong Learning Institute, Birmingham Chapter, Birmingham AL, March 2017

Goldberg, Matthew
"Mitochondrial Dysfunction and Parkinson's" presentation at the 2017 Mitochondrial Medicine Southeast Regional Symposium

Gray, Michelle
1. Society for Neuroscience Annual Meeting. Professional Development Workshop. Addressing Issues Facing Women in the Early Stages of their Scientific Career. Washington, DC, November 2017
2. Advancing your career in Biomedical Sciences. Society for the Advancement of Chicanos and Native Americans in Science, University of Alabama at Birmingham Chapter. Birmingham, AL. March 2017

Gross, Alecia
Emory University, Emory Eye Center Vision Science Seminar Distinguished Speaker, Atlanta, GA

King, Gwendalyn
1. Civitan International 100 Year Anniversary Convention – invited speaker. "What smart mice are telling us about brain aging". June 26th, 2017, Birmingham, AL
2. Wilsonville Civitan Club – invited speaker "Brain aging: the good news and the bad". August 5th, 2016, Wilsonville, Alabama

Pozzo-Miller, Lucas
1. Neuroscience Café, UAB Comprehensive Neuroscience Center, Hoover Public Library, Hoover, AL.
2. Civitan International Annual Convention, 100th year celebration, Sheraton Hotel, Birmingham, AL.

Standaert, David G.
1. Canterbury Beeson Forum on Aging
2. ANA/NINDS Career Development Symposium
3. NINDS 2017 workshop for R25 residents and fellows

Triebel, Kristen
Cancer Support Group

Visscher, Kristina

1. Neuroscience Café Seminar Series January 23, 2017. "Training the aging brain" with Karlene Ball and Kristina Visscher
2. Neuroscience Café Seminar Series March 20, 2017 "Making the best of what we have: How patients with vision loss due to macular degeneration learn to use their spared vision and how that changes their brains" with Dawn DeCarlo and Kristina Visscher
3. Abroms-Engel Institute for the Visual Arts. Panel discussion April 12, 2017 "From Eye to Mind: a panel discussion examining the neuroscience of vision as applied to Jessica Angel's installation Facing the Hyperstructure With Marshall Abroms and Jessica Angel and Kristina Visscher

6. **Awards**

Bradley, Virginia Wadley
UAB Department of Medicine Research Excellence Award

Gavin, Cristin
Honors College Faculty Fellow – dean nominated based on excellence in research, teaching, and service, selected by committee to provide outstanding extracurricular programming for honors students and to increase collaboration between faculty and staff across campus. Second year in this appointment.

Knight, David
UAB Dean's Award for Excellence in Mentorship

Visscher, Kristina
1.Graduate School Dean's Award for Excellence in Mentorship
2.Kavli/National Academy of Sciences Frontiers in Science Fellow

Wadiche, Linda
Appointed to Neurodevelopment Faculty of 1000

7. **Faculty.**
Please include abbreviated CV with publications for previous 12 months. See Appendix F

8. **Trainees**

Benveniste, Tika

A. Post doctoral
Wei Yang
Luke Parkitny

B. Pre-doctoal
Sara Gibson
Zhaoqi Yan
Nathalia Melo

C. Other
Briania Smith

Bradley, Virginia Wadley

A. Post doctoral

B. Pre doctoral

Dissertation Committee Chair and Primary Mentor

Caroline Lassen-Greene, MA, Medical Psychology doctoral program.
Dissertation topic: Pre-stroke cognitive performance differences in a stroke case cohort sample as a function of APOE status. Successfully proposed, April 2015; Defense set for May, 2018.

Jesse Passler, PhD candidate, Medical Psychology doctoral program Dissertation: *The relationship of cognitive decline and impairment to the AD8 and activities of living in the REGARDS sample.* Successfully defended, May, 2017.

Kayla Steward, M.A., Medical Psychology doctoral program *Dissertation topic: Self-awareness of functional deficits in older adults with Mild Cognitive Impairment: Examining predictors of poor insight.* Successfully proposed, August, 2017

Dissertation Committee Member

Samantha Henry, M.A., Medical Psychology doctoral program

C. Other

Faculty Mentor

Noha Sharafeldin, MD, NIH K12 Award application, UAB Institute for Cancer Outcomes and Survivorship

Jessica Mirman, PhD, Assistant Professor, UAB Department of Psychology; Center for Clinical and Translational Science (CCTS) R01 grant review panel

Goldberg, Matthew

A. Post doctoral
Sandeep Kumar Barodia
Laura McMeekin

B. Pre-doctoal
Rose Creed

C. Other
Affan Rizwan
Mitchel King
Nimrit Mokha

Gray, Michelle

A. Post doctoral 0

B. Pre-doctoral
Annesha king, GBS Neuroscience Theme

C. Other
Undergraduate
Isaac Rhoades
Amayrani Garcia
Lawela Rose Enfinger

Gross, Alecia

A. Post doctoral 0

B. Pre doctoral
Stefanie M. Percival

C. Other

Evan Boitet
Katie Bales
Bianca Chambliss

Nakazawa, Kazu

A. Kazuhito Nakao
B. Vivek Jeevakumar

Triebel, Kristen

A. Post doctoral – none
B. Pre doctoral
1. Caitlyn Padek
2. Brittney Otruba
3. Victor DelBene

C. Other
1. Mackenzie Fowler
2. Lauren Bolden

Visscher, Kristina

A. Post doctoral
B. Pre doctoral
(a) Leland Fleming
(b) Mandy Biles
(c) Matt Defenderfer
(d) Sara Nolin

C. Other

9. **Clinical/translational programs**

Bradley, Virginia Wadley

A. New Programs

1R01 MH106366-01A1 (Vance, PI) 07/01/2016 – 02/28/2021
(NEW)
NIH/NIMH Wadley Bradley, Co-I
An RCT of Speed of Processing Training in Middle-aged and Older Adults with HIV
The purpose of this trial is to examine the impact of computer based training on adults with and without HIV-associated Neurocognitive Disorder (HAND) and to determine the optimal duration of the intervention sessions.

UAB Alzheimer's Disease Center (Roberson, PI) 07/01/2017 – 06/30/2019
(NEW)
Internal funding/ philanthropy Wadley, Core Leader
The Outreach and Recruitment Core develops partnerships with community and patient populations for engagement in the aims and research of the Alzheimer's Disease Center, with a focus on African Americans.

B. Update on existing clinical studies

- Determinants of Midlife & Longitudinal Change in Cognitive Function: CARDIA Study

CARDIA is a multisite prospective study that recently completed its Y25 follow-up in which cognitive testing and brain MRIs were measured. This ancillary study will repeat/augment cognitive testing for the Y30 visit (2015-16) on an estimated 3100 participants.

- Reasons for Geographic and Racial Differences in Stroke
  The REGARDS project is focused on advancing the understanding of factors contributing to disparities in stroke risk factors and disparities in cognitive impairment by conducting a second in-person evaluation 9 years after the baseline visit and continuing to provide national data on stroke incidence, case fatality, prevalence of cerebrovascular risk factors and lifestyle choices and assess geographic and racial variations in these factors.
- Memory and Cognition IN Decreased Hypertension Substudy (SPRINT MIND) Systolic Blood Pressure Intervention Trial (SPRINT) Clinical Center Networks. This project is investigating the impact of intensively lowering blood pressure on cardiovascular, kidney, and brain outcomes including cognitive function.
- Childhood SES Factors: Impact on Age-Related Cognitive and Vascular Health
  The general aim of this study is to identify childhood and family socioeconomic (SES) factors that shape disparities in vascular and cognitive health.
- Carotid Revascularization Endarterectomy vs. Stenting Trial (CREST-2)
  CREST-2 Statistical and Data Coordinating Center
  The goal of this multicenter clinical trial is to compare carotid revascularization and intensive medical management vs. intensive medical management alone in the prevention of stroke or death within 30 days of enrollment or ipsilateral stroke up to 4-years thereafter in patients with asymptomatic carotid artery stenosis. Cognitive change outcomes within the study arms also will be compared.
- Processing Speed Training to Preserve Driving and Functional Competencies in MCI
  The goal of this randomized clinical trial is to test the effectiveness of an enriched version of Speed of Processing training in supporting functional abilities in persons with MCI, and to identify genetic, neuroimaging, and cognitive biomarkers predicting who can and cannot benefit from this training
- Center for Translational Research on Aging and Mobility
  The purpose of this grant is to develop and pilot new and innovative ideas for early and late stages of the translation of basic behavioral and social research findings at the individual or population level into programs and practices that will improve the lives of older people and the capacity of institutions to adapt to societal aging.

Gray, Michelle

Understanding cardiac abnormalities in Huntington's Disease patients. HDRhythm observational study designed (patient enrollment in March 2018).

Visscher, Kristina

A. New Programs
B. Update on existing clinical studies
   MBAR project is ongoing, at all four sites.

10. **Technology transfer**
    A. Patent applications
    B. Revenue generated from technology

11. **Educational programs focusing on age-related memory loss**

A. Scientific

New Scientific Dialogues symposium held on December 7, 2017. See Appendix D

B. Public

Visscher, Kristina

Along with colleagues at the McWane Science Center, and through our Research Civitan Club, I run a monthly science outreach event called Sci Café at John's City Diner downtown. We have speakers about various topics, and have recently had speakers focusing on aging.

12. **Collaborative programs with other McKnight Institutes, institutions and research programs**

Bradley, Virginia Wadley

McKnight Brain Aging Registry Cognitive Assessment Core (See Above)
McKnight Foundation Cognitive Intervention Core

Day, Jeremy

- University of Arizona (Carol Barnes, Matt Heuntelman)
- University of Florida (Tom Foster) on effort to understand age-related gene expression changes in the hippocampus.

King, Gwendalyn

- Lynn Dobrunz
- Linda Wadiche
- Jeremy Herskowitz

Visscher, Kristina

McKnight Brain Aging Registry

13. **Collaborative programs with non-McKnight institutes, institutions and research programs**

Bradley, Virginia Wadley

Multi-site collaborations—REGARDS, SPRINT, SPRINT ASK, CREST-2, CARDIA

Day, Jeremy

- Collaboration with Charles Gersbach (Duke University) to apply CRISPR tools to study genetic and epigenetic mechanisms in the brain.

King, Gwendalyn

- Stefanie Krick – lung function and klotho
- Daryl Quarles – renal function and klotho
- Christian Faul – FGF23 and klotho
- Yabing Chen – calcification in aging models

Pozzo-Miller, Lucas

A. Within the UAB system

- Sandipan Pati (Neurology)
- Alan Percy (Pediatrics)
- Manimaran Ramani (Pediatrics)
- Victor Mark (Physical Medicine and Rehabilitation)
- Ed Taub (Psychology)
- Gitendra Uswatte (Psychology)

B. Outside the UAB system
- Frank Longo Stanford University, San Francisco, CA
- Tien-Le Xu, Jiao-Tong University, Shanghai, China
- James Eubanks, Toronto Western Hospital, Canada
- Alan Kozikowski, University of Illinois
- Steve Gray, University of North Carolina at Chapel Hill
- Suzanne Oberholster, Sanford University, Birmingham, AL
- Takafumi Inoue, Easeda University, Tokyo, Japan
- Arturo Romano, University of Buenos Aires, Argentina

Visscher, Kristina
Several collaborations, including with Dr. Aaron Seitz at University of California, Riverside, examining adult cortical plasticity in the context of cognitive training. The results of this work will be very relevant for our aging studies, as we are interested in identifying the mechanisms of adult cortical plasticity. Keeping the adult brain plastic is essential for maintaining healthy cognition throughout aging.

APPENDICES

Appendix A

UAB experts help write healthy brain guidelines

Faculty Excellence

by Bob Shepard

- September 21, 2017
- Print
- Email

An American Heart Association panel, including two experts from UAB, says the same healthy habits that can help ward off heart disease or stroke can also help prevent cognitive decline. (See Apppendix Below)

Virginia J. Howard, PhD, professor in the Department of Epidemiology, UAB School of Public Health.A healthy lifestyle benefits the brain as much as the rest of the body and may lessen the risk of cognitive decline (a loss of the ability to think well) as people age, according to a new advisory from the American Heart Association/American Stroke Association. The advisory was written by a panel of 19 medical experts convened by the AHA, including two from the University of Alabama at Birmingham.

Both the heart and brain need adequate blood flow; but in many people, blood vessels slowly become narrowed or blocked over the course of their lives, a disease process known as atherosclerosis, the cause of many heart attacks and strokes. Many risk factors for atherosclerosis can be modified by following a healthy diet, getting enough physical activity, avoiding tobacco products and other strategies.

“Research summarized in the advisory convincingly demonstrates that the same risk factors that cause atherosclerosis are also major contributors to late-life cognitive impairment and Alzheimer’s disease,” said vascular neurologist Philip Gorelick, M.D., the chair of the advisory’s writing group and executive medical director of Mercy Health Hauenstein Neurosciences in Grand Rapids, Michigan. “By following seven simple steps — Life’s Simple 7 — not only can we prevent heart attack and stroke, we may also be able to prevent cognitive impairment.”

Life’s Simple 7 outlines a set of health factors developed by the American Heart Association to define and promote cardiovascular wellness. Studies show these seven factors may also help foster ideal brain health in adults.

The Life’s Simple 7 program urges individuals to:

- Manage blood pressure
- Control cholesterol
- Keep blood sugar normal

- Get physically active
- Eat a healthy diet
- Lose extra weight
- Don't start smoking, or quit

"We can gauge brain health by observing how well we function within our normal environment," said Ronald M. Lazar, PhD, Evelyn F. McKnight Endowed Chair for Learning and Memory in Aging in the Department of Neurology and one of the UAB faculty on the writing group. "A healthy brain allows us to think, communicate, remember, problem solve, have mobility and regulate emotions. Cognitive impairment can affect any or all of those functions."

 Ronald M. Lazar, PhD, Evelyn F. McKnight Endowed Chair for Learning and Memory in Aging in the Department of Neurology, School of Medicine.Lazar and Virginia J. Howard, PhD, a stroke epidemiologist and the other UAB co-author, say the advisory provides a foundation on which to build a broader definition of brain health that includes other influential factors such as the presence of atrial fibrillation, a type of irregular heartbeat that has been linked to cognitive problems; education and literacy; social and economic status; the geographic region where a person lives; and other brain diseases and head injuries.

Howard, professor in the Department of Epidemiology in the UAB School of Public Health, is the co-principal investigator of UAB's long-running REGARDS study, a national effort to learn more about the factors that increase an individual's risk for stroke and cognitive decline.

"Findings from REGARDS were important components in the deliberations that led to the advisory's recommendations," she said. "Equally important, our investigations while preparing the advisory showed areas where the body of knowledge is incomplete or where hypotheses have not been conclusively proved or disproved. This advisory should stimulate new avenues of collaborative research that can fill in the gaps of our understanding."

The advisory, which is published in the American Heart Association's journal Stroke, stresses the importance of taking steps to keep your brain healthy as early as possible, because atherosclerosis — the narrowing of the arteries that causes many heart attacks, heart failure and strokes — can begin in childhood.

"We cannot wait until we are seniors, in retirement or approaching retirement age, to begin focusing on brain health," said Lazar, who is the director of the Evelyn F. McKnight Brain Institute in the UAB School of Medicine. "Some of the effects of cognitive decline are irreversible. Prevention is the key."

The action items from Life's Simple 7, which are based on findings from multiple scientific studies, meet three practical rules the panel developed in pinpointing ways to improve brain health — that they could be measured, modified and monitored.

"Life's Simple 7 are easy concepts for the public to understand and follow, and easy for health care providers to monitor," Howard said. "Blood pressure, for example, can be easily measured, and there are proven ways to positively affect blood pressure. And then, improvement can be measured over time."

The advisory also recognizes that it is important to follow previously published guidance from the American Heart Association, Institute of Medicine and Alzheimer's Association, which include controlling cardiovascular risks and suggest social engagement and other related strategies for maintaining brain health.

Dementia is costly to treat. Direct care expenses are higher than for cancer and about the same for heart disease, estimates from the AHA show. Plus, the value of unpaid caregiving for dementia patients may exceed $200 billion a year. As lives stretch longer in the United States and elsewhere, about 75 million people worldwide could have dementia by 2030, according to the advisory.

"Policymakers will need to allocate health care resources for this," Gorelick said. "Monitoring rates of dementia in places where public health efforts are improving heart health could provide important information about the success of such an approach and the future need for health care resources for the elderly."

The authors of the advisory reviewed 182 published scientific studies to formulate their conclusions that following Life's Simple 7 has the potential to help people maintain a healthy brain throughout life.

Appendix B

UAB MAGAZINE – FALL 2017

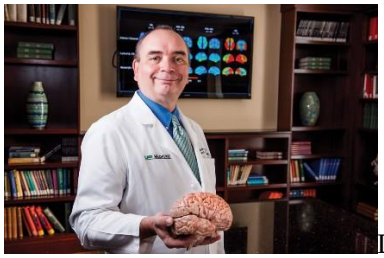
Missing Memories: Helping patients and caregivers in the present; investigating prevention strategies for the future

The number of people coping with a memory disorder or caring for a loved one with a memory disorder is rising. Shortly after being diagnosed with Alzheimer's disease in 2011, singer Glen Campbell recorded a song called "Ghost on the Canvas." The song begins with the line, "I know a place between life and death for you and me."

An existence in limbo is a daily reality for many of the 5.5 million people in the U.S. currently living with Alzheimer's disease or another form of dementia. It also often accurately describes the agonizing circumstances facing the more than 15 million Americans who provide care for family members and loved ones suffering from memory disorders.

"It just takes over your life," Kim Campbell, Glen Campbell's wife of 34 years, said in an interview with *The Tennessean* a few months before Campbell's death from Alzheimer's this past August. "They are losing their identity because they can't remember who they are, but as a caregiver you are losing your identity. You have to give up everything you are doing to take care of them."

UAB researchers are actively working to find treatments and hopefully even a cure for Alzheimer's and other memory disorders. Until those breakthroughs occur, UAB's School of Medicine and School of Nursing are teaming up to try to help current patients and especially caregivers deal with this fatal disease that has been referred to as "the long goodbye."



David Geldmacher from the School of Medicine is co-leading efforts to help people with memory disorders and their families cope and preserve quality of life. "Our focus is to try to promote the quality of life in the family as a whole," says David Geldmacher, MD, holder of the Warren Family Endowed Chair in Neurology and director of the UAB Division of Memory

Disorders and Behavioral Neurology. “There are things we can do for the affected person—prescribe medicines and so forth—but there are also things we can do for the family members and caregivers. Since most people with dementia are cared for in the home environment, our goal is to try to optimize that family’s functioning and quality of life to the greatest extent possible.”

Though Alzheimer’s is the memory disorder that receives the most attention, Geldmacher says there are a number of other diseases and conditions that can cause neurological issues that result in changes to personality and behavior similar to Alzheimer’s. These include Parkinson’s disease, frontotemporal dementia, head injuries, strokes, and even sleep disorders.

“When we use the term dementia, we mean a change in cognition or behavior attributable to brain disease that’s severe enough to interfere with a person’s everyday activities,” Geldmacher says. “So saying ‘dementia’ is like saying ‘headache.’ It’s a generic, overall description of what we observe. But there are many causes of dementia, just like there are many causes for headaches. Dementia is the umbrella term, and specific illnesses like Alzheimer’s disease are the individual spokes.”

A Gathering Storm

Regardless of how the various illnesses are categorized, the overall issue of people in this country suffering from memory disorders is a rapidly growing problem. According to a report released earlier this year by the Centers for Disease Control and Prevention, death rates from Alzheimer’s rose 55 percent from 1999 to 2014 and nearly 14 million people are expected to be afflicted with the disease in the next 20 to 25 years.

“Meanwhile, we have a smaller cohort of people being left behind to take care of these older adults as they move into dementia,” Geldmacher says. “We also have difficulty attracting doctors and nurses to this field, so we have a growing shortage of specialists with an expertise in this area. Unless we come up with treatments that significantly interrupt the progression of the disease or even prevent its emergence, the public health burden on Medicaid and Medicare and the like will be overwhelming by mid-century.”

Rita Jablonski from the School of Nursing is also co-leading efforts to help patients with memory disorders and their families cope. Rita Jablonski, PhD, CRNP, FAAN, FGSA, associate professor with the UAB School of Nursing, is even more emphatic about the problem’s severity. “The dementia crisis is here. It’s not coming; it’s here,” Jablonski says. “Almost $300 billion is expended annually because of this diagnosis, either directly through hospitalization and nursing home care costs or indirectly because family caregivers have to leave the workforce or accept lower-paying positions that enable them to offer care. And that number is only going to go up.”

Since the treatment options for patients with memory disorders remain limited, the focus is increasingly turning toward helping caregivers and other family members deal with the disease. Toward that end, Geldmacher says the UAB Memory Disorders Clinic is creating a new position that he calls “a nurse navigator.”

“Families often don’t know where to turn with their questions,” Geldmacher says. “We hope to provide a single focal point for families that we work with that allows them to call in and get referrals to community resources and other education as needed. We could

potentially even have group educational sessions, where we can help families understand what they're facing and the best ways of managing it."

UAB is also using a $500,000 grant from the U.S. Department of Defense (DoD) on a three-year study to see if family members can be taught caregiving strategies through online or phone instruction. The DoD is interested in studying dementia because a large number of aging and younger veterans are experiencing memory-related problems stemming from head injuries sustained during combat. Such telemedicine programs are important since many rural areas do not offer any assistance for these types of patients and their caregivers.

"We know that a head injury is a risk for developing dementia later in life," Geldmacher says. "And we know that many of the symptoms of people who have experienced repeated brain trauma—such as changes in memory, thinking, and behavior—are very similar to the symptoms that patients with Alzheimer's disease experience. That's why the study for both caregivers of people with Alzheimer's disease and brain injury aims to find out their similarities and their differences. It looks to see if we can create a telemedicine caregiver coaching program that caters to both."

As part of the study, Jablonski says she spends an hour each week for a total of six weeks talking with an individual caregiver. They discuss the problems the caregiver is having with the patient, and Jablonski offers advice on how best to solve the issues. For example, patients with Alzheimer's disease or dementia from traumatic brain injury may resist care efforts from family members, such as taking a bath, taking medicine, practicing routine mouth care, abstaining from alcohol, or going to a medical appointment. When Jablonski and the caregiver talk again a week later, the caregiver will describe what worked well and what didn't and Jablonski will offer fresh advice based on this feedback.

"This type of interaction is mandatory for family members to become more adept at caregiving," Jablonski says. "They know their loved one better than anybody. They can take our general strategies and then tailor them to that person's specific behavior.

"We are logical beings, and logic doesn't work with dementia. So the way you've interacted with them your whole life through logic and reasoning goes out the window with dementia. In fact, a lot of the ways you used to interact with them can now cause behavior triggers that make them upset."

Jablonski says the most common behavior associated with people with memory disorders is repetition, where the person will ask the same question over and over. "Every five minutes they'll ask what time it is," Jablonski says. "Things like that can really wear down family caregivers."

Jablonski teaches techniques that enable caregivers to try to preempt such repetitive behaviors. If a patient continually asks about the time, she says the caregiver should put a large digital clock in the room and then ask the patient what time it is. "Beating the person to the repetitive question can sometimes move the repetitive train of thought off the track," Jablonski says. "You can bounce them out of the loop so maybe that behavior lessens."

On the clinical side, UAB has a group of nurse practitioners who provide longitudinal ongoing care for patients and families facing dementia. Geldmacher points out UAB has the only board-certified cognitive neurologists and nurse practitioners who provide the only outpatient-focused expertise in dementia care in the state. Therefore, it makes sense the School of Medicine and the School of Nursing have formed this partnership to help caregivers navigate this strange and frightening situation.

“Our doctors do a lot of diagnosis, but so much of what happens in the care of the person with dementia is nursing-oriented care, and doctors aren’t really taught that in medical school,” Geldmacher says. “Many people come in wanting to see the doctor because the doctor is going to ‘fix’ the problem. Well, unfortunately for Alzheimer’s disease we know the doctor can’t fix the problem. It’s not going away. That person is going to live with that problem for the rest of their lives.

“How do you live with dementia? That’s what nursing is, the care of the person with the disease. The disease is irrelevant; it’s the person who’s the focus. A lot of people resist transitioning to the nurse practitioner when in fact that health care professional offers the right expertise. The nursing expertise in our group is every bit as important, if not more important, than the physician expertise.”

Prevention & Reduction

With nearly half a million new cases of Alzheimer’s disease diagnosed each year in the U.S.—and an aging baby boomer generation expected to push that figure even higher—it’s clear that efforts to combat the disease will have to do more than treat and support those who are already afflicted. For that reason, clinicians and researchers are increasingly turning their attention toward preventive efforts for Alzheimer’s.

“The lesson we’re drawing from is the history of cardiovascular disease,” says Geldmacher. “In the 1950s, we didn’t know that someone had heart disease until they had a heart attack. Then we realized there were reversible risk factors and that you can treat heart disease long before a heart attack. The day may come when we can do the same thing with Alzheimer’s by finding the illness before any symptoms appear and intervening to prevent brain disease.”

Geldmacher imagines a future where healthy adults undergo routine screenings as they age that look for the earliest signs of Alzheimer’s in the brain with routine scans or tests in the same way blood tests screen for predictors of heart disease. At UAB, clinical trials involving both healthy people and those with dementia, as well as basic research to uncover the molecular underpinnings of Alzheimer’s disease, are helping bring Geldmacher’s vision to life.

Personalized Advice

Today, screening for Alzheimer’s in healthy adults is, in most primary care settings, limited to a short questionnaire. But for those interested in a more detailed examination of their likelihood of developing Alzheimer’s, UAB runs a first-of-its-kind personalized risk clinic, a reflection of the growing influence of precision medicine. Helmed by Geldmacher, the Alzheimer’s Risk Assessment and Intervention Clinic will—for a fee—perform memory tests, collect family history, and carry out a patient’s baseline MRI scan to integrate into his or her personal dementia risk assessment. If the patient has a heightened risk of Alzheimer’s disease, Geldmacher advises the patient how to decrease that risk.

“There’s a lot of junk information on Alzheimer’s out there,” says Geldmacher. “People can’t always sort out what is valid and what is snake oil. We offer personalized attention. We let them know what they can do and inform them on how certain behaviors affect their risk.”

The Alzheimer's Risk Clinic medical professionals' advice is based on a few large studies' results that followed healthy adults and tracked who developed Alzheimer's disease. Studies are still needed to determine whether changing risk factors—like diet—actually alter the risk of Alzheimer's. Additionally, research is needed to uncover new drugs that may prevent the onset of dementia in those most at risk.

Strengthening Defenses

Left to right: Erik Roberson and Jeremy Herskowitz are researching ways to better understand the neurological and neurobiological mechanisms behind the development of Alzheimer's disease.Researchers at UAB and around the country are simultaneously trying to better understand what causes Alzheimer's at a molecular level and how those underlying changes to the brain can be stopped or reversed. Over the past couple of decades, two proteins—amyloid-beta and tau—have been implicated in the disease's development. Both proteins are known to accumulate in the brains of people with Alzheimer's, forming clumps known as amyloid plaques and tau neurofibrillary tangles. But when researchers autopsy the brains of healthy people—who died without ever having memory problems—they also see a significant percentage of brains with amyloid plaques and tau tangles.

According to Jeremy Herskowitz, PhD, an assistant professor of neurology and neurobiology and the Patsy W. and Charles A. Collat Scholar of Neuroscience, "There are large numbers of individuals from between the ages of 60 and 100 who have Alzheimer's pathology but no dementia." Herskowitz is studying what differentiates people who have amyloid-beta and tau pathology in their brains but do not develop dementia from those who have dementia. His lab recently used cutting-edge microscopy techniques to examine brains of elderly individuals who had died with and without Alzheimer's diagnoses. They found that the synapses (connections between nerve cells) in people who avoided Alzheimer's looked completely different—they were longer and more extensive.

"Now we understand how some individuals can withstand dementia despite harboring the pathology in their brains," he says. "We will focus on drugs to remodel the synapses in patients prone to Alzheimer's to slow down the development of dementia." Herskowitz is now pursuing a class of drug that may boost synapses even when amyloid and tau accumulate.

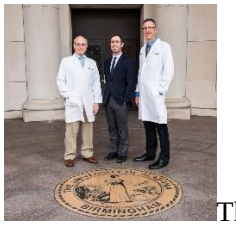
"The research field is beginning to accept the idea that an Alzheimer's therapy will attack the disease from all angles: reducing tau and amyloid, curbing neuroinflammation, and boosting synapses," Herskowitz says.

Erik Roberson, MD, PhD, associate professor of neurology and neurobiology, the Patsy W. and Charles A. Collat Professor of Neuroscience, and director of the UAB Alzheimer's Disease Center, is working on a new twist on of those approaches: attempting to disrupt the effects of tau on the brain. In healthy brain cells, tau proteins help form tracks that transport materials throughout the cells. But when tau proteins accumulate into tangles—as they do in the brains of people with Alzheimer's—transportation goes awry, cells die, and areas of the brain become hyperexcitable.

"In mice, we can fix this hyperexcitability by knocking out their tau genes," says Roberson. "But we can't do that in people." Instead, Roberson's lab is working on developing drugs that keep tau from interacting with other proteins that, when they team up, may cause

the hyperexcitability. Like Herskowitz's plan to change synapses that could block the disease even in the face of amyloid plaques and tau tangles, Roberson is hoping that thwarting tau's interactions may stop Alzheimer's without changing amyloid or tau levels.

Clinical Questions



Through his role as chair of the UAB McKnight Brain Institute, Ronald Lazar is working with researchers like Herskowitz and Roberson to connect memory disorders research. Through his role at the Alzheimer's Disease Center, Roberson is also zooming out from the molecular details of dementia to answer some broader questions about who gets Alzheimer's and why. The center is about to start recruiting patients with and without Alzheimer's to study how health disparities in Alabama contribute to rates of the disease. African-Americans are at a significant higher risk for Alzheimer's, and many other risk factors for dementia—from cardiovascular disease to obesity—are present at higher than average rates in Alabama. "We really need to understand why some people have higher risks and what's unique about them that should guide the way we approach treatment for them," says Roberson.

It is a question that is also at the heart of research being conducted at the UAB Evelyn F. McKnight Brain Institute, which welcomed Ronald Lazar, PhD, the Evelyn F. McKnight Endowed Chair for Learning Memory in Aging in the Department of Neurology, as its new chair this summer.

"We want to take UAB's strengths in both research and clinical medicine and build new relationships between basic scientists and clinical scientists to study age-related memory decline and cognitive decline, and discover how to create resiliency and recovery," says Lazar. "There are a lot of principles that have emerged out of basic science, and there are wonderful cellular and animal models of Alzheimer's. Our challenge is to bring this work forward into the human space."

The institute—one of four McKnight Brain Institutes in the country—was launched at UAB in 2004, and Lazar is already planning new initiatives that include pilot grants to facilitate interdisciplinary work.

Through collaborations with the other McKnight sites, UAB associate professor of neurobiology Kristina Visscher, PhD, is involved in one such interdisciplinary project that aims to define the healthy aging brain.

Kristina Visscher works on imaging studies that seek to define and characterize a healthy aging brain. "There are theories out there that say Alzheimer's is an acceleration of brain aging," explains Visscher, co-director of the Civitan International Neuroimaging Laboratory. "But the problem is that we don't actually understand what a healthy aging brain means."

Visscher and researchers at the McKnight Institutes in Miami and Gainesville, Florida, and Tucson, Arizona, are currently recruiting 200 cognitively healthy people over age 85. The participants undergo tests and scans in three sessions that profile their cognition and

brains. Tests range from timed obstacle courses to memorization challenges, and scans measure such things as the strength of connections between brain areas or the volumes of those areas.

Visscher says she hopes her research reveals what healthy aging brains look like and it teaches us something about how that goes awry in Alzheimer's. Ultimately, she and everyone else studying Alzheimer's want to unlock the secret to growing old without losing one's memory.

"Memory is a function that everybody needs every day to have quality of life, to interact with other people, and to enjoy experiences." says Lazar. "To study memory means we are not only trying to make the Golden Years as meaningful as possible, but we're also trying to preserve this function that maintains civilization and society."

By Cary Estes and Sarah C.P. Wiliams

Quicklinks

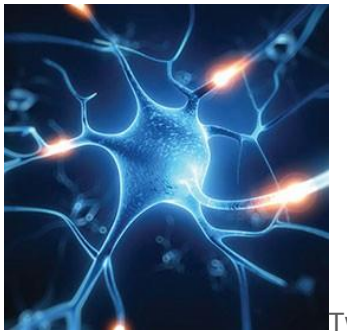
School of Medicine

UAB Medicine

Appendix C

UAB Medicine Magazine Fall 2017

Neural Networking: Neurobiological research shows how synapses change when new neurons are formed



Two UAB neurobiologists are learning how synapses change when new neurons are formed One goal in neurobiology is to understand how the flow of electrical signals through brain circuits gives rise to perception, action, thought, learning, and memories. Linda Overstreet-Wadiche, PhD, and Jacques Wadiche, PhD, associate professors in the UAB Department of Neurobiology and a wife-and-husband team, have published their latest contribution in this effort, focused on a part of the brain that helps form memories: the dentate gyrus of the hippocampus.

The dentate gyrus is one of only two areas in the brain where new neurons are formed continuously in adults through a process called neurogenesis. When a new granule cell neuron is formed in the dentate gyrus, it must get "wired in" by forming synapses, or connections, in order to contribute to circuit function. Dentate granule cells are part of a circuit that receive electrical signals from the entorhinal cortex, a cortical brain region that processes sensory and spatial input from other areas of the brain. By combining this sensory and spatial information, the dentate gyrus can generate a unique memory of an experience.


(Left) Linda Overstreet-Wadiche (Right) Jacques Wadiche

With this in mind, Overstreet-Wadiche and UAB colleagues posed several research questions: Since the number of neurons in the dentate gyrus increases by neurogenesis while the number of neurons in the cortex remains the same, does the brain create additional synapses from the cortical neurons to the new granule cells? Or do some cortical neurons transfer their connections from mature granule cells to the new granule cells?

The answer was revealed through a series of electrophysiology, dendritic spine density, and immunohistochemistry experiments with mice that were genetically altered to produce either more new neurons or to kill off newborn neurons. Their findings support the second model—some of the cortical neurons transfer their connections from mature granule cells to the new granule cells.

This opens the door to look at how this redistribution of synapses between the old and new neurons helps the dentate gyrus function. And it raises tantalizing questions: Does this redistribution disrupt existing memories? How does this redistribution relate to the beneficial effects of exercise, which is a natural way to increase neurogenesis?

"Over the past 10 years there has been evidence supporting a redistribution of synapses between old and new neurons, possibly by a competitive process that the new cells tend to 'win,'" Overstreet-Wadiche says. "Our findings are important because they directly demonstrate that, in order for new cells to win connections, the old cells lose connections. So, the process of adult neurogenesis not only adds new cells to the network, but it also promotes plasticity of the existing network.

“It will be interesting to explore how neurogenesis-induced plasticity contributes to the function of this brain region,” she continues. “Neurogenesis is typically associated with improved acquisition of new information, but some studies have also suggested that neurogenesis promotes ‘forgetting’ of existing memories.”

The researchers also unexpectedly found that the Bax gene, known for its role in cell death (apoptosis), appears to play a role in synaptic pruning in the dentate gyrus. “There is mounting evidence that the cellular machinery that controls cell death also controls the strength and number of synaptic connections,” Overstreet-Wadiche says. “The appropriate balance of synapses strengthening and weakening, collectively termed synaptic plasticity, is critical for appropriate brain function. Therefore, understanding how synaptic pruning occurs may shed light on neurodevelopmental disorders and on neurodegenerative diseases in which a synaptic pruning gone awry may contribute to pathological synapse loss.”

By Jeff Hansen

https://www.uab.edu/medicine/magazine/195-neural-networking-neurobiological-research-shows-how-synapses-change-when-new-neurons-are-formed

Appendix D

HISTORY

On November 5, 2004, the University of Alaba Board of Trustees approved the establishment the Evelyn F. McKnight
Brain Institute at UAB. The Evelyn F. McKnight Brain Institute has the long term goal of translating discoveries from ba biomedical research into processes and products to minimize the deleterious effects of aging on learning and memory in humans.

The purpose of the McKnight Brain Research Foundation is to promote research and investigation of the brain in the fundamental mechanisms that underlie the neurobiology of memory with clinical relevance to the problems of age related memory loss.

THE EVELYN F. McKNIGHT BRAIN INSTITUTE
UNIVERSITY OF ALABAMA AT BIRMINGHAM
Preserving memory, enhancing life

NOTES:

Evelyn F. McKnight Brain Institute

New Scientific Dialogues

Matching basic science and applied neuroscience!

December 7, 2017
8:30 – 11:30 a.m.
Shelby 1015

8:30 Breakfast

9:00 Welcome

Ronald Lazar, PhD
Evelyn F. McKnight Endowed Chair for Learning and Memory in Aging
Department of Neurology

9:15 ***Reperfusion, Cognition & Neuroinflammation***

Ronald Lazar, PhD
Evelyn F. McKnight Endowed Chair for Learning and Memory in Aging
Department of Neurology

Tika Benveniste, PhD
Senior Associate Dean for Research Admin, SOM
Charlene A. Jones Endowed Chair, Neuroimmunology
Professor, Department of Cell, Developmental
And Integrative Biology

9:45 ***Huntington's Disease: From the Brain to the Heart***

Michelle Gray, PhD
Assistant Professor
Department of Neurology

Sabine Huke, PhD
Associate Professor
Med-Cardiovascular

10:15 Break

10:30 ***Hippocampal Architecture in Human Temporal Lobe Epilepsy: From MRI to Epigenetics***

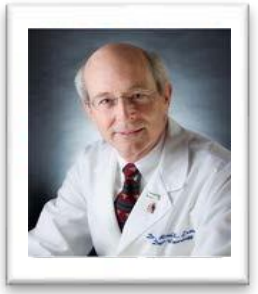
Farah Lubin, PhD
Associate Professor
Director, NINDS, Neuroscience Roadmap Pro
Department of Neurobiology

Lawrence Ver Hoef, MD
Associate Professor
Department of Neurology

11:00 ***The val66met BDNF Single-Nucleotide Polymorphism in Rett Syndrome: A Biostatistical Consultation***

Lucas Pozzo-Miller, PhD
Professor
Interim Scientific Co-director, CIRC
Associate Director, CNC
Co-director, Neuroscience Graduate Theme,
Graduate Biomedical Science
Department of Neurobiology

Lloyd J. Edwards, PhD
Professor and Chair
Department of Biostatistics



Ronald Lazar, PhD

Tika Benveniste, PhD

Michelle Gray, PhD

Sabine Huke, PhD

Farah Lubin, PhD

Lawrence Ver Hoef, MD

Lucas Pozzo-Miller, PhD

Lloyd J. Edwards, PhD

Appendix E

List of Seminar Speakers sponsored by the Evelyn F. McKnight Brain Institute at UAB

Evelyn F. McKnight Brain Institute Seminars 2017		
01/19/2017	Aurelio Galli, PhD University of Vanderbilt	"From the Gut to the Brain: Hormonal Regulation of Brain Dopamine Homeostasis and Cocaine Reward"
02/09/2017	David Weinshenker, PhD Emory University	"Noradrenergic Control of Neurodegenerative Disease"
02/16/2017	Mark Wheeler, PhD Georgia Tech	"Tracking evidence during perceptual decisions using fMRI"
03/16/2017	Aaron Gitler, PhD Stanford University	"Expanding mechanisms and therapeutic targets for neurodegenerative disease"
03/23/2017	Steven Mennerick, PhD Washington University, St. Louis	"Adventures in Hippocampal Neurotransmission"
04/03/2017	Ege Kavalali, PhD UT Southwestern Medical Center	"Mechanisms Underlying Quantal Neurotransmission in Central Synapses"
04/11/2017	Jan-Marion Ramirez, PhD University of Washington School of Medicine, Seattle	"Dissecting the Neuronal Mechanisms Controlling Breathing"
09/07/2017	Fu-Ming Zhou, MD, PhD University of Tennessee Health Science Center	"Dopamine, Ion channels, Basal ganglia and Parkinson's disease"
10/03/2017	Karel Svoboda, PhD Howard Hughes Medical Institute	"The neural circuits underlying short-term memory"
10/19/2017	Rita Cowell, PhD Fellow/Chair of Neuroscience, Southern Research	""Southern Research and the Drug Discovery and Development Pipeline for Neurodegenerative Disorders"
11/09/2017	Babette Fuss, PhD Professor Virginia Commonwealth University	"Extracellular cues as regulators of oligodendrocyte differentiation and (re) myelination"
11/30/2017	Giorgio Ascoli, PhD Krasnow Institute for Advanced Study	"A periodic table of (hippocampal) neurons"

12/07/2017	UAB Faculty: Ronald Lazar, PhD Tika Benveniste, PhD Michelle Gray, PhD Sabine Huke, PhD Farah Lubin, PhD Lawrence Ver Hoef, MD Lucas Pozzo-Miller, PhD Lloyd J. Edwards, PhD	"New Scientific Dialogues – Matching basic science and applied neuroscience!"
12/14/2017	Nicholas Seyfried, PhD Assistant Professor Emory University	"Proteomics-driven Network Approaches for Biomarker Discovery in Alzheimer's Disease"

Appendix F

BIOGRAPHICAL SKETCHES

NAME **Ronald M. Lazar**, PhD, FAAN, FAHA		POSITION TITLE Evelyn K. McKnight Endowed Chair in Learning and Memory in Aging	
EDUCATION/TRAINING			
New York University, University Heights, NY	BA	06/71	Psychology
Northeastern University, Boston, MA	MA	06/73	Psychology
Northeastern University, Boston, MA	PhD	05/77	Psychology
Memorial Sloan-Kettering Cancer Center	Fellow	06/83	Neuropsychology

Positions

1980-1984 Graduate Faculty, Neuropsychology and Learning Processes Programs, CUNY, NY
1980-1984 Assistant Professor of Psychology, Dept of Psychology, Queens College of CUNY, NY
1981-1983 Adjunct Attending Psychologist, Dept of Neurology, Memorial Sloan-Kettering Cancer Center, NY
1983-1984 Assistant Attending Psychologist, Dept of Psychiatry, New York Hospital, NY
1983-1984 Adj Assistant Professor of Psychology (Psychiatry), Cornell University Univ Medical College, NY
1983-1984 Assistant Attending Psychologist, Dept of Neurology, Memorial Sloan-Kettering Cancer Ctr, NY
1984-1993 Chief Psychologist and Director of Neuropsychological Services, Dept of Psychology, Kings County Hospital Center, Brooklyn, NY
1984-1993 Director, Neuropsychology Service, Dept of Neurology, State University Hospital of Brooklyn, NY
1984-1993 Assistant Professor of Neurology and Psychiatry, SUNY/Health Science Center at Brooklyn, NY
1993-1994 Asst Prof of Clinical Neuropsychol, Dept of Neurology, Columbia Univ Coll of Physicians & Surgeons, NY
1994-1996 Associate Professor of Clinical Neuropsychol, Dept of Neurology, Columbia Univ Coll of Physicians & Surgeons, NY
2003-2013 Professor of Clinical Neuropsychology, Depts of Neurology and Neurological Surgery (Tenured), College of Physicians & Surgeons, Columbia University, NY
1994-2017 Professional Neuropsychologist, Dept of Neurology, NY Presbyterian Hospital, NY
1994-2017 Director, Levine Cerebral Localization Laboratory, Stroke Division, Dept of Neurology, NY Neurological Institute, Columbia University Medical Center, New York, NY
2013-Pres Professor of Neuropsychology in Neurology and Neurological Surgery at the Columbia University Medical Center, NY
2017-Pres Evelyn F. McKnight Endowed Chair. Dept of Neurology, Univ of Alabama at Birmingham, Birmingham AL
2017-Pres Professor of Neurology (with Tenure), Dept of Neurology, Univ of Alabama at Birmingham, AL
2017-Pres Director, UAB McKnight Brain Institute, Dept of Neurology, Univ of Alabama at Birmingham, AL

2017-Pres Director, Neuropsychology Division, Dept of Neurology, Univ of Alabama at Birmingham
2017-Pres Senior Scientist, UAB Center for Exercise Medicine, Univ of Alabama at Birmingham
2017-Pres Senior Scientist, UAB Comprehensive Neuroscience Center, Univ of Alabama at Birmingham
2017-Pres Senior Scientist, Center for Neurodegeneration and Experimental Therapeutics at UAB

Honors, Awards, and Advisory Committees

Honors:

Psi Chi / Robert Formica Memorial Award, Department of Psychology, New York University, 1971
Andrew W Mellon Fellow, Dept of Neurology, Memorial Sloan-Kettering Cancer Ctr, 1982-1983
Sigma Xi, 1980
Fellow, American Psychological Association, 2000
Fellow, American Heart Association, 2005
Fellow, American Academy of Neurology, 2011
Fellow, American Neurological Association, 2012
Evelyn K. McKnight Endowed Chair in Learning and Memory in Aging, 2017

Federal Government Advisory Committees

2017 - Pres Fogarty Global Brain Disorders Study Section ZRG1 BDCN-N (55) R, CSR, NIH
2013 – 2015 Agency for Healthcare Quality and Research (AHRQ) US Dept of Health and Human Services, Evidence-based Practice Center Program, Evidence-based Practice Center Program
2009 – 2015 Chartered Member, Acute Neural Injury and Epilepsy (ANIE) Study Section, Center for Scientific Review (CSR), NIH
2002 – 2010 Permanent Member, Circulatory System Devices Advisory Panel, Medical Devices Advisory Committee, Center for Devices and Radiological Health, US FDA
2009 – 2010 ZRG1 BDCN-L (95) S Competitive Revisions; Clinical Neuroscience and Disease, NIH.
1996 Select Committee on Aging. US House of Representatives, Alzheimer's Disease and Related Disorders: The Government's Response. Ninety-Ninth Congress, Second Session (Cold Spring Harbor, New York)

Other Advisory Committees

1995 – 2017 Division 40 (Society for Clinical Neuropsychology), American Psychological Assn
National Co-Chair, Hospital Staff Membership Task Force
Practice Advisory Committee
2014 – 2016 National Institutes of Neurological Disorders and Stroke, NIH
StrokeNet Recovery Working Group

Peer-Review Panels

2011 – Pres Editorial Review Board, *Stroke*
1993 - Pres Ad Hoc Reviewer: New England Journal of Medicine, Anesthesiology, Cancer, Journal of Applied Behavioral Analysis, Annals of Neurology, Epilepsia, Neuropsychologia, Neuropsychology, Circulation, Neuroscience Letters, Journal of the International Neuropsychological Society, Neurology, Stroke, Journal of Neurology, Neurosurgery, & Psychiatry, Cerebrovascular diseases, American Journal of Physical Medicine and Rehabilitation, Resuscitation, Neurosurgery, Brain, Neuropsychology Review, Journal of Neurological Sciences, American Journal of Medicine, Journal of Clinical Anesthesia, Journal of Alzheimer's Disease, Frontiers of

Neurology, Cardovascular Therapy, Annals of Internal Medicine, Neurorehabilitation and Neural Repair, Aphasiology,

Publications (2017 Peer-Review only)

1. Kapadia, S.R., Kodali,, S., Makkar, R., Mehran, R., **Lazar, R.M.,** Virmani, R., Anwaruddin, S., Thourani, V.H., Nazif, T. Mangner, Woitek, F., Krishnaswamy, A., Mick, S., McCabe, J.M., Lowell, L., Zajarias, A., Wilson, Y., Szeto, W.Y., Svensson, L., Alu, M.C. MS, White, Kraemer, C., Parhizgar, A., Leon, M.B., Linke, A. Embolic Protection During Transcatheter Aortic Valve Replacement, Journal of the American College of Cardiology. 2017 Jan 31;69(4):367-377, PMID: 27815101

2. Mokin, M., Zivadinov, R., Dwyer, M.G., **Lazar, R.M.**, Hopkins, L.N., Siddiqui, A.H. Transcatheter Aortic Valve Replacement – Perioperative Stroke and Beyond. Expert Review of Neurotherapeutics, 2017 Apr;17(4):327-334. PMID: 27786568

3. Cramer, S.C., Wolf, S.L., Adams Jr, H.P., Chen, D., Dromerick, A.W., Dunning, K., Ellerbe, C., Grande, A., Janis, S., Lansberg, M.G., **Lazar, R.M.**, PhD, Palesch, Y.Y., Pautler, M., Richards, L., Roth, E., Savitz, S.I., Wechsler, L.R., Wintermark, M., Broderick, J.P. Stroke Recovery & Rehabilitation Research: Issues, Opportunities, and NIH StrokeNet, Stroke. 2017 Mar;48(3):813-819. PMID:28174324

4. Lansky, A.J., Messé, S.R., Brickman, A.M., Dwyer, M., van der Worp, B., **Lazar, R.M.,** Pietras, C.G., Abrams, K.J., McFadden, E., Petersen, N.H., Browndyke, J., Prendergast, B., Ng, V.G., Cutlip, D.E., Kapadia, S., Krucoff, M.W., Linke, A., Moy, C.S., Schofer, J., van Es, G.A., Virmani, R., JPopma. J., Parides, M., Kodali, S., Bilello, M., Akar, J., Furie, K.L., Gress, D., Voros, S., Moses, J., Greer, D., Forrest, J.K. **,** Holmes, D., Kappetein, A.P., Mack, M., Baumbach, A.M.D. Standardized Neurologic Endpoints for Cardiovascular Clinical Trials: An Academic Research Consortium Initiative (NeuroARC), Eur Heart J. 2017 Feb 7. [Epub ahead of print] PMID: 28171522, and J Am Coll Cardiol. 2017 Feb 14;69(6):679-691.
PMID: 28183511

5. Yaghi, S., Herber, C., Boehme, A.K., Andrews, H., Willey, J.Z., Rostanski, S., Khan, M., Marshall, R.S., **Lazar, R.M.**, Boden-Albala, B. NIHSS score Components Predict Infarct Volume in Minor Ischemic Stroke. Journal of Neuroimaging. 2017, [Epub ahead of print] PMID: 28066971

6. Pavol, M.K., Stein, J., Kabir, F.M., Yip, J., Sorkin, L.Y., Marshall, R.S., **Lazar, R.M.** Understanding the connection between cognitive impairment and mobility; what can be gained by neuropsychology assessment? Rehabil Res Pract. 2017;2017. Epub 2017 Apr 27. PMID: 28536658.

7. Howard, V.J., Meschia, J.F., Lal, B.K., Turan, T.N., Roubin, G.S., Brown, R.D., Voeks, J.H., Barrett, K.M., Demaerschalk, B.M., Huston, J., **Lazar, R.M.**, Moore, W.S., Wadley, V.G., Chaturvedi, S., Moy, C.S., Chimowitz, M., Howard, G., Brott, T.G. Carotid revascularization and medical management for asymptomatic carotid stenosis: Protocol of the CREST-2 Clinical Trials, International Journal of Stroke. 2017;12(7):770- 778. [PMID: 28462683]

8. Cukierman-Yaffe, T., Gerstein, H.C., Miller, M.E., Launer, L.J., Williamson, J., Horowitz, K., Ismail-Beigi, F., **Lazar, R.M**. Cognitive function predicts incident CVD in people with diabetes: an analysis from the ACCORD-MIND study, J Clin Endocrinol Metab. 2017 Jun 1. doi: 10.1210/jc.2016-3480. [Epub ahead of print] PMID: 28575229.

9. Lazar, R.M., Boehme, A.K. Aphasia as a predictor of stroke outcome. Journal of the American College of Cardiology, Curr Neurol Neurosci Rep. 2017 Sep 19;17(11):83. PMID: 28929424.

10. Gorelick PB, Furie KL, Iadecola C, Smith EE, Waddy SP, Lloyd-Jones DM, Bae HJ, Bauman MA, Dichgans M, Duncan PW, Girgus M, Howard VJ, **Lazar RM**, Seshadri S, Testai FD, van Gaal S, Yaffe K, Wasiak H, Zerna C; American Heart Association/American Stroke Association. Defining Optimal Brain Health in Adults: A Presidential Advisory From the American Heart Association/American Stroke Association. Stroke. 2017 Oct;48(10):e284-e303.
PMID: 28883125

11. Agarwal S, Presciutti A, Roth W, Matthews E, Rodriguez A, Roh DJ, Park S, Claassen J, **Lazar RM**. Crit Care Med. 2017 Nov 10. [Epub ahead of print] PMID: 29135522

12. Lazar, R.M., Pavol, M., Browndyke, J., Bormann, Dwyer, M.G., Kraemer, C., White, R., Zivadinov,R., Wertheimer, J.C., Thöne-Otto, A., Ravdin, L.D., Naugle,R., Mechanic-Hamilton, D., Garmoe.W.S., Stringer. A.Y., Bender, H.A., Kapadia, S.R., Susheel Kodali, S.K., Ghanem, A., Linke, A., Mehran, R., Virmani, R., Nazif, T., Parhizgar, A., Leon, M.B.et al. Neurocognition and Cerebral lesion burden in High Risk Patients before Undergoing TAVR: The Sentinel Trial, Insights from the Sentinel Trial, Journal of the American College of Cardiology, 2017, in press.

13. Marshall, R.S., Asllani, I., Pavol, M.A., Slattery, P., Cheung, Y.C., **Lazar, R.M**. Regional Altered cerebral hemodyamics and cortical thinning in asymptomatic carotid artery stenosis, PLOS-One, 2017, in press.

Grants/Contracts (2017-present)

Present Support

1 R01 NS097876-01A1 (Lazar, Marshall, Liebeskind, Connolly) 4/1/2017 – 3/31/2022)
NIH/NINDS
Carotid Revascularization and Medical Management for Asymptomatic Carotid Stenosis Trial - Hemodynamics (CREST-H) The goal of this study is to determine whether patients with asymptomatic carotid stenosis who have cerebral hemodynamic compromise and cognitive impairment will improve after revascularization.

1 U01 NS080168-01A1 (Brott) 7/1/2013 – 6/30/2021
NIH/NINDS
CREST-2 Clinical Coordinating Center.
This goal of this project is to assess if contemporary medical therapy is not inferior to contemporary revascularization (carotid endarterectomy or carotid angioplasty/stenting) plus best medical therapy in patients with ≥ 70% asymptomatic carotid stenosis. The cognitive aim is to assess whether medical therapy alone is non-inferior to revascularization to maintain the level of cognitive function at 4 years of follow-up.
Role: Co-I and Cognitive Core PI.

1R21NS096972-01A1 (Lazar/Kodali) 8/1/2016 – 7/31/2018

NIH/NINDS
Cerebral Hemodynamics and Neurocognition in Severe Aortic Valve Disease.
The goal of this project is to determine whether severe aortic stenosis is associated with impaired cerebral hemodynamics and, in turn, impaired cognition, and whether valve replacement is associated with improved cerebral hemodynamics and improved cognition.

1 R21 DK104105-01A1 (Walker) 7/1/2015 – 6/30/2018
NIH/NIDDK
Primary Hyperparathyroidism: Neurocognitive Features.
The goal of this project is to determine whether primary hyperparathyroidism results in reduced cerebral vasomotor reactivity (VMR) that contributes to cognitive dysfunction, and whether reduced VRM can be reversed with surgical intervention.
Role: Co-I

1 R01 NS076277-01A1 (Lazar/Marshall) 4/1/2012-3/31/2018
NIH/NINDS
Blood Flow and Cognition in Asymptomatic Carotid Artery Disease.

This project studies the relationship of four measures of cerebral hemodynamics and cognitive function in patients with asymptomatic carotid artery disease.

Past Support

5 U54 NS081765-02 (Ogedegbe/Williams) 10/1/2012 – 9/30/2017
NIH/NINDS
The goal of this grant is to establish a Center for Stroke Disparities Solutions as a consortium between 3 academic institutions (NYU School of Medicine; Columbia University Medical Center; and SUNY Downstate Medical School); 5 stroke centers and a practice-based research network of primary care practices within New York City's (NYC) Health and Hospital Corporation; the Research Division of the Hebrew Home at Riverdale and the Visiting Nurse Service of NY. The target communities are Black and Hispanic residents of NYC.
Role: Co-I

1 U10NS086728-01 (Marshall) 9/30/2013 – 5/31/2017
NIH/NINDS
New York Stroke Trials Network of Columbia and Cornell (NYCCSTN)
The goal of this program is to establish an infrastructure that would maximize stroke clinical trial enrollment in studies targeted to acute treatment, primary and secondary stroke prevention and stroke recovery.
Role: Co-I and Rehabilitation Core Leader

BIOGRAPHICAL SKETCH

NAME **Steven N. Austad**		POSITION TITLE Assistant Professor	
EDUCATION/TRAINING			
INSTITUTION/LOCATION Uni of CA, Los Angeles CA State Uni, Norhtridge Purdue University	DEGREE B.A. B.A. PhD	YEAR(S) 1969 1976 1981	FIELD OF STUDY English Literature Biology Biological Sciences

Positions

2014 – present: Distinguished Professor & Chair, Department of Biology, University of Alabama at Birmingham (UAB), Birmingham, AL

- Director. UAB Nathan Shock Center of Excellence in the Basic Biology of Aging.
- Associate Director. UAB Comprehensive Center for Healthy Aging.
- Senior Scientist. UAB Nutrition Obesity Research Center.
- Senior Scientist. UAB Center for Exercise Medicine.
- Senior Scientist. UAB Diabetes Research Center
- Member. UAB McKnight Brain Institute.
- Steering Committee Member. UAB Mentored Experiences in Research, Instruction, and Teaching (MERIT) Program.
- Scientist. UAB Alzheimer's Disease Center.
- Executive Committee Member. UAB Comprehensive Neuroscience Center.
- Investigator, McKnight Brain Institute

2014 – present: **Scientific Director**, American Federation for Aging Research, New York City, NY

- **Co-Director,** Nathan Shock Centers Coordinating Center.

2004 – 2013: **Professor**. University of Texas Health Science Center at San Antonio, Dept. of Cellular & Structural Biology & Barshop Institute for Longevity & Aging Studies

- **Interim Director**, Barshop Institute for Longevity & Aging Studies (2012 – 2013)
- **Director**, Biology of Aging Training Grant (2007-2013)
- **Director**, Comparative Aging Core, Nathan Shock Center of Excellence in the Biology of Aging (2010 – 2013)
- **Co-leader**, Biology of Aging Graduate Track (2006-2011)

1993 - 2013: **Affiliate Professor**. University of Washington School of Medicine, Seattle, Washington. Department of Pathology.

1997 - 2004: **Professor**. University of Idaho. Department of Biological Sciences

1993 - 1998: **Associate in Mammalogy**. Harvard University, Museum of Comparative Zoology.

1993 - 1997: **Associate Professor of Zoology**. University of Idaho. Department of Biological Sciences.

1990 - 1992: **Associate Professor**. Harvard University. Department of Organismic & Evolutionary Biology.

1986 - 1990: **Assistant Professor**. Harvard University. Department of Organismic & Evolutionary Biology.

1984 - 1986: **Visiting Research Assistant Professor**. University of New Mexico. Department of Biology.

1981 - 1983: **Research Associate & Visiting Instructor**. Purdue University. Department of Biological Sciences.

1972 - 1975: **Head Animal Trainer**. Lions, Etc. Inc. Noel Marshall Enterprises. Hollywood, California.

HONORS AND AWARDS:

2016: Elected Fellow, American Association for the Advancement of Science
2015: Fondation IPSEN Longevity Prize. Boulogne-Billancourt, France.
2012: Huck Institutes of Life Sciences Distinguished Lecture. Pennsylvania State University, State College, PA
2011: Irving S. Wright Award of Distinction. American Federation for Aging Research. New York City, New York.
2011: The Fogarty Family Foundation Lecture. The University at Albany's Cancer Research Center. Albany, New York.
2008: Outstanding Alumnus Award, Purdue University, Dept. of Biological Sciences, West Lafayette, Indiana.
2008: Robert R. Kohn Memorial Lecture. Case Western Reserve University, Cleveland, OH
2008: Distinguished Lecturer/Visiting Scholar, Ithaca College, Institute of Gerontology, Ithaca, NY
2007: Inaugural Vincent J. Cristofalo Memorial Lectureship. Institute on Aging, University of Pennsylvania, Philadelphia, PA

- Hayflick Lecture. University of Alabama Birmingham, Department of Nutrition Sciences, Clinical Nutrition Research Center, Birmingham, AL

2004: The Thomas Cole Endowed Lectures. Wabash College, Crawfordsville, Indiana.
2003: The Robert W. Kleemeier Award for Outstanding Research. Gerontological Society of America.

- William Darden Endowed Lecture. University of Alabama, Tuscaloosa, Alabama

2001: University of Idaho Interfraternity Council/Panhellenic Council Faculty Member of the Year.
2001: Frank H. Nelson Distinguished Lecturer in Molecular Biology, Biotechnology and Medicine. Montana State University.
2000**:** Timothy W. and Katherine Altorfer Swain Endowed Lecture in Community Health, The University of Illinois College of Medicine at Peoria. Peoria, Illinois.

1999: Ellison Medical Foundation Senior Scholar Award

1997: Bennett J. Cohen Memorial Lecture. University of Michigan, Institute of Gerontology.

1997: Phi Kappa Phi/University of Idaho Alumni Association Distinguished Faculty Award.

1994: Fifth Nathan A. Shock Award, Gerontological Research Center of the National Institute on Aging.

1994: Winner (with John P. Phelan) Geron Corporation - Samuel Goldstein Distinguished Publication Award, Journals of Gerontology: Biological Science
1993: Elected Member, New York Academy of Sciences, New York, NY

1993: Elected **Fellow**, Gerontological Society of America**:** Biological Sciences Section, Washington, DC

Publications 2017

1. Hoffman JM, O'Neill DG, Creevy KE, Austad SN. 2017. Do female dogs age differently than male dogs? Journals of Gerontology: Biological Science and Medical Sciences. May 2 epub ahead of print. DOI: 10.1093/gerona/glx061. PMCID: in process.
2. Zhang N, Valentine J, Zhou Y, Zhang Y, Bhattacharya A, Walsh ME, Fischer K, Austad S, Osmulski PA, Gaczynska ME, Shoelson S, Van Remmen H, Chen Y, Liang H, Musi N. 2017. Sustained NFκB inhibition improves insulin sensitivity but is detrimental to muscle health. *Aging Cell* 16(4):847-858. DOI: 10.1111/acel.12613. PMC55406420.
3. Austad SN (2017). Sex differences in health and longevity. In *Hazzard's Geriatric Medicine and Gerontology*, 7th Edition. J Halter, J Ouslander, S Studenski, K High, S Asthana, C Ritchie, and M Supiano (Eds.) McGraw-Hill: New York. Chapter 8 (pp 133-147). ISBN-13: 978-0-07-183345-5.
4. Schenkelaars Q, Tomczyk S, Wenger Y, Edundayo K, Girard V, Buzgariu W, Austad S, Galliot B. (2017). *Hydra*, a model system for deciphering the mechanisms of aging and resistance to aging. *Handbook of Models for Human Aging*, 2nd Ed., PM Conn (ed.). Academic Press: Cambridge, MA.

BIOGRAPHICAL SKETCH

NAME **Etty (Tika) Benveniste**		POSITION TITLE Assistant Professor	
EDUCATION/TRAINING			
INSTITUTION/LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
CA State Uni, Chico, CA	B.A.	1978	Biological Sciences
Uni of CA, Los Angeles, CA	PhD	1983	Immunology
Uni of CA, Los Angeles, CA	Post-doc	1986	Neurology

Positions

Academic Appointments

1978 – 1979 Research Biologist, National Institutes of Health, Bethesda, Maryland
1986 – 1988 Assistant Professor, Department of Neurology, University of Alabama at Birmingham
1987 – present Member, Graduate Faculty, Graduate Study in Cellular and Molecular Biology
Graduate Study in Neuroscience, Graduate Study in Cell Biology, UAB
1988 – present Senior Scientist, Center for AIDS Research, University of Alabama at Birmingham
1988 – 1992 Assistant Professor, Departments of Neurology and Cell Biology, UAB
1992 – 1995 Associate Professor, Department of Cell Biology, UAB
1993 – present Senior Scientist, UAB Arthritis Center
1995 – present Professor, Departments of Cell Biology, Physiology and Biophysics, Neurology, and Neurobiology, UAB
1995 – 2000 Director, Graduate Program, Department of Cell Biology, UAB
1997 – 2000 Vice-Chairman, Department of Cell Biology, UAB
1999 – 2001 Founding Associate Dean for Postdoctoral Education, Graduate School, UAB
2000 – 2011 Chair, Department of Cell Biology, UAB
2006 – 2010 Co-Director, HHMI Med-Grad Fellowship Program, UAB
2006 – present Associate Director, Basic Sciences, Comprehensive Cancer Center, UAB
2007 – 2011 Co-Director, Cancer Cell Biology Program, Comprehensive Cancer Center, UAB
2008 – 2015 Alma B. Maxwell UAHSF Endowed Chair, UAB
2012 – 2015 Founding Chair, Department of Cell, Developmental and Integrative Biology, UAB
2014 – 2015 Interim Senior Associate Dean for Research Administration and Development, UAB
2015 – present Co-Director, UAB Multiple Sclerosis Center, UAB
2015 – present Senior Associate Dean for Research Administration, UAB
2016 – present Charlene A. Jones Endowed Chair in Neuroimmunology, UAB
2017 – present Associate Vice President for Medicine and Basic Sciences
2017 – present, Investigator, McKnight Brain Institute

Honors, Awards, and Advisory Committees

Chair: SOM Executive Risk Oversight Committee, 2015-
Chair: SOM Master Space Planning Committee, 2016-
Member: Science and Technology Honors Program Leadership Council, 2016-
Co-Chair: Search Committee, Director of the Comprehensive Cancer Center, 2016-2017
Member: Search Committee, Vice President for Research, 2016
Chair: Internal Advisory Board, UAB Women's Reproductive Health Research (WRHR) Program, 2016-
Member: Search Committee, Chair of Neurobiology, 2017

Member: Internal Advisory Board, Institute for Cancer Outcomes and Survivorship, 2017

Professional Societies

Past-President, American Society of Neurochemistry, 2015- 2017

Member: Council of Faculty and Academic Societies, Association of American Medical Colleges, 2013-

Member: Council of Faculty and Academic Societies, Administrative Council, 2013-

Member: AAMC Distinguished Research Award Selection Committee, 2014, 2015

Member: Americas Committee for Treatment and Research in Multiple Sclerosis (ACTRIMS) Program Committee Advisory Board, 2017-

Publications 2017

1. Lai, Y., Tsai, J., Tseng, Y., Wu, M., Liu, W., Lam, H., Yu, J., Nozell, S.E., and Benveniste, E.N. 2017. Small G proteins Rac GTPases regulate the maintenance of glioblastoma stem-like cells. Oncotarget. 75(15) S 4219-4237.
2. Rowse, A.L., Gibson, S.A., Meares, G.P., Rajbhandari, R., Nozell, S.E., Dees, K.J., Hjelmeland, A.B., McFarland, B.C., and Benveniste, E.N. 2017. Protein kinase CK2 is important for the function of glioblastoma brain tumor initiating cells. J. Neuro Oncol. 132(2):219-229.
3. Klein, R. S., Voskuhl, R., Segal, B. M., Dittel, B. N., Lane, T. E., Bethea, J. R., Carson, M. J., Colton, C., Rosi, S., Anderson, A., Piccio, L., Goverman, J. M., Benveniste, E. N., and Cross, A. H. 2017. Speaking out about gender imbalance in invited speakers improves diversity: an example in neuroimmunology. Nature Immunol. 18(5): 475-478.
4. Gibson, S.A., Yang, W., Yan, Z., Liu, Y., Rowse, A., Weinmann, A. S., Qin, H., and E.N. Benveniste. 2017. Protein kinase CK2 controls the fate between Th17 cell and regulatory T cell differentiation. J. Immunol. 198: 4244-4254.

Manuscripts in preparation

1. Meares, G.P., Rajbhandari, R., Gerigk, M., Tien, C-L., Chang, C., Fehling, S.C., Rowse, A., Mulhern, K.C., Gray, G.K., Berbari, N.F., Benveniste, E.N., and Nozell, S.E. 2017. MicroRNA-31 is required for maintaining astrocyte identity. Under revision.
2. Harms, A.S., Thome, A.D., Liu, Y., Yu, H., Li, X., Volpicelli-Daley, L.A., Benveniste, E.N., Qin, H., and Standaert, D.G. 2017. Peripheral monocyte entry is required for alpha-synuclein induced inflammation and neurodegeneration. Under review.
3. Gibson, S. A., Yang, W., Yan, Z., Qin, H., and E.N. Benveniste. 2017. CK2 Controls Th17 and Regulatory T Cell Differentiation Through Inhibition of FoxO1. Submitted.
4. Gibson, S. A., and E. N. Benveniste. 2017. Protein kinase CK2: An emerging regulator of immunity. Trends in Immunol. In preparation.

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
Mark Bolding, PhD	Associate Professor

Current Position:
Associate Professor
Division of Advanced Medical Imaging
Department of Radiology
Director, Civitan International Neuroimaging Laboratory
mbolding@uabmc.edu
205-975-4060

Areas of interest:
Vision - visual behavior and visual cognition; psychiatry – schizophrenia; imaging - MRI and neuroimaging

CURRENT

R01MH102951 (Lahti) 04/01/14-01/31/19 2.4 calendar
NIMH/NIH $403,512
Glutamate, Brain Connectivity and Duration of Untreated Psychosis
The primary aim of the research is to better understand the relationship between duration of psychosis, metabolites measured using MRS, and measures of structural and functional connectivity.

90IF0104-01-00 (DeCarlo) 09/30/15 – 09/29/18 1.44 calendar
DHHS/ACL/NIDDLR $199,909
Prognostic Indicators for Reading in Pediatric Vision Impairment
This longitudinal study will young children with vision impairment to evaluate both top-down and bottom-up processes to determine factors contributing to reading readiness.

1U01EY025858-01A1 (Visscher) 05/01/16 – 04/30/20 1.2 calendar
NEI/NIH $417,330
Changes in Visual Cortical Connectivity Following Central Visual Field Loss
The goal of this project is to identify the neuroplastic mechanisms that allow patients

With macular degeneration to use peripheral vision for tasks, such as reading and recognizing faces, for which people with healthy vision use the macula.

1R01NS094743-01A1 (Ver Hoef) 08/01/16 – 06/30/21 0.6 calendar
NINDS/NIH $417,378

Understanding Hippocampal Internal Architecture in Human Temporal Lobe Epilepsy - From MRI to Epigenetics

This project will assess the performance of a novel high-resolution MRI technique on a common

scanner compared with a special ultra high field research scanner to visualize the internal structure of parts of the brain involved in epilepsy.

1632881 RII Track-2 FEC (Foulger) 09/01/16 – 08/31/20 1.2 calendar
NSF $500,000

The Creation of Next-Generation Tools for Neuroscience - Noninvasive Radioluminescence Approaches to Optogenetics

This is a collaboration between Clemson University, the University of Alabama Birmingham, the University of New Mexico, and the University of South Carolina. The aim of the project is to extend the uses of the experimental method of optogenetics, which, since its introduction in 2005, has had a transformative impact on neurobiology. This method allows experimenters to activate individual neurons or groups of neurons, with high levels of spatial and temporal control, by flashing light on them.

UH3NS100553 (Walker) 09/01/16 – 06/30/21 1.2 calendar
NIH $980,858

Noninvasive Biomarkers to Advance Emerging DBS Electrode Technologies in Parkinson's Disease

The goal of this research is to use minimally invasive, patient-specific cortical physiology elicited by DBS to guide the use of emerging segmented ("directional")
DBS electrode technology in patients with Parkinson's disease.
Role: Co-Investigator

No Number (Visscher) 10/16/14 – 10/15/17 0.6 calendar
McKnight Brain Research Foundation $241,399

Evelyn F. McKnight Neuroimaging Core and Brain Aging Registry

This project will be to support the establishment of the neuroimaging core/brain aging registry

PENDING

R01CA209915 (Bolding) 07/01/16– 06/30/20 2.4 calendar
NCI/NIH $250,000

MRI-Guided Ultrasound Triggered Drug Delivery System for Breast Cancer Therapy

The primary aim of the research is to develop and test a novel drug delivery platform based on using MRI guided focused ultrasound to activate microencapsulated drugs.

12194920 (Bolding)	04/01/17–03/31/19	2.4 calendar
NEI/NIH	$275,000	

High Field Tagged MR Imaging of Extraocular Muscles and Associated Tissues

The primary aim of the research is to develop MR tagging techniques on a 7 Tesla scanner to directly visualize interactions between eye muscles and "pulleys" with very high spatial and temporal resolution.

12464627 (Kesterson)	10/01/18–09/30/21	0.6 calendar
Department of Defense	$525,000	

Translational Animal Models of NF1 Patient Mutations

The goal of this project is to create new genetically engineered mice that can be used to study Neurofibromatosis type 1 (NF1), a genetic disorder causing one of the most common tumor syndromes affecting the nervous system.

S10OD025217 (Bolding)	02/01/18–01/31/19	0.0 calendar
NIH	$299,000	

UAB Bruker BioSpec 9.4T Upgrade

The Magnetic Resonance Imaging (MRI) enabled by the Bruker BioSpec 9.4T MRI scanner provides cost-effective, non-invasive, real-time data in important and relevant animal models of human disease. The upgrade will allow the scanner to remain in operation so that important biological questions can be answered and new therapies can be quickly evaluated.

12502904 (Bolding)	07/01/18-06/30/22	2.4 calendar
NIH	$299,000	

Noninvasive Localized Drug Delivery for Neuromodulation with High Spatial and Temporal Precision

The goal of this project is to develop noninvasive methods for temporally and spatially specific alteration of brain function that can be used in the laboratory and clinic.

OVERLAP:

No overlap. If all pending applications are funded, the percent effort on funded projects will be adjusted to maintain NIH support at or below 12 calendar months.

BIOGRAPHICAL SKETCH

NAME **Virginia G. Wadley Bradley**		POSITION TITLE Professor	
EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
University of Alabama at Birmingham	B.S.	1991	Psychology and
University of Alabama at Birmingham			English
Duke University Medical Center	M.A., PhD	1994, 1997	Medical Psychology
	Internship	1996-1997	Clinical Psychology

Positions

Postdoctoral Training

1997 - 1998 Clinical Associate and Postdoctoral Fellow Duke University Medical Center
Department of Psychiatry and Behavioral Sciences
Division of Behavioral Medicine
Supervisor: James Blumenthal, PhD

1998 - 1999 Instructor and Postdoctoral Fellow University of Alabama at Birmingham
School of Medicine, Department of Neurology
Division of Neuropsychology
Supervisor: Daniel Marson, PhD

2015 - pres. Professor, Department of Medicine, Division of Gerontology, Geriatrics, and Palliative Care; School of Social and Behavioral Sciences, Department of Psychology (secondary appointment); and Department of Ophthalmology (secondary appointment), University of Alabama at Birmingham, Birmingham, AL

2012 - pres. Senior Scientist, Center for Outcomes and Effectiveness Research and Education, University of Alabama at Birmingham, Birmingham, AL

2009 - 2015 Associate Professor, Department of Medicine, Division of Gerontology, Geriatrics, and Palliative Care; School of Social and Behavioral Sciences, Department of Psychology (secondary appointment); and Department of Ophthalmology (secondary appointment—2014-2015)), University of Alabama at Birmingham, Birmingham, AL

2009 - pres. Scientist, appointed, UAB Comprehensive Neuroscience Center

2007 - pres. Associate Director, UAB Edward R. Roybal Center for Translational Research on Aging and Mobility, University of Alabama at Birmingham, Birmingham, AL

2007 - pres. Graduate Faculty, University of Alabama, Tuscaloosa, AL

2005 - 2009 Assistant Professor, Department of Medicine, Division of Gerontology, Geriatrics, and Palliative Care; and School of Social and Behavioral Sciences, Department of Psychology (secondary appointment), University of Alabama at Birmingham, Birmingham, AL

2005 - pres. Director, Dementia Care Research Program, Division of Gerontology, Geriatrics, and Palliative Care, University of Alabama at Birmingham, Birmingham, AL

2005 - pres. Director, Alzheimer's Family Program, Comprehensive Center for Healthy Aging, University of Alabama at Birmingham, Birmingham, AL

2002 - 2009 Scientist, UAB Alzheimer's Disease Research Center

2000 - pres. Senior Scientist (2015), UAB Comprehensive Center for Healthy Aging (formerly Center for Aging)

2000 - 2005 Research Assistant Professor, School of Social and Behavioral Sciences, Department of Psychology, University of Alabama at Birmingham, Birmingham, AL

1999 - 2007 Assistant Director, UAB Edward R. Roybal Center for Translational Research on Aging and Mobility (formerly Center for Research on Applied Gerontology), University of Alabama at Birmingham, Birmingham, AL
1998 - 1999 Instructor, School of Medicine, Department of Neurology, Division of Neuropsychology, University of Alabama at Birmingham, Birmingham, AL
2015 – present Investigator, McKnight Brain Institute

Honors, Awards, and Advisory Committees

1989 Harry S. Truman Scholar for state of Alabama
1990 Outstanding Student, UAB Department of Psychology
1990 Dean's Award, Outstanding Undergraduate in Social and Behavioral Sciences, UAB
1993 - 1994 National Institutes of Health Predoctoral Trainee, Spain Rehabilitation Center, UAB
1994 - 1995 Merit Fellow, UAB Department of Medical Psychology
1996 Outstanding Graduate Student, UAB Department of Medical Psychology
1996 Dean's Award, Outstanding Graduate Student in Social and Behavioral Sciences, UAB
2003 - 2007 Awardee, NIH Loan Repayment Program
2006 Winner, UAB Center for Aging Abstract Competition and Annual Meeting (one of four selected for oral presentation and cash prize)
2010 - 2011 Research Excellence Award, UAB Department of Medicine (cash award for professional development)
2011 - 2012 Research Excellence Award, UAB Department of Medicine (cash award for professional development)
2012 Invited participant, White House Roundtable, Federal Motor Carrier Safety Administration, U.S. Department of Transportation
2012 Winner, UAB Center for Aging Oral Abstract Competition and Annual Meeting (one of four selected for oral presentation and cash prize)
2013 American Psychological Association Nominee to National Heart, Lung and Blood Institute (NHLBI) advisory board
2013 Invited Speaker, Alzheimer's Association Research Roundtable
2012 - 2013 Research Excellence Award, UAB Department of Medicine (cash award for professional development)
2013 - 2014 Research Excellence Award, UAB Department of Medicine (cash award for professional development)
2014 - 2015 Research Excellence Award, UAB Department of Medicine (cash award for professional development)
2016 Invited Speaker, Health Disparities Committee of Alzheimer's Disease and Related Disorders Summit 2016, National Institute of Neurological Disorders and Stroke (NINDS), Washington, DC, March 29-30, 2016
2016 Invited Speaker, Advanced Psychometrics Methods in Cognitive Aging Research: Strengthening Causal Inference in Cognitive Aging Research. National Institute on Aging (NIA) conference grant to UC Davis. Friday Harbor, San Juan Island, Washington, June 5-10, 2016

Publications (2017)

1. Vance DE, Fazeli PL, Shacka JJ, Nicholson WC, McKie P, Raper JL, Azuero A, **Wadley V**, Ball KK. Testing a computerized cognitive training protocol in adults aging with HIV-Associated Neurocognitive Disorders: an RCT in the southern United States. In press 2017, Journal of Medical Internet Research Protocols,6(4), e68. DOI: 10.2196/resprot.6625; PMID: 28446421

2. **Lassen-Greene, C.L., Steward, K., Okonkwo, O., Porter, E., Crowe, M., Vance, D.E., Griffith, H.R., Ball, K., Marson, D.C., **Wadley, V.G**. Mild Cognitive Impairment and changes in everyday function over time: the importance of evaluating both speed and accuracy. Journal of Geriatric Psychiatry and Neurology 2017 Jul; 30(4):220-227. Doi: 10.1177/0891988717711807. PMID: 28639877.
3. Howard VJ, Meschia JF, Lal BK, Turan TN, Roubin GS, Brown RD, Voeks JH, Barrett KM Jr, Demaerschalk BM, Huston J III, Lazar RM, Moore WS, **Wadley VG**, Chaturvedi S, Moy CS, Chimowitz M, Howard G, Brott TG on behalf of the Crest-2 Study. Carotid revascularization and medical management for asymptomatic carotid stenosis: protocol of the CREST-2 clinical trials. International Journal of Stroke 2017 Jan 1:1747493017706238. Doi: 10.1177/174793017706238. PMID: 28462683.
4. Huisingh C, Levitan E, Irvin R, Maclennan P, **Wadley V**, Owsley C. Visual Sensory and Visual-Cognitive Function and Rate of Crash and Near-Crash Involvement among Older Drivers Using Naturalistic Driving Data. Investigative Ophthalmology and Visual Science 2017 Jun 1; 58(7):2959-2967. Doi:10.1167/iovs. 17-21482. PMID: 28605807.
5. Berlowitz DR, Foy CG, Kazis LE, Bolin LP, Conroy MB, Fitzpatrick P, Gure TR, Kimmel PL, Kirchner K, Morisky DE, Newman J, Olney C, Oparil S, Pajewski NM, Powell J, Ramsey T, Simmons DL, Snyder J, Supiano MA, Weiner DE, Whittle J; **SPRINT Research Group**. New England Journal of Medicine 2017 Aug 24;377(8):733-744. Doi: 10.1056/NEJMoa1611179. PMID: 28834483.
6. Fujishiro K, MacDonald LA, Crowe M, McClure LA, Howard VJ, **Wadley VG**. The role of occupation in explaining cognitive functioning in later life: Education and occupational complexity in a US national sample of black and white men and women. Journal of Gerontology Series B: Social Sciences 21 August 2017, https://doi.org/10.1093/geronb/gbx112

Manuscripts submitted but not yet accepted

1. Arora P, Venkatraman A, Callas P, McClure LA,Unverzagt F, Arora G, Howard V, **Wadley VG**, Cushman M. Galectin-3 & incident cognitive impairment in REGARDS, a cohort of blacks & whites.
2. McDonnell, M.M., Hillier, S.L., Roth, D.L., Judd, S.E., Haley, W.E., Esterman, P.J., **Wadley, V.G.,** Howard, V.J. Self-reported pre-stroke physical activity levels and functional ability following incident stroke.

BIOGRAPHICAL SKETCH

NAME **Michael Brenner**		POSITION TITLE Emeritus Professor	
EDUCATION/TRAINING			
INSTITUTION/LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
Harvard College, Cambridge, MA Churchill College, Cambridge, En Uni CA Berkeley, CA	A.B. PhD	1965 1966 1970	Biochemical Sciences Biochemistry

Positions

2015-present Emeritus Professor, Department of Neurobiology, UAB
2007-2015 Professor Department of Neurobiology, UAB
2006 – present Investigator, McKnight Brain Institute
1999-2007 Associate Professor, Department of Neurobiology, UAB
1992-1998 Research Scientist, National Institute of Neurological Disorders and Stroke, NIH, Bethesda, MD, Laboratory of Dr. John Hallenbeck ("Special Expert")
1987-92 Research Scientist, National Institute of Neurological Disorders and Stroke, NIH, Bethesda, MD., Laboratory of Dr. Ernst Freese ("Special Expert")
1985-87 Research Scientist, National Institute of Diabetes, Digestive and Kidney Diseases, NIH, Bethesda, MD, Laboratory of Dr. Jun-ichi Tomizawa ("Expert")
1980-84 Associate Professor, Temple Univ. Medical School, Philadelphia, PA
1979-80 Visiting Assistant Professor, Boston College, Chestnut Hill, MA
1979-80 Research Associate, Harvard University, Cambridge, MA
1976-79 Associate Professor, Harvard University, Cambridge, MA
1972-76 Assistant Professor, Harvard University, Cambridge, MA, Department of Biology

Honors, Awards, and Advisory Committees

Graduated Harvard College Magna cum Laude (1965)
United States Churchill Foundation Fellowship for year at Cambridge University, England (1966)
United States Public Health Service Training Grant (1966-1970)
American Cancer Society Postdoctoral Fellowship (1970-71)
National Institutes of Health Award of Merit (1993)
Grupo Carso Award: biennial award by the Fundación Mexicana para la Salud (Mexican Foundation for Health) for research on organ and tissue transplantation (1999)
Moore Award for best paper on clinico-pathologic correlation, annual meeting of the American Academy of Neuropathogy (2000)
Paper in Nature Genetics selected for commentary (publication #59, 2001)
Outstanding poster award (selected for an oral presentation), Gordon Conference on Intermediate Filaments (2002)
Outstanding poster award (selected for an oral presentation), American Society of Neurochemistry annual meeting (2003)
Paper in Annals of Neurology selected for commentary (publication #74, 2005)
Paper in Glia featured as cover art (publication #79, 2006)
Paper in Movement Disorders featured as cover art (publication #82, 2008)
Graduate Dean's Award for Excellence in Mentorship (2012)

Patent:
United States Patent Number 5,627,047, "Astrocyte-Specific Transcription of Human Genes." granted 6 May 1997, covers the use of the human GFAP regulatory sequences for targeting expression of genes to astrocytes in culture or in transgenic animals. Licensing agreements have been executed with several biotechnology companies.

Publications 2017

Manuscripts in preparation
Brenner, M. and Barton, B.R. (2017) Alexander Disease, In Reference Module in Neuroscience and Biobehavioral Psychology, Elsevier, 2017, ISBN 978-0-12-809324-5, (in press)

Manuscripts in preparation
1.. Heaven, M.R., Flint, D., Wilson, L., Barnes, S., and Brenner, M. Relative stability of mutant GFAP in Alexander disease.
2. Olsen, M., Messing, A., and Brenner, M. Role of AP-1 in the Injury Response of the GFAP Promoter

Books and Book Chapters
Brenner, M. and Nicholas, A.P. (2017) The significance of deiminated GFAP in neurodegenerative diseases with special emphasis on Alexander disease, In Nicholas, A.P. and Bhattacharya, S.K. (eds) Protein Deimination in Human Health and Disease, 2nd Edition, Springer-Verlag New York, pp. 391-412.

BIOGRAPHICAL SKETCH

NAME **Cynthia J. Brown**		POSITION TITLE Professor	
EDUCATION/TRAINING			
INSTITUTION/LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
East Carolina Uni, Greenville, NC	B.S.	1982	Physical Therapy
North Carolina St, Raleigh, NC		1991	
Uni ov North Carolina, Chapel Hill	MD	1996	
UAB	M.S.	2006	Public Health

Positions

2000 – 2003 Staff Physician, St. Mary's Hospital Walk-in Clinic, Naugatuck, CT.
2003 – 2008 Geriatric Program Consultant, UAB Hospital, Birmingham, Alabama
2003 – present Investigator, Birmingham/Atlanta VA Geriatric Research, Education and Clinical Center (GRECC)
2003 – present Medical Director, Birmingham/Atlanta GRECC Fall Prevention and Mobility Clinic
2003 – present Staff Physician, UAB Hospital, UAB Highlands and the Veterans Affairs Medical Center, Birmingham, Alabama
2008 – 2013 Quality Improvement Director, Acute Care for Elders (ACE) Unit, UAB Highlands, Birmingham, Alabama
2017 – present Investigator, McKnight Brain Institute

Honors, Awards, and Advisory Committees

2007 – 2017 Listed in Best Doctors in America – Birmingham

2016 – 2017 Selected for the Hedwig van Ameringen Executive Leadership in Academic Medicine (ELAM) Program for Women

2016 Selected as Top Reviewer for the Annals of Internal Medicine

2017 Graduate School Dean's Award for Excellence in Mentorship, UAB, Birmingham Alabama

Publications 2017

6. Dermody G, Sawyer P, Kennedy R, **Brown CJ**. ED Utilization and Self-Reported Symptoms in Community-Dwelling Older Adults. *J Emerg Nurs*. 2017 Jan;43(1):57-69. PMID: 28131350.

7. Kennedy RE, Sawyer P, Williams CP, Lo AX, Ritchie CS, Roth DL, Allman RM, **Brown CJ**. Life-Space Mobility Change Predicts 6-Month Mortality. *J Amer Geriatr Soc.* 2017; 65(4):833-838. PMID: 28152168.

8. Clay OJ, Perkins M, Wallace G, Crowe M, Sawyer P, **Brown CJ**. Associations of Multimorbid Medical Conditions and Health-related Quality of Life among Older African American men. *J Gerontol B Psychol Sci Soc Sci*. 2017 Jun 27. [Epub ahead of print] PMID: 28658936.

9. Balentine CJ, Leverson G, Vanness D, Knight S, Turan J, **Brown CJ**, Kennedy G, Chen H, Bhatia S. Selecting Post-Acute Care Settings After Abdominal Surgery: Are We Getting It Right? *Am J Surg*. 2017 Sep 20. [Epub ahead of print] PMID: 28951065.

10. Stec MJ, Thalaker-Mercer A, Mayhew DL, Kelly NA, Tuggle C, Merritt EK, **Brown CJ**, Windham ST, Dell'Italia LJ, Bickel CS, Roberts BM, Vaughn KM, Isakova-Donahue I, Many G, Bamman MM. Randomized, Four-Arm, Dose-Response Clinical Trial to Optimize Resistance

Exercise Training for Older Adults with Age-Related Muscle Atrophy. *Exp Gerontol*. 2017;99:98-109. PMID: 28964826.

Manuscripts in preparation

Kennedy RE, Williams CP, Sawyer P, Lo AX, Connelly K, Nassel A, Brown CJ. Life-space Predicts Healthcare Utilization in Community-Dwelling Older Adults (Journal of Aging and Health)

BIOGRAPHICAL SKETCH

NAME **Jeremy J. Day**		POSITION TITLE Assistant Professor	
EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
Auburn University	B.A.	2000-2003	Psychology
University of North Carolina at Chapel Hill	M.A.	2004-2006	Psychology
University of North Carolina at Chapel Hill	PhD	2006-2009	Psychology
University of Alabama at Birmingham		2009-2014	Neurobiology

Positions

2016-present	Interim Associate Director, Civitan International Research Center	UAB
2016-present	Scientist, Alzheimer's Disease Center	UAB
2015-present	Associate Scientist, Civitan International Research Center	UAB
2014-present	Graduate Faculty	UAB
2014-present	Assistant Professor, Dept. of Neurobiology (Primary)	UAB
2014-present	Assistant Professor, Dept. of Genetics (Secondary)	UAB
2014-present	Assistant Professor, Dept. of CDIB (Secondary)	UAB
2014-present	Assistant Professor, Dept. of Psychology (Secondary)	UAB
2014-present	Investigator, McKnight Brain Institute	UAB

Honors, Awards, and Advisory Committees

Faculty

2016	Pittman Scholar, UAB School of Medicine
2015	Avenir Award, National Institute on Drug Abuse
2015	Early Career Travel Award, American College on Neuropsychopharmacology

Reviewer, grant proposals

2015	Parkinson's Disease Society of the United Kingdom, ad hoc reviewer
2015	National Science Foundation CAREER Awards, ad hoc reviewer
2015	NIH/NIDA Scientific Review Group ZDA1 JXR-G (16) R
2016	NIH/NIDA Scientific Review Group ZDA1 SXM-M (13) S

Postdoctoral Training

2013-2014	NIH-NIDA Pathway to Independence Award
2010-2013	NIH-NIDA National Research Service Award
2012	Poster Award, Winter Conference on Brain Research
2011	Travel Award, NIDA Frontiers in Addiction Research Mini-convention
2011	1st place, UAB Dept. of Neurobiology Retreat Postdoctoral Oral Presentation
2010	Scholars Award, UAB Office of Postdoctoral Education
2010	Faculty of 1000 Associate Faculty Member

Graduate Education

2006-2009	NIDA National Research Service Award
2009	Travel Award, Gordon Research Conference on Catecholamines

2009 Travel Award, Gordon Research Conference: Graduate Research Seminar on Catecholamines
2009 Irwin J. Kopin "Young Investigator" Award, Honorable Mention
2008 Poster Award, 12th Conference on In Vivo Methods in Neuroscience
2008 Transportation Grant, University of North Carolina Graduate School
2007 Travel Award, Gordon Research Conference: Graduate Research Seminar on Catecholamines
2007 Teaching Fellowship, University of North Carolina Graduate School
2006 Poster Award, 11th Conference on In Vivo Methods in Neuroscience
2004-2006 NIH Pre-doctoral Training Fellowship (T32 DA007244)

Undergraduate Education
2003 Summa Cum Laude, Auburn University
2003 Undergraduate Research Fellowship, Auburn University

Publications (2017)
1. McCoy, C.R., Jackson, N.L., **Day, J.J.,** & Clinton, S.M. (2017). Genetic predisposition to high anxiety- and depression-like behavior coincides with diminished DNA methylation in the adult rat amygdala. *Behavioral Brain Research* 320:165-178.
2. Duke, C.G., Kennedy, A.J., Gavin, C., **Day, J.J.***, & Sweatt, J.D.* (2017). Experience-dependent epigenomic reorganization in the hippocampus. *Learning & Memory* 24:278-288.
*Corresponding authors
3. Ianov, L., DeBoth, M., Chawla, M., Rani, A., Kennedy, A.J., Piraz, I., **Day, J.J.**, Siniard, A., Kumar, A., Sweatt, J.D., Barnes, C.A., Huentelman, M.J., & Foster, T.C. (In press). Hippocampal transcriptomic profiles: Subfield vulnerability to age and cognitive impairment. *Frontiers in Aging Neuroscience.*
4. Savell, K.E., & **Day, J.J.** Applications of CRISPR/Cas9 in the mammalian central nervous system. (In press). *Yale Journal of Biology and Medicine.*

Manuscripts in review/revision
1. McMeekin, L.J., Li, Y., Crossman, D.K., **Day, J.J.,** Li, Y., Detloff, P.J., & Cowell, R.M. (In revision). Cell-specific deletion of PGC-1a from medium spiny neurons causes transcriptional alterations and age-related motor impairment.
2. Guzman-Karlsson, M.C., Fleming, L.L., Brown, J.A., Sesay, F., Lifer, R.L., Hawkins, K.E., Kennedy, A.J., **Day, J.J.,** Roberson, E.D., & Sweatt, J.D. (In review). Genome-wide transcription and DNA methylation profiling in an APP mouse model of Alzheimer's disease.
3. Azam, A.B., Walters, B.J., Stefanelli, G., Narkaj, K., **Day, J.J.**, & Zovkic, I.B. (In review). Learning and age-related changes in genome-wide H2A.Z binding in the hippocampus.
4. Gallus, N.V.N., Simon, R., Revanna, J.S., Bunner, K.D., Savell, K.E., Sultan, F., & **Day, J.J.** (In review). Functional modulation of activity-dependent transcription by non-coding enhancer RNAs.

BIOGRAPHICAL SKETCH

NAME **Lynn Dobrunz**		POSITION TITLE Professor	
EDUCATION/TRAINING			
INSTITUTION/LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
Harvard University, Cambridge, MA	B.S.	1988	Engineering Science
Johns Hopkins, Baltimore, MD	PhD	1994	Biomedical Engineering
Salk Institute, La Jolla, CA	Postdoc	1999	Molecular Neurobiology

Positions

2014-present Associate Director, UAB Comprehensive Neurosciences Center
2008-present Associate Professor, Department of Neurobiology, University of Alabama at Birmingham, Birmingham, AL.
2012-present Secondary appointment, UAB Department of Cell, Developmental and Integrative Biology
2006-present Member, UAB Civitan International Research Center
2006-present Member, UAB Comprehensive Neurosciences Center
2006-present Investigator, McKnight Brain Institute
2005-present Member, UAB Center for Aging
2002-2012 Secondary appointment, UAB Department of Physiology and Biophysics
1999-2008 Assistant Professor, Department of Neurobiology, University of Alabama at Birmingham

Honors, Awards, and Advisory Committees

1988 Magna Cum Laude, Harvard University
1988 Phi Beta Kappa
1988-1989 National Science Foundation Award for Creativity in Engineering
1988-1989 Able Wolman Fellowship, The Johns Hopkins School of Medicine
1999-2000 Howard Hughes Medical Institute Career Development Award
2010-2014 Member, NIH MNPS Study Section
2014 Member, NIH Committee of Visitors
2014-2017 Member, NIH BRAIN Initiative Review Panel
2015 Member, NIH Conte Center Review Panel

BIOGRAPHICAL SKETCH

NAME **Lloyd J. Edwards**		POSITION TITLE Professor	
EDUCATION/TRAINING			
INSTITUTION/LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
Morehouse College, Atlanta, GA	B.A.	1980	Mathematics
Uni of Maryland, College Park, MA	M.A.	1982	Mathematical Statistics
Uni of NC, Chapel Hill, NC	PhD	1990	Biostatistics

Positions

August 2017 Present, Professor and Chair - Department of Biostatistics, UAB

2017-present Investigator, McKnight Brain Institute

2000 – 2017 Associate Professor - Department of Biostatistics University of North Carolina, Chapel Hill Chapel Hill, North Carolina

1998 - 2000 - Associate Professor - Department of Community and Family Medicine / Division of Biometry Head of Department of Medicine Biostatistics Unit Duke University Medical Center Durham, North Carolina

1998 Associate Professor, Dept Biostatistics, Uni of NC, Chapel Hill, NC

1991 – 1998 Assistant Professor - Department of Biostatistics, University of North Carolina - Chapel Hill, Chapel Hill, North Carolina

1990 – 1991 Visiting Assistant Professor - Department of Biostatistics, University of North Carolina - Chapel Hill, Chapel Hill, North Carolina

1986 – 1990 Graduate Research Assistant, University of North Carolina - Chapel Hill, Chapel Hill, North Carolina

1983 – 1986 Software Engineer/Statistician, TRW Defense Systems Group, McLean, Virginia

Organizations/Honors

Member, UNC IRB Scientific Review Committee (August 2012 - May 2017)

Member of Clinical Research Committee of the Cystic Fibrosis Foundation (Oct 2011 - June 2017)

Publications 2017

1. Smith, A., Jaeger, B.V., Pinheiro, L.C., Edwards, L.J., Tan, H-T, Nielsen, M., Reeve, B.B. (2017). The impact of diagnosis and treatment on health-related quality of life among older adults with bladder cancer. *In press, British Journal of Urology International*.

2. Reeve, B.B., Edwards, L.J., Jaeger, B.C., Hinds, P.S., Dampier, C., Gipson, D.S., Selewski, D.T., Troost, J.P., Thissen, D., Barry, V., Gross, H.E., DeWalt, D.A. (2017). Assessing responsiveness over time of the PROMIS® Pediatric symptom and function measures in cancer, nephrotic syndrome, and sickle cell disease. *In press, Quality of Life Research*.

3. Smith, C.L., Edwards L.J. (2017). A Test of Separate Hypotheses for Comparing Linear Mixed Models with Nonnested Fixed Effects. *Communications in Statistics – Theory and Methods*, 48(11): 5487-5500.

4. Beamer, S., Ferns, S., Edwards, L., Guntherd, G., Nelson, J. (2017). Early extubation in pediatric heart surgery across a spectrum of case complexity: Impact on hospital length of stay and chest tube days. *Progress in Pediatric Cardiology*, 45: 63-68.

5. Virkud, Y.V., Burks, A.W., Steele, P.H., Edwards, L., Berglund, J.P., Jones, S.M., Scurlock, A., Perry, T.T.,
Pesek, R., Vickery, B.P. (2017). Novel baseline predictors of allergic side effects during peanut oral immunotherapy. *Journal of Allergy and Clinical Immunology*, 139(3): 882–888.e5.

BIOGRAPHICAL SKETCH

NAME **Gamlin, Paul Douglas Roger**		POSITION TITLE Professor	
EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
University of Cambridge, England	B.A.	1978	Zoology
State Uni of New York, Stony Brook, NY	PhD	1984	Neurobiology

Positions

2013 - present Professor, Department of Ophthalmology, University of Alabama at Birmingham
2013-present Investigator, McKnight Brain Institute
1997 – present Professor, Departments of Biomedical Engineering, Psychology, and Neurobiology, University of Alabama at Birmingham
1996 - 2013 Professor, Department of Vision Sciences, University of Alabama at Birmingham
2003 - 2013 Director, UAB Center for the Development of Functional Imaging
2004 - 2012 Chairman, Department of Vision Sciences
2001 - 2006 Director, UAB Neuroscience Graduate Program
2002 - 2003 Associate Director, UAB Center for the Development of Functional Imaging
1995 - 1999 Director, UAB Vision Science Research Center (Center designated as University-Wide in 1996)
1995 - 1996 Scientist, Neurobiology Research Center, University of Alabama at Birmingham
1992 - 1996 Associate Professor, Departments of Physiological Optics and Psychology; Scientist, Vision Science Research Center, University of Alabama at Birmingham
1989 - 1992 Assistant Professor, Departments of Physiological Optics and Psychology; Associate Scientist, Vision Science Research Center, UAB
1989 Research Assistant Professor, Department of Physiological Optics, School of Optometry, University of Alabama at Birmingham
1984 - 1986 Research Associate, Neurosciences Program, UAB

Honors, Awards, and Advisory Committees

1984 Sigma Xi Award for Achievement in Research
1993 American Optometric Student Asso Award for Excellence in Basic Science Teaching
1997 UAB President's Award for Excellence in Teaching
2009 Irene E. Loewenfeld Lecturer
2014 RPB Walt and Lilly Disney Award for Amblyopia Research

Publications (2017)

1. Beltran WA, Cideciyan AV, Boye SE, Ye GJ, Iwabe S, Dufour VL, Marinho LF, Swider M, Kosyk MS, Sha J, Boye SL, Peterson JJ, Witherspoon CD, Alexander JJ, Ying GS, Shearman MS, Chulay JD, Hauswirth WW, **Gamlin PD**, Jacobson SG, Aguirre GD. Optimization of Retinal Gene Therapy for X-Linked Retinitis Pigmentosa Due to RPGR Mutations. Mol Ther. 2017 Aug 2;25(8):1866-1880. doi: 10.1016/j.ymthe.2017.05.004. Epub 2017 May 27. PubMed PMID: 28566226; PubMed Central PMCID: PMC5542804.
2. Binda P, **Gamlin PD**. Renewed Attention on the Pupil Light Reflex. Trends Neurosci. 2017 Aug;40(8):455-457. doi: 10.1016/j.tins.2017.06.007. Epub 2017 Jul 7. PubMed PMID: 28693846; PubMed Central PMCID: PMC5562352.

Abstracts

1. Boye, S.L., Choudhury, S., Marsic, D., Strang, C.E., Alexander, J.J., Witherspoon, C.D.,

Zolotukhin, S., **Gamlin, P.D.** and Boye, S.E., (2017). Directed Evolution of Enhanced AAV Capsid Variants Following Intravitreal Injection in Macaque. *Investigative Ophthalmology & Visual Science, 58*(8), pp. 4087.

2. Choudhury, S., Marsic, D., Peterson, J., Fajardo, D., Bennett, A., **Gamlin, P.D**., Agbandje-McKenna, M., Zolotukhin, S., Boye, S.L. and Boye, S.E., (2017). Novel AAV variants isolated by directed evolution in primate display enhanced retinal transduction following intravitreal injection. *Investigative Ophthalmology & Visual Science, 58*(8), pp.4507.
3. **Gamlin, P.D.,** Strang, C.E., Chang, K., Hung, L.F., Arumugam, B., Frishman, L.J., Smith, E.L. and Ostrin, L.A., (2017). Immunotoxin-Induced Ablation of the Intrinsically Photosensitive Retinal Ganglion Cells in Rhesus Monkeys. *Investigative Ophthalmology & Visual Science, 58*(8), pp. 4125.

Grant Support

ACTIVE RESEARCH GRANTS:

Multi-PI: Gamlin, PD Corresponding PI: (Do, MT - Harvard, PI): "Intrinsically photosensitive retinal ganglion cells and their central projections". NIH/NEI Research Grant. 12/01/2015-11/31/2020. Total Costs: $3,298,460. This project proposes to study the intrinsically photosensitive retinal ganglion cells in non-human primates as well as their central targets, the suprachiasmatic nucleus and pretectal olivary nucleus.

Multi-PI: Gamlin, PD (May PM UMMC Corresponding): "Midbrain Circuitry for Neuronal Control of Gaze". NIH/NEI Research Grant. 04/01/2015 - 03/31/2019. Total Costs: $1,011,103. This project proposes to investigate the specific roles of two separate populations of premotor neurons in controlling vergence and ocular accommodation in non-human primates.

Multi-PI: Gamlin, PD (Kara P MUSC Corresponding): "RII Track-2 FEC: Bridging Cognitive Science and Neuroscience Using Innovative Imaging Technologies" NSF Research Infrastructure Grant. 8/1/2015 - 7/31/2019, Total costs $1,600,966. This grant supports the purchase of a multiphoton microscope and 680-1300 nm ultrafast laser. In addition, it supports under-represented individuals at both the undergraduate and postgraduate level for the purpose of workforce development.

PI: Gamlin, PD: "Research to Prevent Blindness Disney Award for Amblyopia Research" Research to prevent Blindness Award. 6/1/2014 - 5/31/2019. Total costs: $100,000. This project is studying the role of the cerebellum in controlling binocular alignment.

Co-PI: Gamlin, PD: **(PI Pittler SJ)** "UAB Vision Science Research Center". NIH/NEI Core Grant. 8/1/2016 - 7/31/2021. Total costs: $2,940,000. This Core grant supports NEI-funded and other vision-related investigators at UAB.

Co-Investigator: Gamlin, PD: **(PI Boye SE, University of Florida) "**Developing Efficient AAV Vectors For Photoreceptor Targeting Via The Vitreous" NIH/NEI Research Grant 6/01/2014-5/31/2019. Total subcontract costs: $415,000. This project is testing AAV vectors and delivery routes for targeting expression to non-human primate photoreceptors.

Co-Investigator: Gamlin, PD: **(PI Boye SE, University of Florida) "**Developing a dual AAV vector gene therapy for the treatment of Usher Syndrome" Gund Harrington Scholar award. 6/01/2017-5/31/2020. Total subcontract costs: $200,000. This project is testing dual AAV vectors for targeting expression of the MYO7A gene to non-human primate photoreceptors.

Co-Investigator: Gamlin, PD: **(PI Heldermon C, University of Florida) "**Optimizing AAV Vectors For Central Nervous System Transduction" NIH/NINDS Research Grant 8/01/2017-5/31/2022. Total subcontract costs: $400,000. This project is testing AAV vectors and delivery routes for targeting gene expression to specific brain regions for the treatment of Mucopolysaccharidosis (MPS) IIIB.

Consultant: Gamlin, PD: (**PI Roecklein, KA, University of Pittsburgh**) "Melanopsin Photosensitivity And Psychopathology". NIH/NIMH Research Grant. 6/1/2014-5/31/2019. Total subcontract costs: $50,000.

BIOGRAPHICAL SKETCH

NAME **Cristin F. Gavin**		POSITION TITLE Assistant Professor	
EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
Birmingham-Southern College	BS, Biology	2006	Biology
Birmingham-Southern College	BA, Philosophy	2006	Philosophy
University of Alabama at Birmingham	PhD, Neuroscience	2012	Neuroscience

Positions

-Assistant Professor, Primary, Department of Neurobiology, Secondary, Department of Psychology, University of Alabama at Birmingham
-Co-Director, Undergraduate Neuroscience Program
-Co-Director, Post-baccalaureate Research Education Program
- Investigator, McKnight Brain Institute

Honors, Awards, and Advisory Committees

Awards and Honors

2017-present Science and Technology Honors Program Leadership Council, Neuroscience representative
2017-present CLSS Process & Policy Advisory Group, Joint Health Sciences Programs Representative
2016 Blaze Leadership Academy 2016-17 class
2016 National Academy of Academic Advisors (NACADA) – Outstanding Faculty Advisor
2016 UAB Outstanding Academic Advisor, Faculty
2016-present Honors College Faculty Fellow

Advisory Committees and Activities

2016-present	University Undergraduate Curriculum Committee
2016-present	Honors Neuroscience Summer Research Academy Director
2016-present	Graduate Biomedical Sciences Graduate Admissions Committee Member, Neuroscience Theme
2016-present	Research Ethics Training for Undergraduates Focus Group, Neuroscience representative
2016-present	New Interdisciplinary Science Majors Committee, Co-Founder, Co-Chair
2016-present	Research Civitan Club, Charity Art Auction Organizer
2016-present	Women in STEM Undergraduate Facilitator
2016-present	Faculty Sponsor, PrePhD Society
2016	Review Committee, Provost's Award for Faculty Excellence in Undergraduate Research, Office of Undergraduate Research
2016	Responsible Conduct in Research Graduate Ethics Training Facilitator
2016	Goldwater Scholar Nominee Selection Committee
2016	Faculty Commencement Representative, School of Medicine and UAB Honors College (Spring and Winter)
2016	Application Review Committee, Presidential Summer Research Scholarship

2016	Beckman Scholars Grant, Research Mentor Selection and Review Committee
2016	UAB Neuroscience Recruitment and Outreach
	James Clemens High School Brain Health Week, Keynote speaker;
	CORD Summer Science Institute, Invited Speaker;
	HOSA State Competition, Neuroscience Representative
2016	Judge (Poster/Oral)
	Civitan International/Simpson-Ramsey Neurodevelopment Symposium
	UAB EXPO
	Graduate Student Research Day
	OST Research Competition
	NEURAL conference

Manuscripts submitted but not yet accepted

Genome-wide transcription and DNA methylation profiling in an APP mouse model of Alzheimer's Disease

Guzman-Karlsson MC, Fleming LL, Brown JA, Sesay F, Lewis JW, Hawkins KE, Kordasiewicz HB, Motley T, Swayze EE, Ecker DJ, Michael TP, Gavin CF, Kennedy, AJ, Day JJ, Roberson ED, Sweatt JD (under review at *Nature Communications*)

Manuscripts in preparation

Actin-myosin dynamics regulate structural plasticity in single spines.

Cristin F. Gavin, Maria Rubio, Erica Young, Courtney Miller and Gavin Rumbaugh. Department of Neuroscience, The Scripps Research Institute, Jupiter, FL

BOOKS AND BOOK CHAPTERS

Book Chapters

Synaptic Plasticity

Cristin F. Gavin and W. Anne Burton Theibert. Essentials of Modern Neuroscience, by Franklin Amthor, W. Anne Burton Theibert, David G. Standaert, and Erik Roberson, McGraw Hill, 2017 (in press)

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
David S. Geldmacher	Patsy and Charles Collat Endowed Professor

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
University of Rochester State University of New York	B.A.	1978	
Health Science Center at Syracuse Syracuse, New York	MD	1986	

Positions

1991 - 1992	Assistant Professor of Neurology	Robert Wood Johnson School of Medicine, University of Medicine and Dentistry of New Jersey
1993 - 2001	Assistant Professor of Neurology	"
2001 - 2002	Associate Professor of Neurology	Case Western Reserve University
2002 - 2006	Associate Professor of Neurology (without term)	"
2006 - 2011	Harrison Distinguished Teaching Associate Professor of Neurology (without term)	University of Virginia School of Medicine
2011 – 2014	Patsy and Charles Collat Endowed Scholar in Neuroscience	"
2011 - present	Professor of Neurology (tenured) Professor of Neurobiology	"
2014 - present	Patsy and Charles Collat Endowed Professor in Neuroscience	University of Alabama at Birmingham
2014 - present	Investigator, McKnight Brain Institute	UAB

Awards/Honors

Honors

2015	Alpha Omega Alpha Medical Honors Society, Inductee
2014	Who's Who in the World Selection
2014-current	America's Top Doctors Selection, Castle-Connolly, Inc.
2013	Appointment to Fellow, American Neurological Association
2011-current	Best Doctors listing, *Birmingham* magazine
2008	Election to Fellow, American College of Physicians
2006	Election to membership, American Neurological Association
2006	Leading Health Professionals of the World, Selection
2005	Appointment to Academy of Distinguished Educators, Uni of VA, School of Medicine
2002-current	The Best Doctors in America Selection
1998	The Best Doctors in America Selection, Woodward/White, Inc.
1998	Top Doctors Listing, *Cleveland* Magazine

1982	Phi Beta Kappa, Inductee
1978-82	National Merit Scholar
1978-82	New York State Regents' Scholar
1978	Valedictorian, Southside HS, Elmira, NY

Awards

2012	Residency Teaching Award, Department of Neurology, University of Alabama-Birmingham
2003	Residency Teaching Award, Department of Neurology, University of Virginia
2001	Award for Achievement: Science and Technology Division Northern Ohio Live Magazine Annual Awards
1995	Monitors' Choice Award – Best Overall Clinical Trials Site Trial E2020-A-01-301, Eisai America, Inc.
1985	Merck Medical Student Achievement Award, SUNY-HSC, Syracuse

BIOGRAPHICAL SKETCH

NAME **Adam Gerstenecker**		POSITION TITLE Assistant Professor	
EDUCATION/TRAINING			
INSTITUTION/LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
So Illinois Uni at Carbondale	B.A.	2001	
Murray State University	M.S.	2007	
University of Louisville	PhD	2014	

Positions

Internship Training:

Year	Degree	Institution
2013-2014	Intern	University of Alabama at Birmingham, Birmingham, AL

Postdoctoral Training:

Year	Degree	Institution
2014- 2016	Neuropsychology Fellow	UAB, Department of Neurology

Academic appointments:

Year	Rank/Title	Institution
2016 – present	Assistant Professor	UAB, Department of Neurology

Other Appointments/Administrative Positions at UAB:

03/16 – present	Faculty Member, UAB Multiple Sclerosis Center
09/16 – present	Faculty Research Member, UAB Alzheimer's Disease Center
2017 – present	Investigator, McKnight Brain Institute

Honors, Awards, and Advisory Committees

2014 John Richard Binford Memorial Award presented to the graduate degree recipient at the University of Louisville who excels in both scholarship and leadership

2014 Graduate Dean's Citation – University of Louisville

One of five finalists for the Association of Test Publishers (ATP) Award for Best Student Poster Focused on Assessment and Western Psychological Services' Emerging Leaders in Assessment Travel Award presented at the 2008 APA Conference in Boston, MA.

Publications 2017

1. **Gerstenecker, A.** (epub ahead of print). The Neuropsychology (Broadly Conceived) of MSA, PSP, and CBD. *Archives of Clinical Neuropsychology*. DOI: 10.1093/arclin/acx093
2. **Gerstenecker, A.**, Hoagey, D., Marson, D., & Kennedy, K. (2017). White Matter Degradation is Associated with Reduced Financial Capacity in Mild Cognitive Impairment and Alzheimer's Disease. *Journal of Alzheimer's Disease, 60,* 537-547.
3. **Gerstenecker, A.**, Lowry, K., Myers, T., Bashir, K., Triebel, K., Martin, R., & Marson D. C. (2017). Medical Decision-Making Capacity and its Cognitive Predictors in Multiple Sclerosis: Preliminary Evidence. *Journal of the Neurological Sciences, 380,* 38-43.
4. **Gerstenecker, A.**, Myers, T., Lowry, K., Martin, R., Triebel, K., Bashir, K., & Marson D. C. (epub ahead of print). Financial Capacity and its Cognitive Predictors in Multiple Sclerosis. *Archives of Clinical Neuropsychology*. DOI: 10.1093/arclin/acx039.
5. Vance, D. E., Frank, J. S., Bail, J., Deaver, J., Triebel, K. L., Niccolai, L. M., **Gerstenecker, A.**, & Meneses, K. (epub ahead of print). Interventions for Cognitive Deficits in Breast Cancer Survivors Treated With Chemotherapy. *Cancer Nursing*. DOI: 10.1097/NCC.0000000000000349.
6. Niccolai, L. M., Triebel, K. L., **Gerstenecker, A.**, McPherson, T. O., Cutter, C. R., Martin, R. C., & Marson, D. C. (2017). Neurocognitive Predictors of Declining Financial Capacity in Persons with

Mild Cognitive Impairment Due to Alzheimer's Disease. *Clinical Gerontologist, 40(1),* 14-23.

BIOGRAPHICAL SKETCH

NAME **Matthew S. Goldberg**		POSITION TITLE Associate Professor	
EDUCATION/TRAINING			
INSTITUTION/LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
University of Michigan	B.S.	1990	Physics
Yale University	PhD	1998	Mol Biophysics
Harvard Medical School	Postdoc	1997- 2003	
Brigham and Women's Hospital	Postdoc	1997 - 2003	

Positions

Year	Rank/Title	Institution
2014-present	Associate Professor	University of Alabama Birmingham
2014-present	Investigator, McKnight Brain Institute UAB	
2005-2014	Assistant Professor	UT Southwestern Medical Center
2003-2005	Instructor	Brigham and Women's Hospital
2003-2005	Instructor in Neurology	Harvard Medical School

Honors, Awards, and Advisory Committees

Grant reviewer March 2017: French Federation for Brain Research (FRC)
Grant reviewer April 2017: Michael J. Fox Foundation for Parkinson's Research
Ad-hoc reviewer Feb 5-7, 2017 Reston, VA: US Army Medical Research and Materiel Command CDMRP Parkinson's Research Program

Publications 2017

1. Ding X, Barodia SK, Ma L, Goldberg MS*, F18 targets LRRK2 for proteasomal degradation and attenuates cell toxicity, Neurobiology of Disease, 2017 98: 122-136. *corresponding author
2. Barodia SK, Creed RB, Goldberg MS*, Parkin and PINK1 function in oxidative stress and neurodegeneration, Brain Research Bulletin, 2017 133:51-59. *corresponding author
3. Creed, RB and Goldberg MS*, New Developments in Rat Models of Parkinson's Disease, Movement Disorders, in press. *corresponding author

Manuscripts submitted but not yet accepted

1. Ding X, Goldberg MS*, Phosphorylated alpha-synuclein increases LRRK2 abundance, inclusion formation and cell toxicity, submitted. *corresponding author
2. Creed, RB and Goldberg MS*, Analysis of ・lpha-synuclein pathology in PINK1 knockout rats, BMC Neuroscience, submitted. *corresponding author

Manuscripts in preparation

Creed, RB, Menalled L, Dave KD, Janssens HB, Veinbergs I, van der Hart M, Rassoulpour A, Goldberg MS*, Comprehensive Analysis of Neurotransmitter Release in Parkin, DJ-1, PINK1 and LRRK2 Knockout Rats, in preparation. *corresponding author

BIOGRAPHICAL SKETCH

NAME **Michelle Gray**		POSITION TITLE Assistant Professor	
EDUCATION/TRAINING			
INSTITUTION/LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
Alabama State University, Montgomery, AL	B.S.	1997	Biology
Ohio State University, Columbus, OH	PhD	2003	Molecular, Cellular, and Developmental Biology
University of California, Los Angeles, Los Angeles, CA	Post doc	2008	Neurogenetics/mouse genetics

Positions

1997-1998 Graduate Teaching Assistant, Introduction to Biology, Introductory Biology Program, The Ohio State University, Columbus, OH

1998 Graduate Teaching Assistant, Human Biology, The Ohio State University, Columbus, OH

1998-2003 Graduate Research Associate, Molecular, Cellular and Developmental Biology Program, The Ohio State University, Columbus, OH

2003-2008 Postdoctoral fellow, Semel Institute for Neuroscience and Human Behavior, David Geffen School of Medicine, University of California, Los Angeles, Los Angeles, CA

2008-2010 Instructor, Dixon Scholar in Neuroscience, Department of Neurology, Center for Neurodegeneration and Experimental Therapeutics, University of Alabama at Birmingham

2010 Assistant Scientist, Center for Glial Biology in Medicine, University of Alabama at Birmingham

2010 Assistant Professor, Department of Neurobiology, Secondary Appointment, University of Alabama at Birmingham, Birmingham, AL

2010-present Assistant Professor, Dixon Scholar in Neuroscience, Department of Neurology, Center for Neurodegeneration and Experimental Therapeutics, University of Alabama at Birmingham

2010 – present Investigator, McKnight Brain Institute

Honors, Awards, and Advisory Committees

1995-1996 National Institutes of Health, Minority Biomedical Research Support Fellow, Alabama State University

1996-1997 National Institutes of Health, Minority Access to Research Careers Honors Fellow, Alabama State University

2000-2003 National Institutes of Health, Ruth L. Kirschstein National Research Service Award, predoctoral fellowship, Laboratory of Christine Beattie, The Ohio State University, Columbus, OH

2003-2005 National Institutes of Health, Post-doctoral fellowship, X. William Yang and Michael Levine, Mental Retardation Research Center, University of California, Los Angeles

2005-2006 National Institutes of Health, Post-doctoral fellowship, X. William Yang and Nelson Freimer, Neurobehavioral Genetics training program, University of California, Los Angeles

2006 Gordon Research Conferences Travel Award, CAG Triplet Repeat Disorders
2007 Session Chair: Society for Neuroscience Annual Meeting, Neuroinflammation: Animal Models and Human Studies, San Diego, CA
2008 Travel Award/Best Poster, CHDI Inc., 3rd Annual HD Therapeutics Conference: A Forum for Drug Discovery & Development, Palm Springs, CA
2008 Dixon Scholar in Neuroscience, Department of Neurology, University of Alabama at Birmingham
2009 Session Chair: CHDI Inc., 4th Annual HD Therapeutics Conference, Cannes, France
2010 National Institutes of Health, NINDS K01 Career Development Award to Promote Diversity in Neuroscience Research
2014 Insights of the Year, Most Influential Paper in the laboratory, Huntington's Disease Study Group for, "Neuronal targets for reducing mutant huntingtin expression to ameliorate disease in a mouse model of Huntington's disease"

Publications 2017 – None

Research support
1R01NS089750-01A1 Gray (PI) 7/1/2015-6/30/2020
Exploring the contribution of astrocytes to Huntington's Disease
To study the contribution of astrocytes and SNARE-dependent glutamate release from astrocytes to Huntington's Disease
Role: Principal Investigator

MGH Collaborative Center for X-linked Dystonia Parkinsonism (XDP) Gray (PI) 01/15-06/17
Modeling X-linked Dystonia Parkinsonism Using BAC Transgenesis
Role: Principal Investigator

BIOGRAPHICAL SKETCH

NAME **Alecia K. Gross**		POSITION TITLE Associate Professor	
EDUCATION/TRAINING			
INSTITUTION/LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
Uni of New Hampshire	B.S.	1993	Biochemistry
Brandeis University	PhD	2002	Biochemistry
Baylor College of Medicine	Postdoc	2006	

Positions

Year	*Rank/Title*	*Institution*
2006 – 2011	Assistant Professor	UAB Department of Vision Sciences
2006 – present	Secondary Appointment	UAB Department of Cell, Developmental and Integrative Biology
2007 – present	Secondary Appointment	UAB Department of Neurobiology
2008 – present	Secondary Appointment	UAB Department of Biochemistry and Molecular Genetics
2006 – present	Scientist	UAB Comprehensive Neuroscience Center
2006 – present	Scientist	UAB Vision Science Research Center
2006 – present	Scientist	UAB Civitan International Research Center
2006 – present	Scientist	UAB Evelyn F. McKnight Brain Institute
2011 – present	Project Leader	UAB Intellectual and Developmental Disabilities Research Center
2011 – present	Associate Professor (with tenure)	UAB Department of Vision Sciences

Honors, Awards, and Advisory Committees

2003 The V.C. Joshi Memorial Award, First Place Postdoctoral Poster Presentation, Baylor College of Medicine

2004 The V.C Joshi Memorial Award, First Place Postdoctoral Oral Presentation, Baylor College of Medicine

2002 – 2004 Science Education Leadership Fellow (SELF), Howard Hughes Medical Institute and Baylor College of Medicine

2002 – 2004 NRSA Postdoctoral Fellowship, Endocrinology Training Program, Baylor College of Medicine

2004 National Eye Institute, NIH Fellowship to attend "Fundamental Issues in Vision Research: Molecular and Cell Biological Approaches" Marine Biological Laboratories, Woods Hole, MA

2004 Jackson Laboratory, Travel Grant to attend The Laboratory Mouse in Vision Research Conference, Jackson Laboratory, Bar Harbor, ME

2004 – 2005 AAAS/Science Program for Excellence in Science Sponsored Membership Award, American Association for the Advancement of Science

2005 The V.C Joshi Memorial Award for first place postdoctoral oral presentation, Annual Biochemistry Research Conference, Baylor College of Medicine

2005 – 2006 Elected Co-President of the Postdoc Association at Baylor College of Medicine

2008 International Society for Eye Research (ISER) Young Investigator Travel Award to travel to XVIII International Congress for Eye Research, Beijing China

2008 XIIIth International Symposium on Retinal Degeneration Young Investigator Travel Award to travel to Emeishan, China for RD2008 meeting

2010 – 2013 Elected Biochemistry (BI) Program Committee Member, Association for Research in Vision and Ophthalmology (ARVO) Annual Meeting Program
2012 – 2013 Nominated by School of Optometry Dean and awarded position in BLAZE leadership academy (development program for high potential faculty and staff to take on positions of senior leadership)
2014 UAB President's Award for Excellence in Teaching
2014-2015 UAB Faculty Senate Chair-Elect
2015 American Optometric Student Association (AOSA) Excellence in Basic/Vision Science Instruction Award
2015-2016 UAB Faculty Senate Chair
2016-present Director, Cell, Molecular and Developmental Biology Graduate Program
2016 UAB Inaugural Recipient for the President's Award for Excellence in Support of UAB and Shared Governance

Publications 2017
None

Manuscripts in preparation
None

BIOGRAPHICAL SKETCH

NAME **John Hablitz**		POSITION TITLE Professor	
EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
State University of New York, Plattsburgh	B.A.	1968	Physiological
University of Houston, Houston, TX	M.A.	1970	Psychology
University of Houston, Houston, TX	PhD	1972	Physiological Psychology

Positions

Postdoctoral Fellow, Department of Physiology, Baylor College of Medicine, and Department of Neurophysiology, The Methodist Hospital, Houston, TX, 1972-73
Instructor, Department of Physiology, Baylor College of Medicine, 1973-74
Assistant, Neurophysiology Service, The Methodist Hospital, 1973-1988
Assistant Professor of Physiology, Baylor College of Medicine, 1974-77
Assistant Professor of Neurology, Baylor College of Medicine, 1977-83
Visiting Scientist, Institute of Neurophysiology, University of Oslo, Oslo Norway, 1978-79
Member, Program in Neurosciences, Baylor College of Medicine, 1978-1988
Associate Professor of Neurology, Baylor College of Medicine, 1983-1988
Visiting Scientist, Department of Neurophysiology, Max- Planck Institute for Psychiatry, Munich, Germany, 1984-85
Associate Professor of Physiology and Molecular Biophysics, Baylor College of Medicine, 1986-1988
Professor of Physiology and Biophysics, University of Alabama at Birmingham, 1989-present
Senior Scientist, Neurobiology Research Center, University of Alabama at Birmingham, 1989-1996
Professor of Psychology, University of Alabama at Birmingham, 1995-present
Professor of Neurobiology, University of Alabama at Birmingham, 1996-present
Chairman, UAB Committee on Graduate Study in Neuroscience, 1997-2001
Vice Chairman, Department of Neurobiology 2002-present
Interim Chair, Department of Neurobiology 2005-2006
Investigator, Evelyn F. McKnight Brain Research Institute 2006-present

Honors, Awards, and Advisory Committees

Javits Neuroscience Investigator Award, 1989
UAB Joint Health Science Department's Teaching Award, 1992
Kellaway Lectureship in Epilepsy, Baylor College of Medicine, 2005
UAB Graduate Dean's Award for Excellence in Mentorship, 2008

Other Activities:
Member, Neurological Sciences 2 Study Section, NIH 1987-1991
Member, American Epilepsy Soc Investigators' Workshop Committee, 1998-2001
Member, Veterans Administration Neurology A Merit Review Panel, 2000-2003

Member, American Epilepsy Society Scientific Program Committee, 2001-2003
Member, Neurobiology of Learning and Memory Study Section, NIH 2003-2007
Member, Developmental Brain Disorders Study Section, NIH 2008-2012.
Member, DOD, AIBS Peer Reviewed Medical Research Review Panel, 2010.

Guest reviewer, Behavioral Neuroscience, Brain Research, British Journal of Pharmacology, Cellular and Molecular Neurobiology, Epilepsy Research, Experimental Biology and Medicine, Experimental Neurology, Journal of Neurophysiology, Journal of Neuroscience, Journal of Physiology, Molecular Pharmacology, Neuroscience, Neuroscience Letters, Pflugers Archive.

Publications (2017)
Albertson AJ, Bohannon AS, Hablitz JJ. HCN Channel Modulation of Synaptic Integration in GABAergic Interneurons in Malformed Rat Neocortex. Front Cell Neurosci 2017, 11:109. PMID:28469560. PMCID:PMC5396479

Abstracts (2017)
1. Lado, W.E. and Hablitz, J.J. Role of somatostatin and parvalbumin interneurons in 4-aminipyridine-induced epileptiform discharges in mouse cortex. SFN 2017 292.21.
2. McMeekin, L.J., Jenkins, L.M., Watkins, B.M., Bohannon, A.S., Patel, A., Krall, A., Hablitz, J.J. and Cowell, R.M. ERRα as a putative mediator of PGC-1α-dependent geneexpression: Relevance for the pathophysiology of schizophrenia.

Invited Speaker (2017)
1. Invited Speaker, Basic EcoE Research Seminar Group, "Roles of specific cortical interneurons in GABAergic network synchronization", September 12, Teleconference.
2. Grants (2017 – present)
UAB Neuroscience Core Center Principal Investigator: John J. Hablitz, PhD
NIH-NINDS P30 NS47466 07/01/05-04/31/2020
This grant provides multiple cores for NINDS funded investigators.
3. Training Program in the Neurobiology of Cognition and Cognitive Disorders
Principal Investigator: John J. Hablitz, PhD
NIH-NINDS T32061788 07/01/2008-06/30/2018
4. Acquired HCN Channelopathies in Cortical Dysplasia Principal Investigator: John J. Hablitz, PhD
NIH-NINDS R01 NS090041 12/01/2014-11/30/18.
This project examines the role of HCN channels in diverse cell groups in animal models of cortical dysplasia.
5. Cellular Mechanism of Synchrony Impairments in Schizophrenia PI: Kazutoshi Nakazawa,
NIH-NIMH R01 MH110681 07/01/2016-06/31/2021
Role on project: Co-Investigator

BIOGRAPHICAL SKETCH

NAME **Jeremy H. Herskowitz**		POSITION TITLE Assistant Professor	
EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
University of North Carolina Chapel Hill, NC	B.S.	2001	Chemistry
Emory University Atlanta, GA	Ph.D.	2007	Microbiology and Molecular Genetics

Positions

2001-2007 Graduate Student with Professor Samuel Speck, Department of Microbiology, Emory University, Atlanta, GA.
2007-2012 Postdoctoral Research with Professors Allan Levey and James Lah Department of Neurology, Emory University, Atlanta, GA.
2012-2014 Instructor, Department of Neurology, Emory University, Atlanta, GA
2014- Assistant Professor, Departments of Neurology and Neurobiology, University of Alabama at Birmingham
2014 - Investigator, McKnight Brain Institute

Honors, Awards, and Advisory Committees

2001 David L. Stern Scholarship Academic Achievement in Chemistry, University of North Carolina at Chapel Hill
2012 Member of Emory University 1% Club
2014 Patsy W. and Charles A. Collat Scholar in Neuroscience Endowment, University of Alabama at Birmingham
2015 Outstanding Early Career Investigator in Alzheimer's disease, Charleston Conference
2016 College of Arts and Science and School of Medicine Interdisciplinary Team Award, University of Alabama at Birmingham

Competitive Fellowships, Faculty Development Awards

2007-2009 NIH Ruth L. Kirschstein National Research Service Award, T32 Institutional Postdoctoral Training Grant, NINDS
2009-2010 Ellison Medical Foundation/American Federation for Aging Research, (AFAR) Postdoctoral Fellowship
2010-2012 BrightFocus/American Health Assistance Foundation (AHAF), Alzheimer's Disease Research Postdoctoral Fellowship
2012-2014 NIH K99/R00 Pathway to Independence Award, NIA priority score = 10
2015-2017 Alzheimer's Association New Investigator Research Grant

BIOGRAPHICAL SKETCH

NAME **Gwendalyn D. King**		POSITION TITLE Assistant Professor	
EDUCATION/TRAINING			
INSTITUTION/LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
Purdue University	B.S.	1999	
University of Michigan	M.S.	2002	
University of Michigan	PhD	2004	
Cedars Sinai Medical Center	Post-doc	2008	
Boston University School of Med	Post-doc	2011	

Positions

2008 – present, Assistant Professor, Department of Neurobiology, UAB
2008 – present, Investigator, McKnight Brain Institute

Honors, Awards, and Advisory Committees

2017 UAB Graduate Program in Biomedical Sciences Outstanding Service Award - Faculty

Publications 2017

1. Laszczyk AM, Fox-Quick S, Nettles D, Overstreet-Wadiche L, King GD. Klotho regulates postnatal neurogenesis to protect against age-related cognitive decline. Neurobiology of Aging (2017) in press.
2. Li Q, Vo HT, Wang J, Fox-Quick S, Dobrunz LE, King GD. Klotho regulates CA1 hippocampal synaptic plasticity. Neuroscience (2017), PMCID: PMC5372240.
3. Adlaf EW, Vaden RJ, Niver AJ, Manuel AF, Onyilo VC, Araujo MT, Dieni CV, Vo HT, King GD, Wadiche Ji, Overstreet-Wadiche L. Adult-born neurons modify excitatory synaptic transmission to existing neurons. Elife (2017). PMCID: PMC5279941.

Manuscripts in preparation

1. Jones LD, Laszczyk AM, Fox SF, Quarles DE, **King GD**. Loss of FGF23 impairs postnatal hippocampal immature neuron maturation. Submission 2017.
2. Laszczyk AM, **King GD**. Shed Klotho regulates FOXO to modulate neuronal stem cells. Submission 2017.

BIOGRAPHICAL SKETCH

NAME **David C. Knight**		POSITION TITLE Associate Professor	
EDUCATION/TRAINING			
INSTITUTION/LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
Truman State University, Kirksville MO	B.S.	1994	Psychology Clinical
University of Wisconsin, Milwaukee WI	M.S.	1999	Psychology
West Virginia Uni, Morgantown WV	Intern	2002	Neuropsychology
University of Wisconsin, Milwaukee WI	PhD	2002	Clinical Psychology
National Institute of Mental Health, Bethesda MD	Postdoc	2007	Cognitive Neuro

Positions

1995-2001 Graduate Research, NMR Research Center, Medical College of Wisconsin & Psychology Department, University of Wisconsin-Milwaukee.

1998-2001 NRSA Predoctoral Fellow (NIMH), Department of Psychology, University of Wisconsin-Milwaukee.

2001-2002 Clinical Neuropsychology Intern, Department of Behavioral Sciences, West Virginia University Medical School, Morgantown, WV.

2002-2007 NIH Postdoctoral IRTA Fellow, Laboratory of Brain & Cognition, National Institute of Mental Health, Bethesda, MD.

2007-2013 Assistant Professor, Departments of Psychology and Neurobiology, University of Alabama at Birmingham

2011-2014 Director, Civitan Functional Neuroimaging Facility, University of Alabama at Birmingham

2013-Present Associate Professor, Department of Psychology and Neurobiology, University of Alabama at Birmingham

2014-Present Co-Director, Undergraduate Neuroscience Program, University of Alabama at Birmingham

2014-present Investigator, McKnight Brain Institute

Honors and Awards

1992 All American Scholar
1992, 93, 94 Edward D. Blanchard Award
1998 Sigma Xi Grant in Aid of Research
2000 Fazio Research Award
1998-2001 NIMH (MH11722), Predoctoral National Research Service Award
2004-2006 NIMH Seymour S. Kety Memorial Fellowship
2017 UAB Graduate Dean's Award for Excellence in Mentorship

Other Experience and Professional Memberships

1995-Present Society for Neuroscience

1996-Present Organization for Human Brain Mapping
2004-Present Pavlovian Society
2016-Present Council on Undergraduate Research
2016-Present Faculty for Undergraduate Neuroscience
2007-Present Editorial Board: The Open Neuroimaging Journal
2016 Associate Editor: The Open Neuroimaging Journal
2017-Present Editor-in-Chief: The Open Neuroimaging Journal

Publications 2017
Harnett, N. G., Wood, K. H., Ference III, E. D., Reid, M. A., Lahti, A. C., Knight, A. J., and Knight, D. C. (2017). Glutamate/glutamine concentrations in the dorsal anterior cingulate vary with Post-Traumatic Stress Disorder symptoms. Journal of Psychiatric Research, 91, 169-176. 28478230

Book
Anticipation and Medicine
Harnett NG, Wood KH, Wheelock MD, Knight AJ, Knight DC.
Nadin M, editor. Cham, Switzerland: Springer International Publishing ; 2017. Anticipation and the Neural Response to Threat; p.219-228.

Emotion socialization as a predictor of physiological and psychological responses to stress.
Guo J, Mrug S, Knight DC.
Physiology & behavior. 2017; 175:119-129. NIHMSID: NIHMS866901
PubMed [journal]
PMID: 28377196 PMCID: PMC5487265

Glutamate/glutamine concentrations in the dorsal anterior cingulate vary with Post-Traumatic Stress Disorder symptoms.
Harnett NG, Wood KH, Ference EW 3rd, Reid MA, Lahti AC, Knight AJ, Knight DC.
Journal of psychiatric research. 2017; 91:169-176.
PubMed [journal] PMID: 28478230

Factor structure of the Emotions as a Child Scale in late adolescence and emerging adulthood.
Guo J, Mrug S, Knight DC.
Psychological assessment. 2017; 29(9):1082-1095.
PubMed [journal] PMID: 27797552

Manuscripts in preparation
Controllability Modulates the Neural Response to Predictable but not Unpredictable Threat in Humans Wood KH, Wheelock MD, Shumen JR, Bowen KH, Ver Hoef LW, Knight DC.
NeuroImage. Forthcoming;

Differentiation of veteran patients with chronic Post Traumatic Stress Disorder from healthy subjects using objective and subjective sleep-related parameters
Tahmasian M, Hamidreza J, Mina A, Ghadami MR, Majtaba Z, Sepehry AA, Knight DC, Khazaie H. Neuroscience letters. Forthcoming; Pavlovian conditioned diminution of the neurobehavioral response to threat. Goodman AM, Harnett NG, Knight DC.
Neuroscience and biobehavioral reviews. 2018; 84:218-224, PubMed [journal] PMID: 29203422

BIOGRAPHICAL SKETCH

NAME **Adrienne C. Lahti**		POSITION TITLE Professor	
EDUCATION/TRAINING			
INSTITUTION/LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
Universite de Liege, Liege, Belgium	MD	1978	
University de Liege, Liege, Belgium	Resident	1983	
University of Maryland, Baltimore, MD	Researc h Fellow	1989	
University of Michigan, Ann Arbor, MI	Resident	1992	

Positions

2017-Present	Investigator, McKnight Brain Institute
9/2014-Present	Patrick H. Linton Professor of Psychiatry
9/2012- Present	Professor with Tenure
1/2012-Present	Secondary Appointment Department of Psychology University of Alabama at Birmingham Professor
2011-Present	Department of Biomedical Engineering Secondary Appointment University of Alabama at Birmingham Professor
10/2010-Present	Department of Psychiatry and Behavioral Neurobiology University of Alabama at Birmingham Professor
1/2010-1/2012	Secondary Appointment Department of Psychology University of Alabama at Birmingham Associate Professor
10/2006-10/2010	Department of Psychiatry and Behavioral Neurobiology University of Alabama at Birmingham Associate Professor
9/1998-10/2006	Department of Psychiatry, University of Maryland at Baltimore, Baltimore, Maryland Associate Professor in Psychiatry
8/1992-8/1998	Department of Psychiatry, University of Maryland at Baltimore, Baltimore, Maryland Research Assistant Professor
7/1983-1/1985	Department of Psychiatry, Université de Liège, Faculté de Médecine, Liège. Assistant Professor

Honors

2017	Member, F1000Prime (Schizophrenia & Other Psychoses Section)
2017	Kempf Fund Award for Research Development in Psychobiological Psychiatry from the American Psychiatric Association (with mentee: Dr Kraguljac)

Publications

In Press

6. Harnett, N. G., Wood, K. H., Ference III, E. D., Reid, M. A., Lahti, A. C., Knight, A. J., and Knight, D. C. (In Press). Glutamate/glutamine concentrations in the dorsal anterior cingulate vary with Post-Traumatic Stress Disorder symptoms. Journal of Psychiatric Research.
7. Nina V. Kraguljac, Matthew S. Carle, Michael A. Frölich, Steve Tran, Michael A. Yassa, David M. White, Abhishek Reddy, and Adrienne C Lahti. Mnemonic Discrimination Deficits in First Episode Psychosis and a Ketamine Model Suggests Dentate Gyrus Pathology Linked to NMDA-Receptor. Biological Psychiatry: Cognitive Neuroscience and Neuroimaging, in press.
8. Badari Birur, Nina Kraguljac, Richard Shelton, Adrienne C Lahti. Brain Structure, Function, and Neurochemistry in Schizophrenia and Bipolar Disorder – A Systematic Review of the Magnetic Resonance Neuroimaging Literature. npj Schizophrenia, in press.
9. Kristin K Lottman, Nina V Kraguljac, David M White, Charity J Morgan, Vince D Calhoun, Allison Butt, Adrienne Carol Lahti. Risperidone Effects on Brain Dynamic Connectivity– a Prospective Resting State fMRI Study in Schizophrenia. Frontiers in Psychiatry, in press.
10. Gawne, T.J., Killen, J.F., Tracy, J.M., and Lahti, A.C. The Effect of Saccadic Eye Movements on the Sensor-Level Magnetoencephalogram. *Clinical Neurophysiology*, in press.

BIOGRAPHICAL SKETCH

NAME **Charles Seth Landefeld**		POSITION TITLE Professor and Chair	
EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
Harvard University	B.A.	1974	History and Science
Oxford University	B.A	1978	Philosophy/Theology
Yale University	.	1979	Medicine
UCSF	MD	1980	Medicine
UCSF	Intern	1982	Medicine
Harvard University	Resident	1985	Internal Medicine
Weatherhead, Case Western Uni	Fellow	1991	Academic Mgt
Academic Alliance for Internal Medicine		2007	Executive Leadership

Current Positions Held

University of Alabama at Birmingham

2012-present Professor and Chair, Department of Medicine, University of Alabama at Birmingham

2012-present Board of Directors, University of Alabama Health Services Foundation

2012-present Executive Committee, University of Alabama Health Services Foundation

2012-present Board of Directors, University of Alabama at Birmingham Health System (including Audit and Finance Committees)

2017-present Investigator, McKnight Brain Institute

Faculty Appointments

Case Western Reserve University

1985-1991 Assistant Professor of Medicine, Case Western Reserve University

1991-1995 Associate Professor of Medicine, Case Western Reserve University

1992-1997 Associate Professor of Epidemiology and Biostatistics

1995-1997 Professor of Medicine, Case Western Reserve University

University of California San Francisco

1997-2012 Professor of Medicine, and of Epidemiology and Biostatistics, University of California San Francisco

University of Alabama at Birmingham

2012-present Professor of Medicine, University of Alabama at Birmingham

Center for Advanced Study in the Behavioral Sciences at Stanford University

2008-2009 Fellow

Hospital Appointments

1985-1997 Visiting Staff, University Hospitals of Cleveland

1990-1997 Medical Co-Director, Unit for the Acute Care of Elders

1991-1997 Staff Physician, Cleveland VAMC
1997-2012 Staff Physician, San Francisco VAMC
1998-2012 Staff Physician, Moffit Long Hospital
2007-2012 Staff Physician, San Francisco General Hospital

Administrative Appointments

Case Western Reserve University

1987-1997 Director, Fellowship in General Internal Medicine
1987-1990 Director, Clinical Analysis Project
1988-1993 Director, Clinical Epidemiology Section, Division of General Internal Medicine
1991-1997 Director, Program in Health Care Research, Department of Medicine
1991-1993 Co-Chief, Division of General Internal Medicine
1993-1994 Acting Chief, Division of General Internal Medicine
1994-1997 Chief, Division of General Internal Medicine and Health Care Research

University of California San Francisco & San Francisco VAMC

1997-2012 Chief, Division of Geriatrics, Department of Medicine
1997-2012 Director, UCSF-Mt. Zion Center on Aging
1997-1998 Acting Director, Nursing Home Care Unit, SFVAMC
1998-2009 Associate Chief of Staff/Geriatrics and Extended Care, San Francisco VAMC
1998-1999 Director, Geriatrics Fellowship Program
1999-2004 Co-Director, Geriatrics Fellowship Program
1998-2012 Director, VA National Quality Scholars Fellowship Program
2010-2012 Associate Chairman for Strategic Planning and Implementation, Department of Medicine

University of Alabama at Birmingham

2012-present Chair, Department of Medicine, University of Alabama at Birmingham

Ancillary Positions Held

1995-1997 Senior Faculty Associate, University Center on Aging and Health, Case Western Reserve University

Clinical Training and Experience

1979-1982 Medical Resident, PGY1-3, University of California San Francisco
1982-1983 Chief Medical Resident, University of California San Francisco
1983-1985 Henry J. Kaiser Family Foundation Fellow in General Internal Medicine, Harvard Medical School and Brigham and Women's Hospital

Honors and Awards

1971-1974 Harvard University Scholarship
1973 History of Science Departmental Prize, Harvard University
1974 B.A. magna cum laude
1976-1978 Rhodes Scholarship
1985-1987 Keck Research Scholar
1990-1993 American College of Physicians George Morris Piersol Teaching and Research Scholar

1990 Fellow, American College of Physicians
1991-1992 President, Midwest Society of General Internal Medicine
1992 Henry Christian Award for Excellence in Research (American Federation for Clinical Research)
1992 Society of General Internal Medicine Workshop Letter of Recognition
1993-1997 Senior Research Associate, HSR&D Service, Department of Veterans Affairs
1997 Elected, American Society for Clinical Investigation
1999-2000 President, Society of General Internal Medicine
2003 Harry Weinstein Award, Program for Elders in the Central City
2005 Elected, Association of American Physicians
2008 Fellow, Center for Advanced Study in the Behavioral Sciences at Stanford University
2011 Robert J. Glaser Award, "For Exceptional Contributions to Education and Research," Society of General Internal Medicine
2012 Spencer Chair in Medical Science Leadership, UAB School of Medicine
2015 Elected, American Clinical and Climatological Association
2016 Appointed Member, US Preventive Services Task Force
2016 Laureate, Alabama Chapter, American College of Physicians
2017 Appointed Member, Board of the American Board of Internal Medicine

Publications (2017)

Turnipseed EG, Landefeld CS. A triumph for the Agency for Healthcare Research and Quality Safety Program for Long-term Care: Moving beyond "Round up the usual suspects" [published online May 19, 2017]. *JAMA Intern Med.* JAMA Intern Med. 2017 Aug 1;177(8):1163-1164. doi: 10.1001/jamainternmed.2017.1792. PMID: 28525915

BIOGRAPHICAL SKETCH

NAME **Robin Lester**		POSITION TITLE Professor	
EDUCATION/TRAINING			
INSTITUTION/LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
University of Bristol, U.K.	B.Sc.	1984	
University of Bristol, U.K.	PhD	1988	
Vollum Institute, Portland, OR	Post-doc	1991	

Positions

1992-1993 Research Assistant Professor / Baylor College of Medicine
1993-1995 Assistant Professor / Neuroscience / Baylor College of Medicine
1995-1996 Associate Scientist / NRC, University of Alabama at Birmingham
1996-2001 Assistant Professor / Neurobiology, University of Alabama at Birmingham
2006-present, Investigator, McKnight Brain Institute
2001-2011 Associate Professor / Neurobiology, University of Alabama at Birmingham
2011-present Professor / Neurobiology, University of Alabama at Birmingham

Honors, Awards, and Advisory Committees

2017- Reviewer of UAB fellowship applications (GRiP)
2017- Reviewer preclinical curriculum – Fundamentals Module
2017- Reviewer Scholarly Activity
2017- Preclinical subcommittee: Step 1 Prep Time Task Force
2017 Diversity Fair participant

Publications 2017

None

BIOGRAPHICAL SKETCH

NAME **Farah Lubin**		POSITION TITLE Associate Professor	
EDUCATION/TRAINING			
INSTITUTION/LOCATION AL State Uni, Montgomery, AL SUNY, Binghamton, NY	DEGREE B.S. PhD	YEAR(S) 1996 2001	FIELD OF STUDY Cell/Moleular Bio Biology

Positions

2006-2008 Postdoctoral Fellow, Advisor: J. David Sweatt, PhD, Department of Neuroscience, Baylor College of Medicine, Houston, TX

Department of Neurobiology, University of Alabama-Birmingham, Birmingham, AL

2006-present Investigator, McKnight Brain Institute

2002-2005 Postdoctoral Fellow, Cain Foundation Labs/Texas Children's Hospital**,** Advisor: Anne E. Anderson, M.D.**,** Department of Pediatrics-Neurology, Baylor College of Medicine, Houston, TX

ACADEMIC APPOINTMENTS: (In reverse chronological order)

2015-Present Associate Professor with Tenure, Dept. of Neurobiology, Dept. of Cell, Developmental and Integrative Biology, and Genetics Dept., University of Alabama at Birmingham, Birmingham, AL

2015-Present Director, Comprehensive Neuroscience Center EEG core

2014-Present Director, NINDS Neuroscience Roadmap Scholar Program; Co-Director: Lori L. McMahon, PhDat University of Alabama at Birmingham, Birmingham, AL

2009-Present Investigator, McKnight Brain Institute, University of Alabama at Birmingham, Birmingham, AL

2009-2015 Assistant Professor, Department of Neurobiology, University of Alabama-Birmingham, Birmingham, AL

2009-2015 Assistant Professor, Dept. of Cell Biology, University of Alabama at Birmingham, Birmingham, AL

2011-2015 Assistant Professor, Genetics Dept., University of Alabama at Birmingham, Birmingham, AL

2011-2014 Principal Investigator, GS-13/1, Veteran Affairs at University of Alabama at

Honors, Awards, and Advisory Committees

2017 UAB Dean's Award for Excellence in Mentorship

2017 Nominated School of Medicine Dean's Excellence Award in Diversity Enhancement

2013-2014 ellence in Editing/Reviewing

Publications 2017

1. W.M. Webb, R.G. Sanchez, G.A. Perez, A.A. Butler, R.M. Hauser, M.C. Rich, A.L. O'Bierne, T.J. Jarome, **F.D. Lubin**. Dynamic association of epigenetic H3K4me3 and DNA 5hmC marks in the dorsal hippocampus and anterior cingulate cortex following reactivation of a fear memory. 2017. *Neurobiology of Learning and Memory* Jul; 142(Pt A):66-78. (citations 01) 19

2. J.L. Cohen, A.E. Ata1, N.L. Jackson, E.J. Rahn, W.M. Webb, **F.D. Lubin**, and S.M. Clinton. Amygdalar expression of the microRNA miR-101a and its target Ezh2 contribute to rodent anxiety-like behavior. 2017. *European Journal of Neuroscience* Oct; 46(7):2241-2252.

Manuscripts in preparation

1. Timothy J. Jarome, Anderson A. Butler, Gabriella Perez, Megan C. Rich, and **Farah D. Lubin**. Histone Ubiquitination controls heterochromatin and euchromatin dynamics during memory consolidation. Submitted to *Neuron*.

2. William M. Webb, Anderson A. Butler, and **Farah D. Lubin**. Lysine methylated NF-kappaB mediates histone methylation marks during memory consolidation. Submitted to *PNAS*.
3. R. Ryley Parrish*, Richard G. Sanchez*, Roxanne M. Lockhart, Kazuhito Nakao, Susan C. Buckingham, Kristen Riley, Tore Eid, and **F.D. Lubin.** Increasing *O*-GlcNAc levels in the hippocampus is anti-consultant and reduces epileptiform activity. In preparation.
4. A. Wheeler, W. Haselden, R.R. Parrish and **F.D. Lubin**. The effects of Levetiracetam on Histone methylation levels in the epileptic hippocampus. In preparation.

BIOGRAPHICAL SKETCH

NAME **Roy C. Martin**		POSITION TITLE Associate Professor	
EDUCATION/TRAINING			
INSTITUTION/LOCATION Louisiana State University West Virginia University	DEGREE PhD Postdoctoral Fellowship	YEAR(S) 1990-1995 1995	FIELD OF STUDY Clinical Psychology Neuropsychology

Positions

Associate Professor, Department of Neurology
Investigator, McKnight Brain Institute

Honors, Awards, and Advisory Committees

Publications 2017

1. Beattie JF, Martin RC, Kana RK, Deshpande H, Lee S, Cure J, Ver Hoef L. Hippocampal dentation: Structural variation and its association with episodic memory in healthy adults. *Neuropsychologia*, 2017 101: 65-75.
2. Gerstenecker, A., Lowry, K., Myers, T., Bashir, K., Triebel, K., Martin, R., & Marson. Medical Decision-Making Capacity and its Cognitive Predictors in Multiple Sclerosis. *Journal of the Neurological Sciences,* In Press.
3. Gerstenecker A, Myers T, Lowry K, Martin R, Triebel K, Bashir K, Marson D. Financial capacity and its cognitive predictors in multiple sclerosis. *Archives of Clinical Neuropsychology*, In Press.
4. Niccolai LM, Triebel KL, Gerstenecker A, McPherson T, Cutter GR, Martin RC, Marson DC. Neurocognitive predictors of declining financial capacity in persons with mild cognitive impairment. *Clinical Gerontologist* 2017; 40: 14-23.
5. Piper K, Richman J, Faught E, Martin R, Funkhouser E, Szaflarski JP, Dai C, Juarez L, Pisu M. Adherence to antiepileptic drugs among diverse older Americans on Part D Medicare. *Epilepsy & Behavior* 2017; 66: 68-73.
6. Pisu M, Richman J, Piper K, Martin R, Funkhouser E, Dai C, Juarez L, Szaflarski J, Faught E. Quality of antiepileptic treatment among older Medicare beneficiaries with epilepsy: A retrospective claims data analysis. *Medical Care* 2017; 55 (7): 677-683.
7. Martin RC, Faught E, Szaflarski JP, Richman J, Funkhouser E, Piper L, Juarez L, Dai C, Pisu M. What does the U.S. Medicare administrative claims database tell us about initial antiepileptic drug treatment for older adults with new-onset epilepsy? *Epilepsia* 2017 48 (4): 548-557.
8. Martin RC. Treatment Challenges in Nonepileptic Psychogenic Seizures: Finding the Perfect Fit for the No-One-Size-Fits-All Group. *Epilepsy Currents* 2017; 17 (3): 147-149.
9. Szaflarski JP, Martin RC, Faught E, Funkhouser E, Richman J, Piper K, Juarez L, Dia C, Pisu M. Quality indicator for epilepsy treatment (QUIET) 15: Intervening after recurrent seizures in the elderly. *Epilepsy & Behavior* 2017; 12: 272-282.

BIOGRAPHICAL SKETCH

NAME **Lori McMahon**		POSITION TITLE Professor Dean, Graduate School	
EDUCATION/TRAINING			
INSTITUTION/LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
-Southern Illinois University, Edwardsville, IL	B.A.	1987	Biology/Chemistry
-St. Louis Health Science Ctr, St. Louis, MO	PhD	1993	Neuropharmacology
-Duke University, Durham, NC	Postdoc	1998	Neurophysiology

Positions

1998 Primary Appointment – Department of Physiology and Biophysics
Cell, Developmental & Integrative Biology
Secondary Appointments: Neurobiology
Other Appointments:
McKnight Brain Institute, Neurology, Civitan International Research Center, comprehensive Ctr for healthy Aging, General Clinical Research Center, Electrical & Computer Engineering, Medicine,

B. Positions and Honors

Professional Experience

1987-1993 Graduate Assistant, Saint Louis University
1993-1998 Research Associate, Duke University
1998-2006 Assistant Professor, UAB Department of Physiology and Biophysics
2002-2006 Assistant Scientist, UAB Alzheimer's Disease Research Center
2006-2010 Associate Professor with tenure, UAB Department of Physiology and Biophysics
2006-2012 Director, Neuroscience Theme Graduate Program
2006-2012 Co-Director, Synaptic Plasticity Core Facility
2008-pres Scientist, UAB Comprehensive Center for Healthy Aging
2010-2012 Professor, UAB Department of Physiology and Biophysics
2012-pres Scientist, Center for Exercise is Medicine
2012-pres Professor, UAB Department of Cell, Developmental, and Integrative Biology
2012-pres Jarman F Lowder Endowed Professor of Neuroscience
2012-pres Director, Comprehensive Neuroscience Center
2012-pres Member, UAB SOM Dean's Executive Committee
2012-2015 Associate Director, Comprehensive Center for Healthy Aging
2013-2016 Associate Director, UAB McKnight Brain Institute
2015-pres Dean, UAB Graduate School

Honors

1983-1987 Presidential Scholarship, Southern Illinois University
1987 Ella Ott Weissman Award in Biological Sciences
1987-1988 Saint Louis University Predoctoral Fellowship
1988-1992 NIH Institutional Neuropharmacology Training Grant, Saint Louis Univ.
1994-1995 NIH Institutional Postdoctoral Fellowship, Duke University

1995-1998 NIH NRSA Individual Postdoctoral Training Grant, Duke University
1999-2000 New Investigator Award, Epilepsy Foundation
2000-2002 Junior Investigator Award, American Heart Association
2002 Ad Hoc Reviewer, NIH Study Section, MDCN 3
2002-2009 American Physiological Society Awards Committee
2002-2010 Editorial Board, Journal of Neurophysiology
2004-2005 Ad hoc member of NIH Study Section, Molecular Neuropharmacology (MNPS)
2005-2008 Permanent Member, NIH Study Section, Molecular Neuropharmacology (MNPS)
2008-2010 NARSAD Independent Investigator Award
2008-pres Editorial Board, Neuropsychopharmacology
2008 President's Excellence in Teaching Award, UAB
2009-2013 Permanent Member NIH Study Section, Learning and Memory (LAM)
2009 Reviewing Editor, Frontiers in Aging Neuroscience
2010 Editorial Review Board, Frontiers in Neurodegenerative Disease
2011 Outstanding Mentor Award UAB
2011 NIH NICHD Intramural Program Reviewer
2011-2013 Co-Chair Faculty Council, UAB Promotions and Tenure Committee
2011-2014 Program Committee, Society for Neuroscience
2011-pres President, Birmingham Chapter of the Society for Neuroscience
2012-2013 Chair, Theme G, Novel Methods and Technology Development, SfN
2013-2014 Chair, Theme B, Neural Excitability, Synapses, and Glia: Cellular Mechanisms, SfN
2016-pres Editorial Board, Journal of Neuroscience

Complete List of Published Work: https://www.ncbi.nlm.nih.gov/pubmed/?term=mcmahon+LL

BIOGRAPHICAL SKETCH

NAME **James H. Meador-Woodruff, MD**	POSITION TITLE Heman E. Drummond Professor and Chairman Department of Psychiatry

EDUCATION/TRAINING

EDUCATION

09/73-06/76 Manchester High School, Richmond, Virginia
09/76-05/80 University of Richmond, Richmond, Virginia; B.S. in Chemistry, minor subject Mathematics (*summa cum laude*)
08/80-05/84 Medical College of Virginia Commonwealth University, Richmond, Virginia; M.D.

POSTDOCTORAL TRAINING

06/84-06/85 Intern, Department of Psychiatry, University of Michigan
07/85-06/89 Resident, Department of Psychiatry, University of Michigan (*Graduation with Distinction*) 07/85-12/89 Postdoctoral Fellow, Mental Health Research Institute, University of Michigan (Laboratories of Huda Akil and Stanley J. Watson)

INSTITUTION AND LOCATION	DEGR EE M.D.	YEAR(S) 1984	FIELD OF STUDY Psychiatry
Department of Psychiatry and Behavioral Neurobiology University of Alabama at Birmingham SC 560C			

Positions

ACADEMIC APPOINTMENTS

07/89-12/89 Research Fellow, Mental Health Research Institute, University of Michigan
07/89-12/89 Lecturer, Department of Psychiatry, University of Michigan
01/90-08/93 Research Investigator, Mental Health Research Institute, University of Michigan
01/90-08/95 Assistant Professor of Psychiatry, University of Michigan
01/90-08/95 Assistant Research Scientist, Mental Health Research Institute, University of Michigan
09/95-08/97 Associate Research Scientist, Mental Health Research Institute, University of Michigan
09/95-08/02 Associate Professor of Psychiatry, University of Michigan
09/97-08/02 Senior Associate Research Scientist, Mental Health Research Institute, University of Michigan
09/02-08/03 Senior Research Scientist, Mental Health Research Institute, University of Michigan
09/02-03/06 Professor of Psychiatry, University of Michigan
09/03-03/06 Research Professor, Molecular and Behavioral Neuroscience Institute (formally Mental Health Research Institute), University of Michigan
04/06-present Heman E. Drummond Professor, Department of Psychiatry and Behavioral Neurobiology, University of Alabama at Birmingham
04/06-present Professor of Neurobiology, University of Alabama at Birmingham
04/06-present Senior Scientist, Civitan International Research Center, University of Alabama at Birmingham
04/06-present Investigator, McKnight Brain Institute

08/06-present Senior Scientist, Center for Glial Biology in Medicine, University of Alabama at Birmingham
10/06-present Senior Scientist, Comprehensive Neuroscience Center, University of Alabama at Birmingham
07/07-present Senior Scientist, Center for Neurodegeneration and Experimental Therapeutics, University of Alabama at Birmingham
01/09-present Senior Scientist, Evelyn F. McKnight Brain Institute, University of Alabama at Birmingham
04/09-present Senior Scientist, Alzheimer's Disease Research Center (ADRC), University of Alabama at Birmingham

ACADEMIC ADMINISTRATIVE APPOINTMENTS

07/95-03/99 Research Advisor, Department of Psychiatry, Ann Arbor Veterans Administration Medical Center
04/99-12/02 Director of Psychiatric Research, Department of Psychiatry, Ann Arbor Veterans Administration Medical Center
07/00-12/05 Director of Residency Research Track, Department of Psychiatry, University of Michigan
09/01-03/02 Interim Associate Chair for Research, Department of Psychiatry, Universityof Michigan
09/01-07/02 Associate Chair for Research Training and Faculty Development, Department of Psychiatry, University of Michigan
07/02-03/06 Associate Chair for Research, Department of Psychiatry, University of Michigan
07/03-12/05 Co-Director of Residency Clinical Scholars Track, Department of Psychiatry, University of Michigan
03/04-01/06 Vice Chair, Department of Psychiatry, University of Michigan
04/06-present Psychiatrist-in-Chief, University of Alabama at Birmingham Health System Hospitals and Clinics
04/06-present Chairman, Department of Psychiatry and Behavioral Neurobiology, University of Alabama at Birmingham

Honors, Awards, and Advisory Committees

1976 Virginia High School League, State Champion, Debate
1976 The Margaret Pharr Award (Mathematical Association of America) 1977 Phi Eta Sigma (national academic honor society)
1978 Gamma Sigma Epsilon (national chemistry honor society) 1979 Pi Mu Epsilon (national mathematics honor society)
1979 The J. Stanton Pierce Award (Department of Chemistry, University of Richmond) 1979 The Denoon Scholarship (University of Richmond)
1980 American Chemical Society Award for Outstanding Achievement in Chemistry 1980 The Garnett Ryland Award (Department of Chemistry, University of Richmond) 1980 Sigma Xi (national research honor society)
1980 Phi Beta Kappa
1983 The National Dean's List
1983 The Merck Scholarship (Medical College of Virginia Commonwealth University)
1984 The Sandoz Award in Recognition of Superior Academic Achievement and Contribution to Health Care (Department of Psychiatry, Medical College of Virginia Commonwealth University) 1986 American College of Neuropsychopharmacology/Mead Johnson Travel Fellowship

1987 American Psychiatric Association/Pennwalt Resident Research Award Competition, Honorable Mention
1988 Upjohn Pharmaceutical/University of Michigan Department of Psychiatry, The Psychiatry Resident Outstanding Writing Award
1988 Alpha Omega Alpha
1989 The Lilly Psychiatric Research Fellowship
1989 The American Psychiatric Association/Dista Products Resident Research Award
1989 Upjohn Pharmaceutical/University of Michigan Department of Psychiatry, The Psychiatry Resident Outstanding Writing Award
1989 Graduation with Distinction from the Residency Program, Department of Psychiatry, University of Michigan
1991 The A. E. Bennett Neuropsychiatric Research Foundation Award
1992 Collegium Internationale Neuro-Psychopharmacologicum (CINP) Rafaelsen Fellowship Award
1993 Young Investigator Award, International Congress on Schizophrenia Research 2002 Elected as a Fellow of the American College of Neuropsychopharmacology

Publications (2017)

1. Actin polymerization is reduced in the anterior cingulate cortex of elderly patients with schizophrenia.Bhambhvani HP, Mueller TM, Simmons MS, Meador-Woodruff JH.Transl Psychiatry. 2017 Dec 11;7(12):1278. doi: 10.1038/s41398-017-0045-y.PMID: 29225346
2. Abnormalities of signal transduction networks in chronic schizophrenia. McGuire JL, Depasquale EA, Funk AJ, O'Donnovan SM, Hasselfeld K, Marwaha S, Hammond JH, Hartounian V, Meador-Woodruff JH, Meller J, McCullumsmith RE. NPJ Schizophr. 2017 Sep 12;3:30. doi: 10.1038/s41537-017-0032-6. eCollection 2017. PMID: 28904993
3. Pre-clinical Medical Students as the Primary Longitudinal Provider of Psychiatric Care in the Outpatient Setting: A Novel Training Model. Martinez JTC Jr, Fargason RE, Meador-Woodruff JH. Acad Psychiatry. 2017 Aug;41(4):538-541. doi: 10.1007/s40596-016-0659-z. Epub 2017 Jan 31. No abstract available. PMID: 28144829
4. Altered fucosyltransferase expression in the superior temporal gyrus of elderly patients with schizophrenia. Mueller TM, Yates SD, Haroutunian V, Meador-Woodruff JH. Schizophr Res. 2017 Apr;182:66-73. doi: 10.1016/j.schres.2016.10.024. Epub 2016 Oct 20. PMID: 27773385

BIOGRAPHICAL SKETCH

NAME **Kazutoshi (Kazu) Nakazawa**		POSITION TITLE Associate Professor	
EDUCATION/TRAINING			
INSTITUTION/LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
-Keio University School of Medicine, Tokyo, Japan	MD	1981 – 1987	Medicine
-Graduate School of Medicine, Keio University, Tokyo, Japan Biological Science	PhD	1987 – 1991	Biological Science
-Frontier Science Program, Riken Institute, Japan	Post-doctoral	1991- 1995	
-Picower Center for Learning & Memory, MIT	Post-doctoral	1995 - 2003	

Positions

2003- 2013 Principal investigator, Intramural Program, National Institute of Mental Health

2013 – present Associate Professor, Department of Psychiatry and Behavioral Neurobiology, University of Alabama at Birmingham

2013 – present Investigator, McKnight Brain Institute

Honors, Awards, and Advisory Committees

1987-1991: Scholarship for graduate school from Japan Scholarship Foundation

1995-1997: Human Frontier Science Program (HFSP) Long-Term Fellowship

1997-1999: Howard Hughes Medical Institute, Postdoctoral fellow

2010: National Institute of Mental Health (NIMH) Director's Merit Award

Publications 2017

Original Articles in Referred Journals:

1. Yang C, Kobayashi S, Nakao K, Han M, Qu Y, Ren Q, Zhang J, Ma M, Dong C, Toki H, Yamaguchi J, Chaki S, Shirayama Y, Nakazawa K, Manabe T, and Hashimoto K. AMPAR activation-independent antidepressant actions of ketamine metabolite. Submitted
2. Nakao K, Jeevakumar V, Jiang SZ, Fujita Y, Diaz NB, Pretell Annan CA, Eskow Jaunarajs KL, Hashimoto K, Belforte JE, and Nakazawa K. Schizophrenia-like dopamine release abnormalities in a mouse model of NMDA receptor hypofunction. Under revision in Schizophrenia Bulletin
3. Kolata SM, Nakao K, Jeevakumar V, Farmer-Alroth EL, Fujita Y, Bartley AF, Jiang SZ, Rompala GR, Sorge RE, Jimenez DV, Martinowich K, Mateo Y, Hashimoto K, Dobrunz LE, and Nakazawa K. (2017) Neuropsychiatric phenotypes produced by GABA reduction in mouse cortex and hippocampus. Neuropsychopharmacology in press
4. Radke AK, Jury NJ, Delpire E, Nakazawa K, and Holmes A. (2017) Reduced ethanol drinking following selective cortical interneuron deletion of the GluN2B NMDA receptors subunit. Alcohol 58, 47-51 [PMID: 28109345].

Books and Reviews:

Nakazawa K, Jeevakumar V, Nakao K. (2017) Spatial and Temporal Boundaries of NMDA receptor Hypofunction Leading to Schizophrenia. NPJ Schizophrenia 3, 7, 2017 [PMID: 28592819]

Nakazawa K (2017) Dentate Mossy Cell and Pattern Separation. Neuron 93, 465-467 [PMID: 28182899]

Conference/Invited Talk As Chair/Organizer

March 28, 2017, Symposium: "Alterations in NRG/ErbB and NMDA signaling may contribute to brain region-specific dopamine dysbalance in schizophrenia" at International Congress on Schizophrenia Research (2017 ICOSR), San Diego.

As Speaker:

1. Title: "Dysfunction of GABAergic interneurons and neuropsychiatric illnesses", at MIT Colloquium on the Brain and Cognition in Department of Brain and Cognitive Sciences at MIT, Cambridge, MA, October 12, 2017.
2. Title: "Cortical hypodopaminergia vs striatal hyperdopaminergia revisited in an NMDAR hypofunction model of schizophrenia", at Symposium: "Alterations in NRG/ErbB and NMDA signaling may contribute to brain region-specific dopamine dysbalance in schizophrenia" at International Congress on Schizophrenia Research (ICOSR) 2017, San Diego.

Abstracts for Meeting Presentation:

1. Kolata SM, Nakao K, Jeevakumar V, Fujita Y, Hashimoto K, and Nakazawa K. (2017) Cortical GABA reduction leads to deficits in effort-based behavior by impaired anterior cingulate cortex dopamine release. The 56th ACNP Annual Meeting, Palm Springs, CA, December 3-7.
2. Nakao K, Fujita Y, Jaunarajs KL, Hashimoto K, and Nakazawa K (2017) Blunted prefrontal dopamine release in a NMDA receptor hypofunction mouse model. Soc. Neurosci. Abstr. 43
3. Nakao K, and Nakazawa K (2017) Cortical hypodopaminergia vs striatal hyperdopaminergia revisited in an NMDAR hypofunction model of schizophrenia. International Congress on Schizophrenia Research. San Diego, March 24-28.

BIOGRAPHICAL SKETCH

NAME **Vladimir Parpura, MD, PhD**		POSITION TITLE Professor	
EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
School of Medicine in Split, University of Zagreb, Croatia	MD	1989	Biological role of gangliosides
Iowa State University, Ames, IA	PhD	1993	Glia-neuron signaling

MILITARY SERVICE
Yugoslav National Army (10/1983-9/1984, compulsory military service; 9-10/1988, re-mobilization) Atomic, Biological and Chemical Weapon Defense; Rank: Lieutenant

POSITIONS
MEDICAL EXPERIENCE
07/87 International Educational Exchange, Dept. of Haemodynamics, University Clinic Novi Sad, Yugoslavia
07/88 International Educational Exchange, Dept. of General Surgery, University General Hospital Cordoba, Spain
07/89 International Educational Exchange, University of Rome, Italy, declined
07/89-12/89 Rotating Internship in Medicine, Clinical Hospital Center, Split, University of Zagreb, Croatia

ACADEMIC APPOINTMENTS: (In reverse chronological order)

Year	Rank/Title	Institution
10/1/15-	Professor (with tenure)	Dept. of Neurobiology, UAB

Secondary appointments: Department of Cell Developmental and Integrative Biology (10/1/15-), Dept. of Biomedical Engineering (10/1/15-) and Dept. of Vision Science (10/1/15-)

7/1/07-9/30/15	Associate Professor (with tenure)	Dept. of Neurobiology, UAB, AL

Secondary appointments: Dept. of Cell Biology (8/27/07-3/6/12), which became Department of Cell Developmental and Integrative Biology (3/7/12-9/30/15), Dept. of Vision Science (9/28/07-9/30/15) and Dept. of Biomedical Engineering (1/1/09-9/30/15)

2015-present	Investigator, McKnight Brain Institute	
4/16/13-5/26/15,	Professor (with tenure)	Dept. of Biotechnology, Univ. of Rijeka, Croatia
7/1/-9/15/07	Visiting Associate Researcher*	Dept. of Cell Biology & Neuroscience Univ. of California, Riverside, CA
7/06-6/07	Cooperative Faculty-Associate Professor*	Dept. of Physics & Astronomy Univ. of California, Riverside, CA
7/05-6/07	Associate Professor (with tenure)*	Dept. of Cell Biology & Neuroscience

Sabbatical leave in residence (7/1/06-1/2/07)Univ. of California, Riverside, CA

7/00-6/05	Assistant Professor*	Dept. of Cell Biology & Neuroscience Univ. of California, Riverside, CA
12/96-7/00	Affiliate Assistant Professor	Dept. of Zoology & Genetics Iowa State University, Ames, IA

Graduate Faculty (unless inherently linked to the appointment; * see above):

05/98-7/00 Graduate Faculty, Dept. of Zoology & Genetics, Iowa State University, Ames, IA

10/98-7/00 Graduate Faculty, Program for Neuroscience, Iowa State University, Ames, IA

9/12/07-6/5/14Graduate Faculty, Dept. of Neurobiology (consolidated to GBS; see below), Univ. of Alabama at Birmingham (UAB), Birmingham, AL

10/4/07-7/16/12 Graduate Faculty, Cellular and Molecular Biology Program (consolidated to GBS; see below), UAB, Birmingham, AL

7/17/12- Graduate Faculty, Graduate Biomedical Science (GBS), UAB, Birmingham, AL

3/21/13- Graduate Faculty, Medical Scientist Training Program (MSTP), UAB, Birmingham, AL

Honors, Awards, and Advisory Committees

AWARDS/HONORS

2017- Elected Corresponding Member, Section of Medical Sciences, The Slovenian Academy of Sciences and Arts
2017-2018 McNulty Civitan Scientist Award, The UAB Civitan International Research Center and The Chesapeake District of Civitan International
2017- Elected Fellow, The American Association for the Advancement of Science (AAAS)

COUNCILS AND COMMITTEES

8/8/12- Member-At-Large (2-year term, 2 terms; 2013-15, 2015-17), Central Nervous System Section Steering Committee, American Physiological Society; Reviewer for CNS Section Awards: 2016 Research Recognition Award, and 2016 & 2017 Van Harreveld Memorial Award

3/17/15-3/20/17 President-Elect (2-year term), American Society for Neurochemistry
3/15/15-3/23/16 Member, American Society for Neurochemistry, 2016 Scientific Program Committee for 47th Annual ASN Meeting, Denver, CO
3/21/17- President (2-year term), American Society for Neurochemistry
10/24/17- Member, Program Committee, Joint International Society for Neurochemistry-American Society for Neurochemistry Meeting, Montreal, Canada

TEACHING

Mentor, 2013, 2015 and 2017 Summer Science Institute (SSI) Research Internships for High School and Community College Students, Center for Community OutReach Development (CORD), UAB

7/28/17 CORD Summer Science Program Closing Ceremony:
Mesina, M.[1], Hopkins, S.[2], Wideman, S.[5],Montana, V.[5], Jokanović, V.R., Parpura, V. (2017) Effects of Graphene Oxide and Copolymers on the Morphology of the D54 Human Glioma Cell Line; poster presentation

[1] High school student, [2] Undergraduate Student, [3]Graduate Student, [4] Post-Doc, and [5]Research associate in my laboratory

1/3-3/3/17 Course Director. OBHS121 System 1 Neuroscience /DENT1255 Neuroscience. 7 lectures, test questions, brain anatomy practicum, exams and grading. University of Alabama Birmingham; optometry and dental students, total of 115.

1/10/-4/21/17 Course Director. NBL433/PY433 Diseases of the Nervous System. Undergraduate Neuroscience Program, University of Alabama at Birmingham. 7 (of 12) 75-minute lectures, discussions, exams and grading; 26 undergraduate students.

2/15/2017 Taught in GBS 746 Cellular Neurophysiology (Director: J. Wadiche), University of Alabama Birmingham; 2 lectures and provided exam questions; 4 graduate students

1/19/-4/13/17 Course Director. NBL 703. Neurobiology Seminar Series. University of Alabama Birmingham. 31graduate students

MANUSCRIPTS

1. Parpura, V., Fisher, E., Lechleiter, J.D., Schousboe, A., Waagepetersen, H.S., Brunet, S., Baltan, S., Verkhratsky, A. (2017) Glutamate and ATP on interface between signaling and metabolism in astroglia: examples from pathology. *Neurochem Res* 42:19–34.
2. Verkhratsky, A., Rodríguez, J.J., Parpura, V., Zorec, R. (2017) Astroglial calcium signalling in Alzheimer's disease. *Biochem Biophys Res Commun* 483:1005-1012.
3. Zorec, R., Parpura, V., Verkhratsky, A. (2017) Astroglial vesicular trafficking in neurodegenerative diseases. *Neurochem Res* 42:905-917.
4. Buscemi, L., Ginet, V., Lopatar, J., Montana, V. Pucci, L., Spagnuolo, P., Zehnder, S., Grubišić, V., Truttman, A., Sala, C., Hirt, L., Parpura, V., Puyal, J,. Bezzi, P. (2017) Homer1 scaffold proteins govern Ca^{2+} dynamics in normal and reactive astrocytes. *Cereb Cortex* 27:2365–2384
5. Zorec, R., Parpura, V., Vardjan, N., Verkhratsky, A. (2017) Astrocytic face of Alzheimer's disease. *Behav Brain Res* 322:250-257.
6. Grubišić, V., Parpura, V. (2017) Two modes of enteric gliotransmission differentially affect gut physiology. *Glia* 65:699–711.
7. Verkhratsky, A., Zorec, R., Rodríguez, J.J., Parpura, V. (2017) Stratification of astrocytes in healthy and diseased brain. *Brain Pathol* 27:629-644.

Journal articles in press

1. Verkhratsky, A., Zorec, R., Rodríguez, J.J., Parpura, V. (2015) Astrogliopathology in neurodegeneration. *Eur J Neurodeg Disease*
2. Grubišić, V., Verkhratsky, A., Zorec, R., Parpura, V. (2017) Enteric glia regulate gut motility in health and disease. *Brain Res Bull*
3. Zorec, R., Parpura, V., Verkhratsky, A. (2017) Astroglial vesicular network: Evolutionary trends, physiology and pathophysiology. *Acta Physiol (Oxf)*

Journal articles submitted but not yet accepted

1. Sammons, J.D., Cavender, C.E., Gottipati, M.K., Parpura, V., Gross, A.K. (2016) Monitoring GPCR trafficking kinetics in healthy and diseased knock-in mouse retinas
2. Stenovec, M., Trkov, S., Smolič, T., Kreft, M., Parpura, V., Zorec, R. (2016) Undiscriminate mobility disruption of different secretory organelles by presenilin PS1ΔE9 in astrocytes

Invited lectures, etc. at national/international postgraduate courses and meetings and at other universities

3/22/17 "Glial calcium signaling in neurodegenerative diseases", In Colloquium 9: Principles Neurogliopathology (Chairs: Nina Vardjan, University of Ljubljana & Alexei Verkhratsky, The University of Manchester) 48th Annual Meeting of the American Society for Neurochemistry, Little Rock, AR

4/6/17 "Probing astrocytes and neurons with carbon nanotubes: Implications for translational medicine" Biochemistry & Biotechnology Symposium: Innovative Models for Investigating

Fundamental Biological and Disease-Related Processes, University of Missouri-Saint Louis, Saint Louis, MO
5/3/17 "Vesicular glutamate release from astrocytes at the interface of signaling and metabolism", Department of Neurosciences, Lerner Research Institute, Cleveland Clinic, Cleveland, OH
9/21/17 "Vesicular glutamate release from astrocytes at the interface of signaling and metabolism", International Conference "Brain Extracellular Matrix and Glia in Health and Disease", Voronezh, Russian federation
10/17/17 "Vesicular Glutamate Release from Astrocytes at the Interface of Signaling", In Session 4: Astrocyte Function in Health and Disease (Organizer: Doug Feinstein, University of Illinois), 11th Great Lakes Glia Meeting. Traverse City, MI

Undergraduate students (BS Honors Thesis Project Committee)
Benjamin D. Boros (4/4/17-), Undergraduate Neuroscience Program and the Science and Technology Honors
Hailey Edwards (7/18/17-), Science and Technology Honors Program, UAB

GRANT SUPPORT: (CURRENT AND PAST)
Active
12/1/13-11/30/17* National Institutes of Health (R21HD078678) "The Role of Astroglia in the Enteric Nervous System and Gut Function" (PI) 275,000(Direct), $129,063 (indirect), $404,250 (Total). *two consecutive 1 year no cost extensions approved (12/1/15-11/30/16 & 12/1/16-11/30/17)
7/1/16-6/30/20COST (CA 15214), EU Framework Programme Horizon 2020 "An integrative action for multidisciplinary studies on cellular structural networks- EuroCellNet" (International partner; PI: Pavel Hozák)
8/15/16 – 6/30/18 National Institutes of Health (R21NS093971) Frequency-dependent Modulation of Synaptic Transmission and Plasticity by pH (Collaborator: 2.5% salary effort; PIs: Mark O. Bevensee PhD, Lynn E. Dobrunz**)**

Pending
03/23/18 - 03/28/18 National Institutes of Health, R13 "ASN 2018 Annual Meeting" (PI) 31,000 (Direct)
1/1/18-12/31/19 Department of Defense, Congressionally Directed Medical Research Programs, Idea Award with Special Focus, "Exocytosis release of glutamate from human glioblastomas" PI; $400,000 (direct)
1/1/18-12/31/21 Department of Defense, Congressionally Directed Medical Research Programs, Translational Team Science Award; "Use of icatibant for the treatment of high-grade gliomas, "PI; $400,000 (direct)
12/01/17- 11/30/22 NIH-R01 "Bradykinin-elicited Regulated Exocytosis in Gliomas" (PI): $1,250,000 (Direct), $587,500 (indirect), $1,837,500 (Total)
1/1/18-12/31/20 Harrington Discovery Institute, Harrington Scholar-Innovator Program "Small organic bradykinin 2 receptor blockers for use in glioblastoma" (PI); direct only: $99, 070
1/1/18-12/31/19 Shire, Investigator Initiated Research Grant, "Re-purposing Firazyr® for the treatment of anaplastic gliomas" (PI); $312,296 (direct), $112,427 (indirect), $424,723 (total)

BIOGRAPHICAL SKETCH

NAME **Lucas Damian Pozzo-Miller**		POSITION TITLE Professor	
EDUCATION/TRAINING			
INSTITUTION/LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
Universidad nacional de Cordoba, Argentina	B.S.	1985	Physical/Natural Sci
Universidad Nacional de Cordoba Argentina	M.S.	1986	Physical/Natural Sci
Universidad Nacional de Cordoba Argentina	PhD	1989	
Case Western Reserve Uni Cleveland, OH	Postdoc	1992	Hippocampal synapse
Roche Institute of Molecular Bio Nutley, NJ	Postdoc	1995	Hippocampal synapse
Master Teacher Program UAB		2006	
Healthcare Leadership Academy		2013	

Positions

1995-1998 *Senior Staff Fellow* (Research-track Assistant Professor). Laboratory of Neurobiology (Tom Reese, Lab Chief, member US National Academy of Sciences), National Institute of Neurological Disorders and Stroke (NINDS), National Institutes of Health (NIH), Bethesda, MD.

1998-2006 *Assistant Professor* (tenure-track), Department of Neurobiology, School of Medicine, UAB. Secondary appointments in the Departments of Cell Biology and Physiology & Biophysics (currently Cell, Developmental & Integrative Biology), School of Medicine, UAB.

2006-present *Scientist*, Civitan International Research Center; *Investigator*, Evelyn F. McKnight Brain Institute; *Scientist*, Center for Glial Biology in Medicine; *Scientist*, Vision Science Research Center; *Member*, Comprehensive Neuroscience Center, UAB.

2006-2009 *Associate Professor* (with tenure), Department of Neurobiology, School of Medicine, UAB.

2006-present *Investigator*, McKnight Brain Institute

2009-present *Professor*, Department of Neurobiology, School of Medicine, UAB.

2013-present *Professor*, Department of Neurobiology, College of Arts & Sciences, UAB.

2014-present Secondary appointment in the Department of Neurology, School of Medicine, UAB.

2014-present *Associate Director*, Comprehensive Neuroscience Center, UAB.

2016-present *Interim Scientific Co-Director*, Civitan International Research Center, UAB.

2017-present *Co-Director*, Neuroscience Theme, Graduate Biomedical Sciences (GBS), UAB.

Honors, Awards, and Advisory Committees

2017 Chair Nanosymposium at the Society for Neuroscience Annual Meeting, Washington, DC.

Publications 2017

1.. Li W, A Bellot-Saez, ML Phillips, T Yang, FM Longo & L Pozzo-Miller (2017). A small molecule TrkB ligand restores hippocampal synaptic plasticity and object location memory in Rett syndrome mice. *Disease Models & Mechanisms* 10: 837-845.

2. Xu X & L Pozzo-Miller (2017). EEA1 restores homeostatic synaptic plasticity in hippocampal neurons from Rett syndrome mice. *Journal of Physiology (London)* 595: 5699-5712.

3. Xu X, J Garcia, R Ewalt, S Nason & L Pozzo-Miller (2017). The *BDNF* val-66-met polymorphism affects neuronal morphology and synaptic transmission in cultured hippocampal neurons from Rett syndrome mice. *Frontiers in Cellular Neuroscience* 11: 203 (doi: 10.3389/fncel.2017.00203).

4. Ferreras S, G Fernandez, V Danelon, MV Pisano, L Masseroni, CA Chapleau, FA Krapacher, EC Mlewski, DH Masco, C Arias, L Pozzo-Miller, MG Paglini (2017). Cdk5 is essential for amphetamine to increase dendritic spine density in hippocampal pyramidal neurons. *Frontiers in Cellular Neuroscience* 11: 372 (doi: 10.3389/fncel.2017.00372.

5. Phillips M & L Pozzo-Miller (2017). Atypical hippocampal afferent inputs to the medial prefrontal cortex alter social behaviors in the *Mecp2* mouse model of Rett syndrome. *Society for Neuroscience Abstracts* 450.03

BIOGRAPHICAL SKETCH

NAME **Sumanth D. Prabhu**		POSITION TITLE Professor	
EDUCATION/TRAINING			
INSTITUTION/LOCATION Pennsylvania State Uni, PA Jefferson Medical Collge, PA Uni of Pittsburgh, PA University of Pittsburgh, PA Univ of TX Health Science Ctr, San Antonio, TX	DEGREE B.S. MD Intern & Resident Research Fellow	YEAR(S) 1983 1985 1988 1989 1992	FIELD OF STUDY Science Medicine

Positions

7/92-8/98	Assistant Professor	Dept. of Medicine/Cardiology Univ. of TX Health Science Ctr San Antonio, Texas
9/95-8/98	Assistant Professor (Joint)	Dept. of Physiology Univ. of TX Health Science Ctr
9/98-11/99	Associate Professor	Dept. of Medicine/Cardiology Dept. of Physiology Univ. of TX Health Science Ctr
12/99-6/05	Associate Professor	Dept. of Medicine/Cardiology University of Louisville Louisville, KY
6/00-6/11	University Scholar	University of Louisville Louisville, KY
7/00-6/05	Associate Professor (Joint)	Dept. of Physiology/Biophysics University of Louisville
7/05-9/11	Professor	Dept. of Medicine/ Division of Cardiovascular Medicine Dept. of Physiology/Biophysics University of Louisville
7/11- 9/11	Distinguished University Scholar	University of Louisville Louisville, KY
10/11-	Adjunct Professor (Gratis)	Division of Cardiovascular Disease/

		Department of Medicine University of Louisville Louisville, KY
10/11-	Professor	Division of Cardiovascular Disease/ Department of Medicine Dept. of Cell, Developmental, and Integrative Biology (CDIB) Univ. of Alabama at Birmingham
10/11-	Director	Division of Cardiovascular Disease Univ. of Alabama at Birmingham
02/12-	Mary Gertrude Waters Endowed Chair of Cardiovascular Medicine	Univ. of Alabama at Birmingham
02/12-	Director	Comprehensive Cardiovascular Ctr. Univ. of Alabama at Birmingham

C. OTHER POSITIONS AND EMPLOYMENT

7/92-11/99	Staff Cardiologist	University Hospital & VA Hospital San Antonio, Texas
7/93-6/97	Associate Director	Non-Invasive Cardiology University Hospital & VA Hospital San Antonio, Texas
7/96-11/98	Director	Cardiology Fellowship Program Univ. of TX Health Science Ctr San Antonio, Texas
12/99-9/11	Staff Cardiologist	University of Louisville Hospital Louisville VA Medical Center University Medical Associates Jewish Hospital Norton Hospital Louisville, KY
3/02-4/05	Director, Coronary Care Unit	University of Louisville Hospital
9/02-9/11	Director	Louisville VA Heart Failure Clinic Louisville, KY
7/06-3/10	Director	Heart Failure Section Division of Cardiovascular Medicine University of Louisville

2008-9/11	Medical Director, Heart Failure	University of Louisville Hospital Louisville, KY
3/10-9/11	Director	Heart Failure/Transplant Research Division of Cardiovascular Medicine University of Louisville
7/09-9/11	Director	Preventive Cardiology Clinic University of Louisville
9/10-9/11	Cardiology Section Chief	University of Louisville Hospital Louisville, KY
10/11-	Staff Cardiologist	UAB Hospital/Clinics Birmingham VA Medical Center Birmingham, AL
10/11-	Cardiologist-in-Chief	UAB Hospital Birmingham, AL
1/12-	Co-Chair	Cardiovascular Leadership Cmte. UAB Hospital Birmingham, AL
1/12-	Faculty Member	Graduate Biomedical Science & MSTP Program, UAB

2017-present, Investigator, McKnight Brain Institute

Honors, Awards, and Advisory Committees
Association of University Cardiologists, 2017
American Clinical and Climatological Association, 2017
Member, NIH MPOR Study Section 7/2015-6/2019

Invited Lectures and Presenations 2017

9/29/17 Distinguished Guest Lecturer: "Immune Activation in Heart Failure"
19th Annual Molecular Cardiology Research Institute Retreat
Tufts Medical Center
Woods Hole, Massachusetts

9/21/17 Invited Speaker: "Immune Cell Remodeling in Heart Failure"
Center for Heart Failure Research
15th Annual Symposium on Heart Failure
University of Oslo
Oslo, Norway

9/15/17 Moderator: "Molecular Mechanisms of Arrhythmia"
6th Annual Symposium of the UAB Comprehensive Cardiovascular Center

Focus on Cardiovascular Electrophysiology
Birmingham, AL

7/14/17 "Immune Cell Alterations in Heart Failure"
International Academy of Cardiology
2017 Annual Scientific Sessions
22nd World Congress on Heart Disease
Vancouver, BC, Canada

5/31/17 "CCR2+ Infiltrating Macrophages and Pressure-Overload Heart Failure"
2017 International Society for Heart Research – North American Section Meeting
"Translation of Cardiovascular Therapeutics to the Clinic"
New Orleans, LA

5/4/17 "Heart Failure: An Inflammatory Response to Injury"
LSUHSC Cardiovascular Center of Excellence Seminar Series
Louisiana State University Health Sciences Center
New Orleans, LA

4/23/17 "Splenic Macrophages in Heart Failure"
SCVP Symposium: New Roles for Inflammation in the Heart
American Society for Investigative Pathology (ASIP) Annual Meeting
Experimental Biology 2017
Chicago, IL

4/12/17 "Immune Cell Remodeling in Heart Failure"
Research Seminar, Department of Cell Biology and Molecular Medicine
Rutgers, New Jersey Medical School
Newark, NJ

3/2/17 "Splenic Marginal Zone Macrophages and Cardiac Repair"
Cardiovascular Tissue Engineering Symposium
NIH NHLBI Progenitor Cell Biology Consortium (PCBC) Birmingham, AL

1/26/17 "Immune Cell Hypothesis of Heart Failure"
Comprehensive Cardiovascular Center Seminar Series
University of Alabama at Birmingham
Birmingham, AL

Publications 2017

1. Bajaj NS, Gutiérrez OM, Arora G, Judd SE, Patel N, Bennett A, Prabhu SD, Howard G, Howard VJ, Cushman M, Arora P. Racial differences in plasma NTproBNP levels and allcause mortality: the REGARDS study. JAMA Cardiol. 2017 (in press).
2. Kain V, Liu F, Kozlovskaya VA, Ingle KA, Bolisetty S, Agarwal A, Khedkar S, Prabhu SD, Kharlampieva E, Halade GV. Resolution agonist 15-epi-lipoxin A4 programs early activation of resolving phase in post-myocardial infarction healing. Sci Rep. 2017;7(1):9999. doi: 10.1038/s41598-017-10441-8

3. Yanamandala M, Zhu W, Garry DJ, Kamp T, Hare JM, Jun H-W, Yoon Y-S, Bursac N, Prabhu SD, Dorn GW, II, Bolli R, Kitsis RN, Zhang J. Overcoming the roadblocks to cardiac cell therapy using tissue engineering. J Am Coll Cardiol. 2017;70:766-775.
4. Hamid T, Prabhu SD. Immunomodulation is the key to cardiac repair. Circ Res. 2017;120:1530-1532.
5. Halade GV, Kain V, Ingle KA, Prabhu SD. Interaction of 12/15 lipoxygenase with fatty acids alters the leukocyte kinetics leading to improved post-myocardial infarction healing Am J Physiol Heart Circ Physiol. 2017;313:H89-H102.
6. Marian MJ, Alli O, Al Solaiman F, Brott BC, Sasse M, Leesar T, Prabhu SD, Leesar MA. Ticagrelor and eptifibatide bolus versus ticagrelor and eptifibatide bolus with 2-hour infusion in high-risk acute coronary syndromes patients undergoing early percutaneous coronary intervention. J Am Heart Assoc. 2017;6(6). pii: e005562. doi: 10.1161/ JAHA.117.005562.
7. Dassanayaka S, Brainard RE, Watson LJ, Long BW, Brittian KR, DeMartino AM, Aird AL, Kilfoil PJ, Muthusamy S, Hamid T, Prabhu SD, Jones SP. Cardiomyocyte Ogt limits ventricular dysfunction in mice following pressure overload without affecting hypertrophy. Basic Res Cardiol. 2017;112(3):23. doi: 10.1007/s00395-017-0612-7.
8. Bansal SS, Ismahil MA, Goel M, Patel B, Hamid T, Rokosh G, Prabhu SD. Activated Tlymphocytes are essential drivers of pathological remodeling in ischemic heart failure. Circ Heart Fail. 2017;10(3):e003688. doi: 10.1161/CIRCHEARTFAILURE.116.003688.
*Selected for F1000 Prime.
9. Kingery JR, Hamid T, Lewis RK, Ismahil MA, Bansal SS, Rokosh G, Townes TM, Ildstad ST, Jones SP, Prabhu SD. Leukocyte iNOS is required for inflammation and pathological remodeling in ischemic heart failure. Basic Res Cardiol. 2017;112(2):19. doi: 10.1007/s00395-017-0609-2.
10. Soucy KG, Bartoli C, Phillips D, Giridharan GA, Sobieski MA, Prabhu SD, Slaughter MS, Koenig SC. Continuous-flow left ventricular assist device support improves myocardial supply:demand in chronic heart failure. Ann Biomed Eng. 2017;45:1475-1486.
11. Patel B, Ismahil MA, Hamid T, Bansal SS, Prabhu SD. Mononuclear phagocytes are dispensable for cardiac remodeling during chronic pressure-overload heart failure. PLoS One. 2017;12(1):e0170781. doi: 10.1371/journal.pone.0170781.
12. Lam PH, Dooley DJ, Inampudi C, Arundel C, Fonarow GC, Butler J, Wu WC, Blackman MR, Anker MS, Deedwania P, White M, Prabhu SD, Morgan CJ, Love TE, Aronow WS, Allman RM, Ahmed A. Lack of evidence of lower 30-day all-cause readmission in Medicare beneficiaries with heart failure and reduced ejection fraction discharged on spironolactone. Int J Cardiol. 2017;227:462-466.
13. Evonuk KS, Prabhu SD, Young ME, DeSilva TM. Myocardial ischemia/reperfusion impairs neurogenesis and hippocampal-dependent learning and memory. Brain Behav Immun. 2017;61:266-273.
14. Lynch TL, Ismahil MA, Jegga AG, Zilliox M, Troidl C, Prabhu SD, Sadayappan S. Cardiac inflammation in genetic dilated cardiomyopathy caused by MYBPC3 mutation. J Mol Cell Cardiol. 2017;102:83-93.

Manuscripts in preparation

1. Yan J, Thomson JK, Zhao W, Gao X, Wu X, DeMarco D, Kong W, Tong M, Zhang Q, Bakhos M, Fast V, Sun J, Liang Q, **Prabhu SD**, Ai X. The stress kinase JNK promotes gap junction downregulation and atrial fibrillation in the aged heart (submitted).

2. Patel B, Bansal SS, Ismahil MA, Hamid T, Mack M, **Prabhu SD**. $CCR2^{+}$ monocytederived infiltrating macrophages are required for adverse cardiac remodeling during pressure-overload (submitted).

3. Bansal SS, Ismahil MA, Goel M, Rokosh G, Hamid T, **Prabhu SD**. Dysfunctional and proinflammatory regulatory T-lymphocytes are essential for adverse cardiac remodeling in ischemic cardiomyopathy (submitted).

BIOGRAPHICAL SKETCH

NAME **Erik Roberson**		POSITION TITLE Associate Professor Virginia B. Spencer Professor of Neuroscience	
EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
Princeton University, Princeton, NJ	A.B.	1990	Molecular Biology
Baylor College of Medicine	PhD	1997	Neuroscience
Baylor College of Medicine	MD	1999	

Positions

2005–08 Assistant Adjunct Professor of Neurology, UCSF
2006–08 Staff Scientist, Gladstone Institute of Neurological Disease
2008–12 Assistant Professor of Neurology, UAB
2012– Associate Professor of Neurology with tenure, UAB
2013–15 Associate Director, UAB Alzheimer's Disease Center
2013– Co-Director, UAB Center for Neurodegeneration and Experimental Therapeutics
2015– Co-Director, Evelyn F. McKnight Brain Institute at UAB
2015– Director, UAB Alzheimer's Disease Center

Concurrent Appointments

2008–12 Assistant Professor of Neurobiology, UAB (joint appointment)
2012– Associate Professor of Neurobiology, UAB (joint appointment)
2008– Investigator, UAB Center for Neurodegeneration and Experimental Therapeutics
2008– Investigator, McKnight Brain Institute, UAB
2008– Neurologist, UAB Division of Memory Disorders and Behavioral Neurology
2008– Faculty, UAB Graduate School
2008– Faculty, UAB Medical Scientist Training Program
2008– Scientist, UAB Comprehensive Center for Healthy Aging
2010– Scientist, UAB Center for Glial Biology in Medicine

Honors, Awards, and Advisory Committees

- Valedictorian, Washington High School, Cedar Rapids, IA, 1986
- Phi Beta Kappa, 1990
- NIH Medical Scientist Training Program fellowship, 1990–1999
- Baylor College of Medicine Presidential Scholar, 1990–1999
- Baylor College of Medicine Dean's Award for Excellence, 1992–1997
- Life & Health Insurance Medical Research Fund Young Scientist Scholar, 1992–1997
- Alpha Omega Alpha, 1999
- UCSF Chief Resident in Neurology, 2002–2003
- S.D. Bechtel, Jr. Young Investigator Award, 2004
- Kathryn Grupe Award for Excellence in Alzheimer's Disease Research, 2005
- Virginia B. Spencer Endowed Scholar in Neuroscience at UAB, 2008–2013
- Fellow, American Neurological Association, 2012
- McNulty Civitan Scientist Award, 2012
- Virginia B. Spencer Endowed Professor of Neuroscience at UAB, 2013–
- Derek Denny-Brown Neurological Scholar Award, American Neurological Association, 2015

Publications

1. Arrant, A.E., and E.D. Roberson. (2017). Frontotemporal dementia. In *The Cerebral Cortex in Neurodegenerative and Neuropsychiatric Disorders: Experimental Approaches to Clinical Issues*. N. Weishaupt and D. Cechetto, eds. (London: Elsevier).
2. Roberson, E.D., and A. Kao. Animal models of dementia. In *The Behavioral Neurology of Dementia, 2nd Ed.*, B.L. Miller and B.F. Boeve, eds. (Cambridge: Cambridge University Press). In press.
3. E.D. Roberson. Treatment of central nervous system degenerative disorders. In *Goodman & Gilman's The Pharmacological Basis of Therapeutics, Thirteenth Edition.* L. Brunton, ed. (New York: McGraw-Hill Companies, Inc.). In press.

BIOGRAPHICAL SKETCH

NAME **Michael Switow Saag**		POSITION TITLE Professor of Medicine Associate Dean for Global Health Director, UAB Center for AIDS Res	
EDUCATION/TRAINING			
INSTITUTION/LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
Chemistry, Tulane Uni	B.S.	1977	Chemistry
University of Louisville, Louisville, Kentucky	MD	1981	Medicine
UAB	Intern	1982	Medicine
UAB	Resident	1984	
UAB	Chief Resident	1985	
UAB	Fellow	1987	
UAB	Post Doc	1987	

Positions

1987 - 2010	Staff Physician, Medical Service Infectious Diseases, Department of Veterans Affairs Medical Center, Birmingham, Alabama
1987 - 2010	Consulting Physician, Cooper Green Hospital, Birmingham, Alabama
1987 - Present	Attending Physician, Department of Medicine, University of Alabama at Birmingham, School of Medicine, Birmingham, Alabama
2009 - Present	Secondary Appointment to Epidemiology, University of Alabama at Birmingham, School of Public Health, Birmingham Alabama
2017 – Present	Investigator, McKnight Brain Institute

Honors, Awards, and Advisory Committees

2012 - Present	Board Member, Infectious Diseases and Therapy
2012 - Present	Member, WHO Antiretroviral Therapy Guidelines Committee
2013 -	Member, CFAR Sub-Saharan Africa Working Group (CFAR-SSA)
2013 - Present	Member, NIH R13 Grant Review Panel
2013 - Present	Member, NIH NIAID/DIR Board of Scientific Counselors
2013 - Present	Co-Chair, AASLD/IDSA/ IAS-USA Hepatitis C Guidelines Committee
2016-present	Member, United Health Council

Publications 2017

None.

Manuscripts in preparation

Gibbons LE, R Fredericksen, JO Merrill, ME McCaul, G Chander, H Hutton, WB Lober, WC Mathews, K Mayer, G Burkholder, JH Willig, MJ Mugavero, MS **Saag**, MM Kitahata, TC Edwards, D Patrick, HM Crane, PC Crane. The PROMIS Alcohol Use Short Form in a Clinical Care Setting. Drug Alcohol Depend (in press).

BIOGRAPHICAL SKETCH

NAME **David George Standaert**		POSITION TITLE Professor and Chair	
EDUCATION/TRAINING			
INSTITUTION/LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
Harvard University	A.B.	1982	Biochemistry
Washington University School of Medicine	MD/PhD	1988	Medicine, Pharmacology

Positions

July, 1995 – June, 2000 Assistant Neurologist, Massachusetts General Hospital, Boston, MA
July, 2000 – June, 2006 Associate Neurologist, Massachusetts General Hospital, Boston, MA
July, 2000 – June, 2006 Associate Neurologist, Brigham and Women's Hospital, Boston, MA
July, 2005 – June, 2006 Consultant in Neurology, Spaulding Rehabilitation Hos, Boston, MA
Jan., 2007 – Sept. 2010 Vice-Chair, UAB Department of Neurology
Oct., 2010 – Oct. 2011 Interim Chair, UAB Department of Neurology
Oct., 2013 – Sept. 2016 Chair, Health Services Foundation Advisory Board
July, 2007 – June, 2017 Director, UAB Division of Movement Disorders
Oct., 2014 – Sept, 2016 Board of Directors, UAB Health System
July, 2006 – present Neurologist, University of Alabama Hospital
2006 – present Investigator, McKnight Brain Institute
Nov., 2011 – present Chair, UAB Department of Neurology

Honors, Awards, and Advisory Committees

2007-2017 (inclusive) "Best Doctors in America"

Publications 2017

1. Kelley KD, Peavy G, Edland S, Rogers W, Riley DE, et al. The Role of Stress as a Risk Factor for Progressive Supranuclear Palsy. J Parkinsons Dis. 2017;7(2):377-383. PubMed PMID: 28409749.
2.. Bluett B, Litvan I, Cheng S, Juncos J, Riley DE, et al. Understanding falls in progressive supranuclear palsy. Parkinsonism Relat Disord. 2017 Feb;35:75-81. PubMed PMID: 28007518.
3..Birchall EL, Walker HC, Cutter G, Guthrie S, Joop A, et al. The effect of unilateral subthalamic nucleus deep brain stimulation on depression in Parkinson's disease. Brain Stimul. 2017 May - Jun;10(3):651-656. PubMed PMID: 28065487; PubMed Central PMCID: PMC5410399.
4. Figge DA, Standaert DG. Dysregulation of BET proteins in levodopa-induced dyskinesia. Neurobiol Dis. 2017 Jun;102:125-132. PubMed PMID: 28286180; NIHMSID: NIHMS861546; PubMed Central PMCID: PMC5410664.
5. Amara AW, Walker HC, Joop A, Cutter G, DeWolfe JL, Harding SM, Standaert DG. Effects of subthalamic nucleus deep brain stimulation on objective sleep outcomes in Parkinson's disease. Mov Disord Clin Pract. 2017 Mar-Apr;4(2):183-190. doi: 10.1002/mdc3.12375. Epub 2016 Jun PMID: 28924578
6. Zimmerman CN, Eskow Jaunarajs KL, Meringolo M, Rizzo FR, Santoro M, Standaert DG, Pisani A. Evaluation of AZD1446 as a Therapeutic in DYT1 Dystonia. Front Syst Neurosci. 2017 Jun 13;11:43. doi: 10.3389/fnsys.2017.00043. eCollection 2017. PMID: 28659770
7. Gendelman HE, Zhang Y, Santamaria P, Olson KE, Schutt CR, Bhatti D, Shetty BLD, Lu Y, Estes KA, Standaert DG, Heinrichs-Graham E, Larson L, Meza JL, Follett M, Forsberg E, Siuzdak G, Wilson TW, Peterson C, Mosley RL. Evaluation of the safety and immunomodulatory effects of

sargramostim in a randomized, double-blind phase 1 clinical Parkinson's disease trial. NPJ Parkinsons Dis. 2017 Mar 23;3:10. doi: 10.1038/s41531-017-0013- eCollection 2017. PMID: 28649610

8. Scarduzio M, Zimmerman CN, Jaunarajs KL, Wang Q, Standaert DG, McMahon LL. Strength of cholinergic tone dictates the polarity of dopamine D2 receptor modulation of striatal cholinergic interneuron excitability in DYT1 dystonia. Exp Neurol. 2017 Sep;295:162-175. doi: 10.1016/j.expneurol.2017.06.005. Epub 2017 Jun 3. PMID: 28587876

BIOGRAPHICAL SKETCH

NAME **Anne Theibert**		POSITION TITLE Professor	
EDUCATION/TRAINING			
INSTITUTION/LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
Goucher College, Baltimore, MD	B.A.	1979	Chemistry
Johns Hopkins Uni, Baltimore, MD	PhD	1985	Biochemistry
Johns Hopkins Uni, Baltimore, MD	Postdoc	1987	
Johns Hopkins Uni, Baltimore, MD	Postdoc	1991	

Positions

Year	Rank/Title	Institution
2009-present	Undergraduate Neuroscience Program Director	University of Alabama at Birmingham
2006-present	Investigator	McKnight Brain Institute
2000-present	Associate Professor (primary) Department of Neurobiology	University of Alabama at Birmingham
2000-present	Associate Professor (secondary) Department of Cell, Developmental and Integrative Biology	University of Alabama at Birmingham
2000-2012	Associate Professor (secondary) Physiology and Biophysics	Universityof Alabama at Department of Birmingham
1996-2000	Assistant Professor (primary) of Neurobiology	University of Alabama at Department Birmingham
1991-1996	Assistant Professor (primary) of Cell Biology	University of Alabama at Department Birmingham

Honors, Awards, and Advisory Committees

Undergraduate Neuroscience Program Director; Undergraduate Neuroscience Program Curriculum Committee; Neurobiology Department Graduate Program Director and Executive Committee Chair; Graduate Biomedical Science (GBS) Steering and Oversight Committee (SOC); GBS Curriculum Committee; GBS Neuroscience Curriculum Committee; Comprehensive Neuroscience Center (CNC) Executive Committee; Science and Technology Honors Program Admissions Committee

Publications 2017

None.

Manuscripts in preparation

None.

BIOGRAPHICAL SKETCH

NAME **Kristen L. Triebel**		POSITION TITLE Associate Professor	
EDUCATION/TRAINING			
INSTITUTION/LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
Pittsburg State University	B.A.	2002	
Psychology, Forest Institute	M.A.	2005	Psychology
Psychology, Forest Institute	PsyD	2006	Psychology
Coatesville VA Med Ctr, Coatesville, PA	Intern	2006	
Dept of Neurology, UAB	Fellow	2008	

Positions

Year	Rank/Title	Institution
10/2017 - Present	Associate Professor/Neuropsychologist (Tenure-track)	UAB, Neurology
10/2011 – 9/2017	Assistant Professor/Neuropsychologist (Tenure-track)	UAB, Neurology
2008 - 2011	Instructor/Neuropsychologist	UAB, Neurology
2017-present	Investigator, McKnight Brain Institute	

Other Appointments/Administrative Positions at UAB:

03/16 – present	Faculty Member, UAB Multiple Sclerosis Center
01/16 – present	Scientist, Alzheimer's Disease Center, UAB
04/15 – present	Member, CNS Disease Working Group, Comprehensive Cancer Center, UAB
01/12 – present	Director, Clinical Neuropsychology Training Program, UAB
08/12 - present	Associate Scientist, Comprehensive Cancer Center, Cancer Control and Population Sciences Program, UAB
06/12 - present	Scientist, Center for Outcomes and Effectiveness Research and Education (COERE), UAB
08/09 - present	Scientist, UAB Comprehensive Neuroscience Center
01/09 - present	Psychology Graduate Faculty, UAB

Honors, Awards, and Advisory Committees

Professional societies:

American Academy of Clinical Neuropsychology (AACN)
International Neuropsychological Society (INS)
National Academy of Neuropsychology (NAN)

Councils and committees:

External service activities:

Chair, Membership Committee, National Academy of Neuropsychology (NAN) (Chair term: 2015-2017; Membership Committee term 2012-2017)
Professional Member Advisor, Student Committee, National Academy of Neuropsychology, 2014-2017
Member, International & Affiliation Task Force, NAN, 2015-2016
Leader, Student Task Force, NAN, 2014
Co-leader, Ambassador and Leadership Development Program Task Force, NAN, 2016 – present
Secretary-Elect, Member of the Board of Directors, NAN, 2018 - 2020

UAB service activities:

Senator, UAB Faculty Senate, (term: Sept. 2016 – Sept. 2018)

Member, UAB Faculty Policies and Procedures Committee (term: Sept. 2016 – Sept. 2018)
Working Group Member – UAB Faculty Wellness Task Force (appointed December 2016 – 2017)
UAB Deep Brain Stimulation Patient Selection Committee (member, recurring monthly, 2008 – present)

Publications 2017

1..Steward, K., Novack, T., Kennedy, R., Crowe, M., Marson, D., and Triebel, K. L. The Wechsler Test of Adult Reading (WTAR) as a measure of premorbid intelligence following traumatic brain injury. *Archives of Clinical Neuropsychology* 2017; 32(1): 98-103. doi: 10.1093/arclin/acw081. PMID: 27799224.

2. Steward, K. A., Kennedy, R., Novack, T. A., Crowe, M., Marson, D. C., and Triebel, K. L. The role of cognitive reserve in recovery from traumatic brain injury. *Journal of Head Trauma and Rehabilitation* 2017 May 17. doi: 10.1097/HTR.0000000000000325. [Epub ahead of print] PMID: 28520675

3. Gerstenecker, A., Myers, T, Lowry, K, Martin, R.C., Triebel, K., Bashir, K., & Marson, D. C. (in press). Financial capacity and its cognitive predictors in multiple sclerosis. *Archives of Clinical Neuropsychology. Epub ahead of print; 2017 May 13:1-8. doi:* 10.1093/arclin/acx039. PMID: 28505336

Manuscripts in press:

1..Gerstenecker, A., Triebel, K., Martin, R., Bashir, K., & Marson, D. C. (in press). Medical Decision-Making Capacity and its Cognitive Predictors in Multiple Sclerosis. *Journal of the Neurological Sciences.*

2. Gerstenecker, A., Triebel, K. L., Eakin, A., Martin, R., & Marson, D. (in press). Exploring the factor structure of financial capacity in cognitively normal and impaired older adults. *Clinical Gerontologist.*

Manuscripts submitted but not yet accepted:

Martin, R. C., Triebel, K. L., Falola, M., Cutter, G., and Marson, D. Declining financial capacity in patients with mild cognitive impairment: A six-year longitudinal study. Submitted to *Archives of Clinical Neuropsychology.*

BIOGRAPHICAL SKETCH

NAME **Eroboghene E. Ubogu**		POSITION TITLE Professor	
EDUCATION/TRAINING			
INSTITUTION/LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
King's College, Lagos, Nigeria		1991	Secondary School
University of Lagos, Lagos, Nigeria		1992	Pre-medical
Abbey Tutorial College, London, England, United Kingdom (Advanced Level).		1993	Advanced Level
Imperial College School of Medicine (University of London), London, England, United Kingdom		1998	MBBS

Positions

Professor (tenured) September 2013-
Department of Neurology
The University of Alabama at Birmingham
Birmingham, Alabama

Director, Division of Neuromuscular Diseases September 2013-
Department of Neurology
The University of Alabama at Birmingham
Birmingham, Alabama

Director, September 2013-
Neuromuscular Immunopathology Research Laboratory
Division of Neuromuscular Diseases
Department of Neurology
The University of Alabama at Birmingham
Birmingham, Alabama

Director, Shin J. Oh Muscle and Nerve Histopathology September 2013-
Laboratory, Division of Neuromuscular Diseases
Department of Neurology
The University of Alabama at Birmingham
Birmingham, Alabama

Director, Electromyography and Clinical Neurophysiology September 2013-
Laboratory, Division of Neuromuscular Diseases
Department of Neurology
The University of Alabama at Birmingham
Birmingham, Alabama

Director, Clinical Neurophysiology Residency Program (Fellowship), Department of Neurology
The University of Alabama at Birmingham
Birmingham, Alabama — September 2013-

Director, Neuromuscular Medicine Fellowship Program, Department of Neurology
The University of Alabama at Birmingham
Birmingham, Alabama — March 2014-June 2015

Professor
Department of Neurobiology
The University of Alabama at Birmingham
Birmingham, Alabama — August 2015-

Investigator
McKnight Brain Institute
The University of Alabama at Birmingham
Birmingham, Alabama — 2015 - present

Presentations

1. The Human Blood-Nerve Barrier: Clinical and Translational Aspects. Session: The Neurovascular Unit and Specialized Neural Barriers in Disease: The Blood-Nerve Barrier. "The Impact of the Central Nervous System Sanctuary Mediated by the Neurovascular Unit in Neurologic Disease". The 23rd Annual Blood-Brain Barrier Consortium Meeting in collaboration with the International Brain Barriers Society, Skamania Lodge, Stevenson, Washington, March 2nd, 2017.
2. Unravelling the Mysteries of the Human Blood-Nerve Barrier: Implications for Neuroinflammation. Multiple Sclerosis Collaborative Research Meeting. UAB Multiple Sclerosis Center (MSC), Department of Neurology, the University of Alabama at Birmingham, Birmingham, Alabama, May 26th, 2017
3. Monoclonal CD11b (αM integrin) antibody therapy for Guillain-Barré syndrome. Biowebspin (Switzerland)-Argenx (Belgium-Netherlands) Non-confidential proposal Teleconference presentation. November 21st, 2017.

Publications 2017

1. Dong C, Greathouse KM, Beacham RL, Palladino SP, Helton ES, Ubogu EE. Fibronectin connecting segment-1 peptide inhibits pathogenic leukocyte trafficking and inflammatory demyelination in experimental models of chronic inflammatory demyelinating polyradiculoneuropathy. ***Experimental Neurology*** 2017; 292: 35-45 (on-line version: DOI: 10.1016/j.expneurol.2017.02.012, published February 16th, 2017).
2. van Schaik IN, Bril V, van Geloven N, Hartung HP, Lewis RA, Sobue G, Lawo JP, Praus M, Mielke O, Durn BL, Cornblath DR, Merkies ISJ; PATH study group. Subcutaneous immunoglobulin for maintenance treatment in chronic inflammatory demyelinating polyneuropathy (PATH): a randomised, double-blind, placebo-controlled, phase 3 trial. ***Lancet Neurology*** 2017 (DOI: 10.1016/S14744422(17)30378-2, published November 6th, 2017).

3. Palladino SP, Helton ES, Jain P, Dong C, Crowley MR, Crossman DK, Ubogu EE. The human blood-nerve barrier transcriptome. ***Scientific Reports*** 2017 (*In press*; accepted for publication on November 24th, 2017)

BIOGRAPHICAL SKETCH

NAME **Kristina M. Visscher**		POSITION TITLE Associate Professor	
EDUCATION/TRAINING			
INSTITUTION/LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
Carleton College, Northfield MN	B.A.	1998	Physics
Washington Uni, St. Louis, MO	PhD	2004	Neuroscienc

Positions

2009-2017 Assistant Professor, Neurobiology, University of Alabama, Birmingham
Secondary appointments in Psychology, Vision Sciences/optometry, Biomedical Engineering, Ophthalmology, Vision Science Research Center, Comprehensive Center for Healthy Aging

2017-present Associate Professor, Neurobiology, University of Alabama, Birmingham
Secondary appointments in Psychology, Vision Sciences/Optometry, Biomedical Engineering, Ophthalmology, Vision Science Research Center, Comprehensive Center for Healthy Aging

2009-present Investigator, McKnight Brain Institute
The University of Alabama at Birmingham
Birmingham, Alabama

Honors, Awards, and Advisory Committees

Graduate School Dean's Award for Excellence in Mentorship, UAB (2017)

Publications 2017

Bowman, A., Griffis, J., Visscher, K., Dobbins, A., Gawne, T., Difrancesco, M, Szaflarski, J, (2017) Relationship between alpha rhythm and the default mode network: An EEG-fMRI study Journal of Clinical Neurophysiology, (2017).

BIOGRAPHICAL SKETCH

NAME **Jacques I. Wadiche**		POSITION TITLE Associate Professor	
EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
Northwestern University; Evanston, IL	B.A.	1984-1988	Neurobio. & Physiology
Vollum Institute, OHSU; Portland, OR	PhD	1992-1998	Neurosci. / Biophysics
Vollum Institute, OHSU; Portland, OR	Postdoctoral Student	1998-2006	Synaptic Transmission
CSHL Imaging Course; Co. Sp.Har., NY		2003	Neuroimaging

Positions

1987 - 1988 Undergraduate Thesis Fellow, Department of Neurobio. and Physiol., Northwestern University, Evanston, IL; Advisor: Fred Turek, PhD

1990 - 1992 Research Assistant, Department of Neuroscience, Baylor College of Medicine, Houston, TX; Advisor: James W. Patrick, PhD

1992 - 1998 Graduate Student, Vollum Institute, Oregon Health Sciences University, Portland, OR; Advisor: Michael P. Kavanaugh, PhD

1998 - 2006 Postdoctoral Fellow, Vollum Institute, Oregon Health Sciences University, Portland, OR; Advisor: Craig E. Jahr, PhD

2004 Teaching Assistant, Cold Spring Harbor Laboratories Imaging Course, Cold Spring Harbor, NY

2006 – 2013 Assistant Professor, Department of Neurobiology, University of Alabama at Birmingham; Birmingham, AL

2006-present Investigator, McKnight Brain Institute

2013 - Associate Professor, Department of Neurobiology, University of Alabama at Birmingham; Birmingham, AL

Honors, Awards, and Advisory Committees

1987 - 1989 Research Assistantship, Northwestern Univ.

1992 - 1994 Predoctoral Dean's Fellowship, Oregon Health Sciences University, Portland, OR

1994 Biophysical Society Student Travel Award

1994 - 1996 NIH - NIDA Predoctoral Training Fellowship, Vollum Institute, Oregon Health Sciences University, Portland, OR

1996 Medical Research Foundation Tartar Award, Oregon Health Sciences University, Portland, OR

1998 John Resko Award Outstanding Doctoral Thesis, Oregon Health Sciences University, Portland, OR (recognizes best doctoral thesis)

1999 NIH/NIDDK Training Grant fellowship, Vollum Institute, OHSU

2002 - 2004 NIH - NIMH National Research Postdoctoral Fellowship, Vollum Institute, Oregon Health Sciences University, Portland, OR

2003 Cold Spring Harbor Laboratories Imaging Course - student

2004 Cold Spring Harbor Laboratories Imaging Course - teaching fellowship

2007 - 2009 Editorial Member, Open Neuroscience Journal

2008 - Ad hoc reviewer: Netherlands Organization for Scientific Research, Agence Nationale de la Recherce (France), North Carolina Biotechnology Center
2009 - Ad hoc reviewer NSF Peer Review Committees (Biomolecular Systems, Cellular Systems)
2011 - Editorial Board, Frontiers in Behavioral and Psychiatric Genetics
2016 Graduate Dean's Excellence in Mentorship Award, UAB

Publications (2017)

Nietz AK, Vaden JH, Coddington LT, Overstreet-Wadiche L, Wadiche JI. (2017) Non-synaptic signaling from cerebellar climbing fibers modulates Golgi cell activity. eLife 6: e29215

Adlaf EW, Vaden RJ, Niver AJ, Manuel AF, Onyilo VC, Araujo MT, Dieni CV, Vo HT, King GD, Wadiche JI, Overstreet-Wadiche L (2017) Adult-born neurons modify excitatory synaptic transmission to existing neurons. eLife 6: e19886

BIOGRAPHICAL SKETCH

NAME **Linda Wadiche**		POSITION TITLE Associate Professor	
EDUCATION/TRAINING			
INSTITUTION/LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
North Park Uni, Chicago, IL	B.S.	1992	Biology
Northwestern Uni, Chicago, IL		1997	
Vollum Institute, Oregon Health	PhD	2004	

Positions

2011 – present Associate Professor, Department of Neurobiology, UAB
2006 - 2011 Assistant Professor (primary), Department of Neurobiology, UAB
2006-present Investigator, McKnight Brain Institute
2005 - 2006 Assistant Research Professor, Vollum Institute, Oregon Health & Sciences University, Portland, OR

Honors, Awards, and Advisory Committees

2018-19 Standing member, CURE grant review board

Publications 2017

PUBLICATIONS (Google scholar H-index 28)

1. Nietz AK, Vaden JH, Coddington LT, Overstreet-Wadiche L, Wadiche JI. (2017) Non-synaptic signaling from cerebellar climbing fibers modulates Golgi cell activity. Elife. 6. pii: e29215.
2. Laszczyk AM, Fox-Quick S, Vo HT, Nettles D, Pugh PC, **Overstreet-Wadiche L**, King GD (2017) Klotho Regulates Postnatal Neurogenesis and Protects Against Age-Related Spatial Memory Loss. *Neurobiology of Aging*, 59:41-54.
3. Adlaf EW, Vaden RJ, Niver, AJ, Manuel AF, Onyilo VC, Araujo MT, Dieni CV, Vo HT, King GD, Wadiche JI, **Overstreet-Wadiche LS** (2017) Adult Born Neurons Modify Excitatory Synaptic Transmission to Existing Neurons. *Elife* 6:e19886. PMC5279947 **F1000 recommended*

BIOGRAPHICAL SKETCH

NAME **Scott Wilson**		POSITION TITLE Associate Professor	
EDUCATION/TRAINING			
INSTITUTION/LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
University of South Florida	B.S.	1986	Biology
University of South Florida	M.S.	1989	Microbiology
University of Florida	PhD	1996	Molecular Genetics
National Cancer Institute	Postdoc	2002	Genetics

Positions

1990-1991 Instructor, Introductory Biology, Hillsboro Community College, Tampa, Florida

1992-1996 Graduate student in the laboratory of Maurice Swanson, Department of Molecular Genetics and Microbiology, University of Florida College of Medicine, Gainesville, Florida

1997-2002 Postdoctoral Fellow in the laboratory of Drs. Neal Copeland and Nancy Jenkins, National Cancer Institute, Frederick, MD.

8-02 to present Assistant Professor, Department of Neurobiology, University of Alabama at Birmingham, Birmingham, AL,

11-03 to present Secondary Appointment in the Department of Biochemistry and Molecular Genetics

11-04 to present Secondary Appointment in the Department of Genetics

2006-present Investigator, McKnight Brain Institute

6-06 to present Director of Summer Program in Neuroscience

10-06 to present Director of Molecular Recombineering Core. NIH Blueprint Core facility.

8-10 to present Associate Professor, Department of Neurobiology, University of Alabama at Birmingham, Birmingham, AL

Appendix G

RESEARCH ARTICLE

Dendritic Spines Provide Cognitive Resilience against Alzheimer's Disease

Benjamin D. Boros,[1,2] Kelsey M. Greathouse, BS,[1,2] Erik G. Gentry, BS,[1,2] Kendall A. Curtis,[1,2] Elizabeth L. Birchall, BS,[1,2] Marla Gearing, PhD,[3] and Jeremy H. Herskowitz, PhD [1,2]

Objective: Neuroimaging and other biomarker assays suggest that the pathological processes of Alzheimer's disease (AD) begin years prior to clinical dementia onset. However, some 30 to 50% of older individuals who harbor AD pathology do not become symptomatic in their lifetime. It is hypothesized that such individuals exhibit cognitive resilience that protects against AD dementia. We hypothesized that in cases with AD pathology, structural changes in dendritic spines would distinguish individuals who had or did not have clinical dementia.

Methods: We compared dendritic spines within layer II and III pyramidal neuron dendrites in Brodmann area 46 dorsolateral prefrontal cortex using the Golgi–Cox technique in 12 age-matched pathology-free controls, 8 controls with AD pathology (CAD), and 21 AD cases. We used highly optimized methods to trace impregnated dendrites from bright-field microscopy images that enabled accurate 3-dimensional digital reconstruction of dendritic structure for morphologic analyses.

Results: Spine density was similar among control and CAD cases but was reduced significantly in AD. Thin and mushroom spines were reduced significantly in AD compared to CAD brains, whereas stubby spine density was decreased significantly in CAD and AD compared to controls. Increased spine extent distinguished CAD cases from controls and AD. Linear regression analysis of all cases indicated that spine density was not associated with neuritic plaque score but did display negative correlation with Braak staging.

Interpretation: These observations provide cellular evidence to support the hypothesis that dendritic spine plasticity is a mechanism of cognitive resilience that protects older individuals with AD pathology from developing dementia.

ANN NEUROL 2017;00:000–000

Alzheimer's disease (AD) is the most common cause of dementia in older individuals and a leading cause of death in the developed world. Recent advances in neuroimaging and other biomarker assays that provide the means to detect AD pathophysiology in vivo suggest that the pathological processes of AD begin years to decades prior to clinical dementia onset.[1] However, some 30 to 50% of older individuals who harbor AD pathology do not become symptomatic in their lifetime.[2]

Large-scale epidemiological studies provide evidence for cognitive resilience to AD pathology, including the Religious Orders Study and the companion Rush Memory and Aging Project. These studies showed that one-third of individuals in their 80s are cognitively nor- mal despite levels of b-amyloid (Ab) plaques and neuro- fibrillary tangles (NFTs) that meet National Institute on Aging (NIA)-Reagan criteria for intermediate to high likelihood of AD.[3] Additionally, the Baltimore Longitu- dinal Study of Aging, Honolulu-Asia Aging Study, 90 1 Study, and Medical Research Council Cognitive Function and Ageing Study reported similar disconnect among Ab plaques, NFTs, and cognition.[4–7] Dating to the work of Ramon y Cajal, it is hypothesized that the brain is capable of protective structural plasticity in the

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Additional supporting information can be found in the online version of this article.

face of aging and disease, a proposed mechanism contrib- uting to cognitive resilience.[8] However, studies providing neurobiological evidence of this in patients with AD pathology are limited.

Cognitively normal individuals with AD pathol- ogy are proposed to represent individuals who are resil- ient to dementia or in preclinical stages of AD.[2] This cohort allows exploration of mechanisms that are (1) critical for retaining cognitive function in the face of AD pathology (ie, cognitive resilience) or (2) involved in the transition from preclinical to symptomatic AD. Neuronal synapse loss correlates more strongly with cognitive impairment than classical pathologic markers of AD,[9,10] yet whether synapse loss is progressive or synaptic remodeling contributes to cognitive resilience to protect individuals with AD pathophysiology is not known.[11,12] Excitatory synapses occur on actin-rich dendritic protrusions called dendritic spines, and synapse strength and activity are inseparably linked to spine morphology.[13] We hypothesized that in cases with AD pathology, structural changes in dendritic spines would distinguish individuals who had or did not have clinical dementia. To test this hypothesis, we used highly optimized 3-dimensional modeling of dendritic spines to analyze prefrontal cortex synapse populations from controls, cognitively normal individuals with high AD pathology (CAD), and AD dementia cases.

Subjects and Methods

Human Brain Tissue

Samples of frontal cortex derived from subjects exhibiting a range of AD pathology were examined. Tissue samples were collected at the Emory University Alzheimer's Disease Research Center. The case diagnosis is based on Mini-Mental State Examination (MMSE), Consortium to Establish a Reg- istry for Alzheimer's disease (CERAD) criteria for the neuro- pathologic diagnosis of AD, and Braak staging of neurofibrillary pathology. Cases were categorized into 3 diag- nostic groups, which included (1) 12 cognitively normal con- trols without AD pathology, (2) 8 cognitively normal control subjects showing moderate to severe AD pathology at autopsy, and (3) 21 definite AD cases with severe pathology.[1,2] The 3 groups were matched as closely as possible for age, sex, and postmortem interval. It is important to note that the majority of these cases had no coexisting pathologies, such as stroke or Lewy body disease. Although multiple neuropsychological tests were employed in the cognitive testing of these subjects, the MMSE is the most commonly used test for complaints of memory problems or when a diagnosis of dementia is being considered, and those results are presented in Table 1. Severe to moderate AD patients have MMSE scores of 10 to 20 of total possible of 30; at the end stages of disease, impairment

is so severe as to prevent testing. Clinical Dementia Rating (CDR) was conducted on 3 cases.[14,15] CDR scores the sever- ity of symptoms of dementia using a composite range of 0 to 3, where 0 indicates no symptoms of dementia and 3 marks severe impairment. Pathology data on cases is presented in Table 2. Neuritic and diffuse plaques were scored semiquanti- tatively according to CERAD methods.[16] CERAD (0-3 or none, sparse, moderate, frequent) and Braak (0–6) scores are measures of the severity of neuritic plaque and NFT accumu- lation, respectively. The Amyloid Braak CERAD score was used as a global measure of AD pathology.[17]

Tissue Processing and Golgi–Cox Staining

All tissue samples were fixed in 4% paraformaldehyde immedi- ately following dissection and stored in preservative solution containing sodium azide at 4°C. Tissue blocks of approximately 20 × 20 × 5mm taken from the dorsolateral prefrontal cortex (Brodmann area 46 [BA46]) were sectioned into 250 μm slices (about 15 per block) using a Leica Vibratome (VT1000s, Leica Biosystems, Buffalo Grove, IL) and stored in preservation buffer (0.1% wt/vol sodium azide in phosphate-buffered saline) until Golgi–Cox impregnation. All tissues were stained using the FD Rapid Golgi Stain Kit (PK401, FD Neurotechnologies, Colum- bia, MD) and the manufacturer's instructions with the follow- ing modifications. Tissue slices were impregnated in chromate mixture of Solution A (potassium dichromate and mercuric chloride) and Solution B (potassium chromate). The chromate solution was replaced after the first 24 hours, and tissue was then left in chromate solution in the dark for 6 weeks. Next, tissue slices were immersed in Solution C for 48 hours, and this solution was replaced after 24 hours, according to manufac- turer's instructions. Tissues were then plated on 75 × 25mm gelatin-coated slides (PO101, FD Neurotechnologies) using additional Solution C and allowed to dry in the dark for 2 hours. Next, tissues were submerged sequentially in mixtures of Solution D, Solution E, and distilled water according to the manufacturer's instructions. After rinsing with distilled water, tissues were dehydrated with graded alcohols (70%, 90%, 100% ethanol in deionized water) and cleared with xylenes (X3P-1GAL, Thermo Fisher Scientific, Waltham, MA). Slides were sealed with Permount Toulene Solution (SP15-100, Fisher Chemicals, Fair Lawn, NJ) and cover-slipped with spacers (Secure Seal Spacer, 20mm diameter × 0.12mm depth, 70327- 205, Electron Microscopy Sciences, Hartfield, PA) and 50 × 24mm glass (cover glass, rectangles, 24 × 50mm, thickness 5 0.13–0.17mm, 633153, Carolina Biological, Bur- lington, NC). Slides were stored in darkness.

Dendrite Imaging

Layers II and III pyramidal neuron dendrites in BA46 dorsolat- eral prefrontal cortex were imaged. For each case, many tissue slices were Golgi stained. From each tissue slice, 2 or more cells were imaged and analyzed. Ten to 20 Golgi-stained cells were sampled per case. From each cell, a single dendritic segment was imaged. The following criteria were used to select cells for imaging: (1) located centrally within the tissue sample depth,

TABLE 1. Clinical Data on Postmortem Human Brain Tissue Samples

Cases	Race/Sex	PMI, h	Age at Onset, yr	Age at Death, yr	ApoE	MMSE
Control, n 5 12						
1	WF	3		52	E3/4	
2	AM	6		59	E2/3	
3	WM	5.5		94	E3/3	29
4	WF	6		91	E3/3	29
5	WM	12.5		56		
6	AF	6		61		
7	WF	6		75	E3/3	29
8	AM	<12		61	E3/4	CDR5 0
9	WF	11.5		78	E3/3	30
10	WF	15.5		92	E3/3	
11	WF	14.5		88	E2/3	26
12	AM	2.5		70	E3/3	29
CAD, n 5 8						
1	WM	35.5		76	E2/4	29
2	WM	20		81	E3/3	27
3	WF	17		64	E4/4	30
4	WF	38		82	E3/4	30
5	WM	19		89	E3/3	27
6	WM	5.5		80	E3/4	28
7	WM	20.5		87	E3/4	27
8	WF	5		87	E2/3	
AD, n 5 21						
1	WM	9	78	84	E3/4	20
2	WF	15.5		93	E3/4	
3	WM	78		77	E3/4	25
4	AF	6	79	86	E3/3	15
5	WF	4	76	94	E3/4	19
6	WM	28	63	77	E4/4	CDR5 3
7	WM	40	85	94	E3/4	18
8	WM	21	69	76	E3/3	15
9	WF	5	76	88	E3/4	CDR5 3
10	WM	4	72	80	E3/4	23
11	AM	7	70	86	E4/4	12
12	WM	5.5	76	83	E3/4	10
13	WM	9	56	64	E3/4	
14	WF	7	59	72	E3/4	SI
15	WF	5		93	E3/4	6
16	WM	4	74	85	E3/4	13
17	WM	12	70	77	E3/4	SI
18	WM	2.5	60	74	E3/3	6
19	WF	2.5	70	91	E3/4	
20	WF	9.5		85	E4/4	
21	WF	12	69	81	E3/4	0

Twelve cognitively normal, age-equivalent, pathology-free controls were compared to 8 cognitively normal controls with Alzheimers disease (AD) pathol- ogy (CAD) and 21 sporadic AD cases. If values are blank, then information was not available. Age of onset is not applicable to controls or CAD cases. A5 African American; ApoE5 apolipoprotein E; CDR5 Clinical Dementia Rating; F5 female; M5 male; MMSE5 Mini-Mental State Examina- tion; PMI5 postmortem interval; SI5 sight impairment; W5 white/Caucasian.

TABLE 2. Pathology Data on Postmortem Human Brain Tissue Samples

Cases	Frontal NP	Frontal DP	Frontal NFT	Braak Stage	CERAD Score	ABC Score
Control, n 5 12						
1	None	Frequent	None	0	B	Low
2	None	None	None	I	0	None
3	None	None	None	II	0	None
4	Sparse	Frequent	None	III	A	Low
5	None	None	None	I	0	None
6	None	Sparse	None	II	0	Low
7	None	None	None	I	0	None
8	None	Moderate	None	II	0	Low
9	None	None	None	II	0	None
10	None	None	Sparse	III	0	None
11	None	Sparse	None	II	0	None
12	None	Moderate	None	I	0	None
CAD, n 5 8						
1	Frequent	Moderate	None	IV	C	Intermediate
2	Sparse	Moderate	None	II	B	Low
3	Frequent	Frequent	Sparse	II	C	Low
4	Frequent	Frequent	None	III	C	Intermediate
5	Frequent	Frequent	None	IV	C	Intermediate
6	Frequent	Frequent	Sparse	IV	C	Intermediate
7	Moderate	None	Sparse	I	B	Intermediate
8	Frequent	Frequent	Sparse	III	C	Intermediate
AD, n 5 21						
1	Frequent	Frequent	Sparse	IV	C	Intermediate
2	Frequent	Frequent	None	III	C	Intermediate
3	Frequent	Frequent	None	III	C	Intermediate
4	Frequent	Moderate	None	II	C	Low
5	Moderate	Frequent	Sparse	IV	C	Intermediate
6	Frequent	Frequent	Frequent	VI	C	Intermediate
7	Frequent	Frequent	Sparse	I	C	Low
8	Frequent	Moderate	Sparse	IV	C	Intermediate
9	Frequent	Moderate	Sparse	IV	C	Intermediate
10	Frequent	Frequent	Sparse	IV	C	Intermediate
11	Sparse	Frequent	Sparse	IV	C	Intermediate
12	Frequent	Sparse	Frequent	V	C	High
13	Frequent	None	Frequent	V–VI	C	High
14	Frequent	Frequent	Moderate	VI	C	High
15	Frequent	Moderate	Frequent	VI	C	High
16	Frequent	Frequent	Frequent	VI	C	High
17	Frequent	Frequent	Frequent	VI	C	High
18	Frequent	Frequent	Moderate	VI	C	High
19	Frequent	Frequent	Frequent	VI	C	High
20	Frequent	Moderate	Moderate	VI	C	High
21	Frequent	None	Frequent	VI	C	High

Twelve cognitively normal, age-equivalent, pathology-free controls were compared to 8 cognitively normal controls with Alzheimer's disease (AD) pathology (CAD) and 21 sporadic AD cases.
ABC 5 Amyloid Braak CERAD score; CERAD 5 Consortium to Establish a Registry for Alzheimer's Disease; DP 5 diffuse b-amyloid plaque; NFT 5 neurofibrillary tangle; NP 5 neuritic b-amyloid plaque.

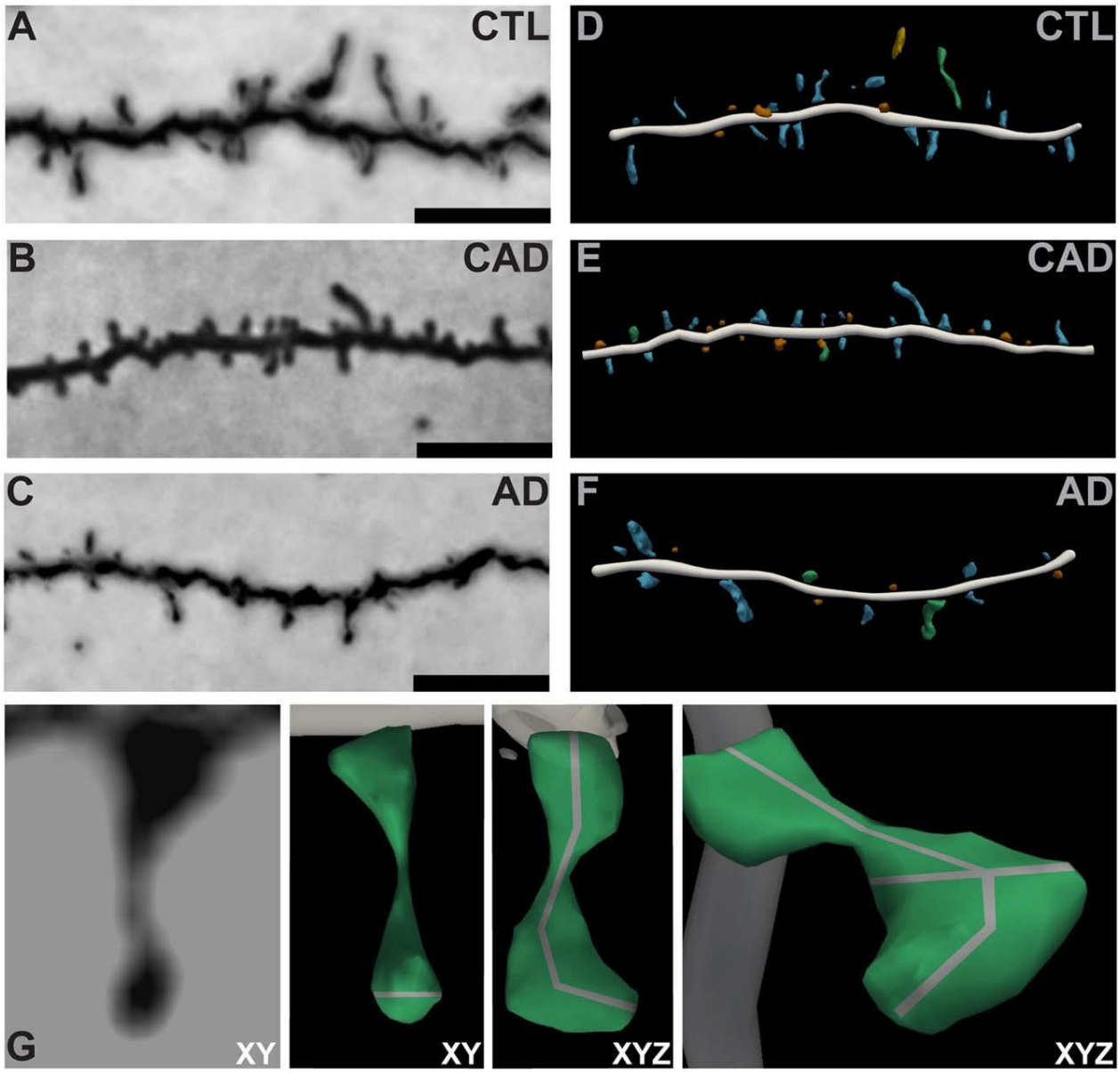


FIGURE 1: Highly optimized 3-dimensional modeling of dendritic spines in controls (CTL), cognitively normal individuals with high Alzheimer's disease (AD) pathology (CAD), and AD cases. (A, C, E) Representative bright-field images of Golgi-impregnated dendrites. Scale bars represent 5 μm. (B, D, F) Three-dimensional digital reconstructions of the same dendrites generated in Neurolucida360. (G; left to right) Representative zoomed-in bright-field image of a single Golgi-impregnated spine in the XY plane; 3-dimensional digital reconstruction of the spine in the XY plane with a gray line representing the head diameter measurement; clockwise rotation in XYZ dimensions with a gray line representing the spine extent measurement; further rotation in XYZ with gray lines representing spine head diameter and extent.

(2) not obscured by large staining debris, and (3) fully impreg- nated. If the cell met the criteria, a single dendritic length was imaged. Dendrite selection criteria were: (1) unobstructed/iso- lated/not overlapping other dendrites, (2) length > 30 mm, and (3) diameter approximately 1 mm. If > 2 dendrites fulfilled the criteria from a single cell, the first dendrite clockwise was the only dendrite selected. If no dendrites from a cell fulfilled the criteria, another cell was viewed and scrutinized. All imaging was conducted by a single, blinded experimenter. Each tissue slice was initially viewed under low 34 magnification to establish the region of interest (layers II and III). Next, a pyra- midal cell dendrite within the region of interest was viewed at 360 magnification to determine whether the dendrite fulfilled the above criteria. A maximum of 2 pyramidal cells were imaged per tissue slice. Z-stacks were captured with a z-step size of 0.1 mm. Each image was recorded using the following parameters: lamp, 100%; field stop, 1.5mm; exposure, 60 milli- seconds; analog gain, 2.0–2.43; image size, 1,028 3 1,028 pix-

els (0.1619 3 0.1619 3 0.1 mm). Images were captured on a Nikon (Tokyo, Japan) Eclipse Ni upright microscope with

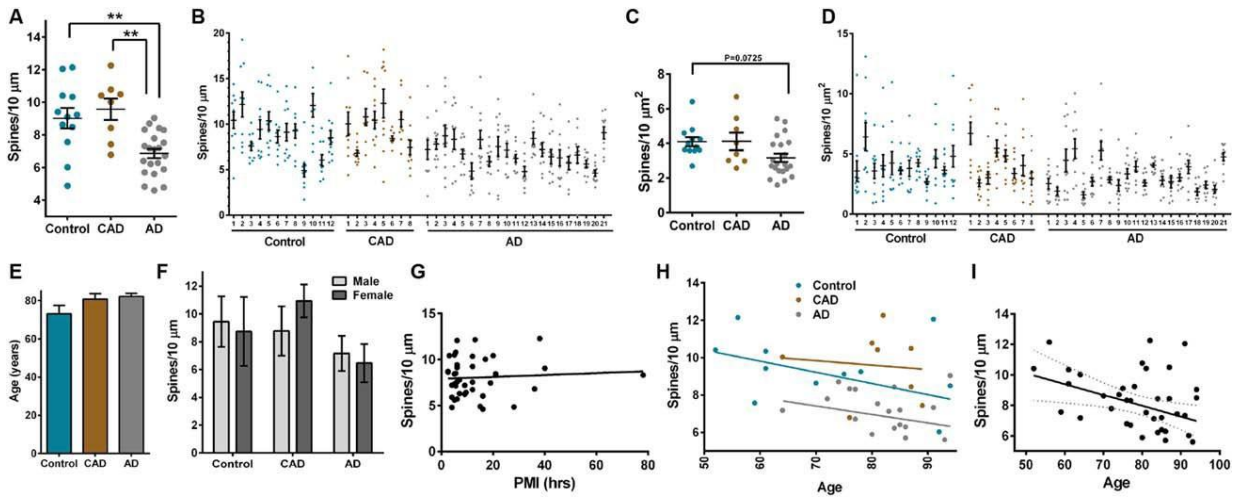


FIGURE 2: Comparison of dendritic spin density in controls, cognitively normal individuals with high Alzheimer's disease (AD) pathology (CAD), and AD cases. (A) Mean spine density per 10 mm was reduced significantly in AD compared to controls and CAD (1-way analysis of variance [ANOVA]: $F_{2,38}$ 510.31, p 50.0003; Tukey: controls, **p 50.0032, CAD, **p 50.0013). Each case is expressed as an individual data point, and each data point is an average of 10 to 20 dendrites. (B) Distribution of spine density measured per 10 mm of dendrite. Each dot represents the average spine density per 10 mm for each dendrite that was imaged. (C) Aggregate distribution of spine density measured by surface area of dendrite in control, CAD, and AD cases. Each dot represents the average spine density per surface area of dendrite for each individual case. Spine density measured per dendrite surface area is reduced in AD cases compared to controls (1-way ANOVA: p50.0398, $F_{2,38}$53.515; Tukey: controls, p50.0725). Lines represent the mean6standard error of the mean. (D) Distribution of spine density measured per surface area of dendrite in control, CAD, and AD cases. Each dot represents the average spine density per surface area of dendrite for each individual dendrite that was imaged. Case numbers refer to patients described in Table 1. (E) Mean age was similar among controls, CAD, and AD. (F) Average spine density per 10 mm of dendrite for each individual was graphed based on dis- ease state and sex. (G) Linear regression analysis of spine density measured per 10 mm of dendrite across all cases with post- mortem interval (PMI). Each dot represents the average spine density per 10 mm for each individual case. The density of spines per 10 mm of dendrite was plotted against the PMI for each individual. PMI is represented in hours. (H) Linear regression analy- sis of spine density measured per 10 mm of dendrite in control, CAD, and AD cases with age. Each dot represents the average spine density per 10 mm for each individual case. The density of spines per 10 mm of dendrite was plotted against the age of each individual. Age is represented in years. (I) Linear regression analysis of spine density measured per 10 mm of dendrite in all cases with age represented in years. Each dot represents the average spine density per 10 mm for each individual case. The density of spines per 10 mm of dendrite was plotted against the age of each individual. Age was inversely proportional to spine density ($F_{1,39}$ 5 6.570, R^2 5 0.1442, p 5 0.0143). Dashed lines represent 95% confidence intervals.

Lumen 200 (Prior Scientific, Rockland, MA) light source, Nikon DS-43 Digital Sight for bright-field microscopy, and Nikon Elements 4.20.02. A 3 60 oil immersion objective (Nikon Plan Apo, N.A. 1.40) was used.

Three-Dimensional Digital Image Reconstruction
Dendrite and spine reconstructions were conducted by a single, blinded experimenter. Image stacks of neuronal dendrites were imported to Neurolucida 360 (2.70.1, MBF Biosciences, Williston, VT). Dendrites were traced using a semiautomated directional ker- nel algorithm. Spines were traced using voxel clustering. Initiation and termination points for dendrite reconstruction were established using the following criteria: must be 2' 10 lm away from the distal tip of the dendrite, must contain consistent dendrite diameter, must have a level axis with limited movement in the z plane, and must be 2'30 lm in length. Next, the experimenter manually scrutinized each assigned point in the x, y, and z plane to verify that the point was located on the dendrite or spine and not artificially assigned. Points were scrutinized first by viewing the dendrite at individual x–z or y–z planes and by ensuring that points were correctly posi- tioned at the midline of the dendrite. Afterward, points were verified in the x–y plane, and the diameter of each point was con- firmed to match the dendrite diameter. Dendritic spine reconstruc- tion utilized the following parameters for classification: outer range,

7.0 lm; minimum height, 0.3 lm; detector sensitivity, 90 to 125%; minimum count, 8 voxels. Dendritic spines were traced as the experimenter traversed the full dendrite z-plane and inspected the x–y plane at each individual z-step. The morphology of each reconstructed spine was carefully scrutinized by verifying that axial smear did not cause misrepresentation, and the merge and slice tools were used to correct inconsistencies. Spine backbone was used in recording spine extent and in spine classification. The position- ing of each backbone point (including point of greatest breadth) was confirmed by the experimenter. To correct a misrepresentative backbone, the spine was viewed from the z-plane, and experi- menter moved backbone points in the x–y plane. Any reposition- ing in the x–z or y–z plane was performed while the spine was being viewed from the lateral angle.

Morphometric analysis was conducted for each spine, and measurements categorized spines into thin, stubby, mushroom, and filopodia classes. Reconstructions were exported to Neuro- lucida Explorer (2.70.1, MBF Biosciences), where data were

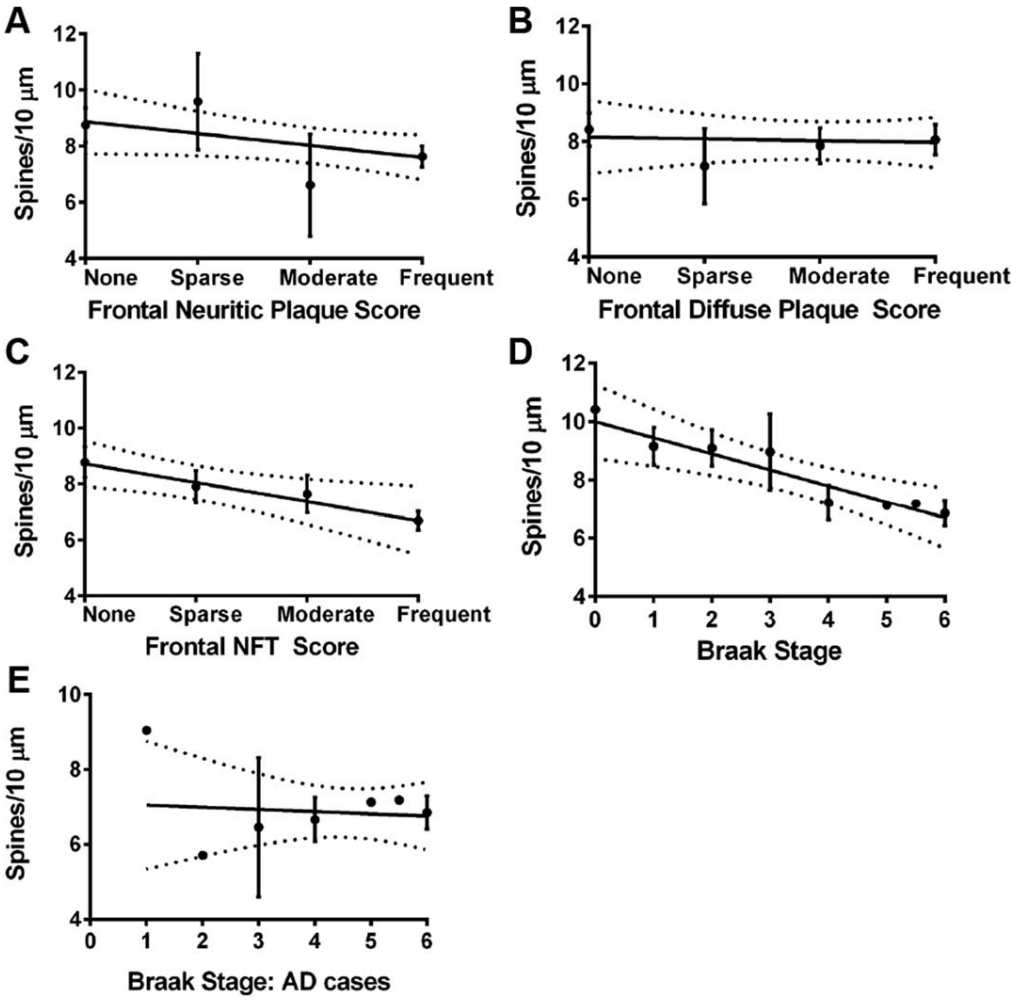


FIGURE 3: Linear regression analysis of spine density and Alzheimer's disease (AD) pathology. (A) Spine density does not correlate with neuritic plaque score. (B) Spine density does not correlate with diffuse plaque score. (C) There is negative correlation of spine density with neurofibrillary tangle (NFT) score ($F_{1,39}$56.495, $R^2$50.1428, p50.0149). (D) There is negative correlation of spine density with Braak staging ($F_{1,37}$ 5 11.63, R^2 5 0.2392, p 50.0016). (E) Spine density does not correlate with Braak staging among AD cases. Dashed lines represent 95% confidence intervals.

collected for quantitative analysis. The dendritic spine measure- ment parameters included spine extent and spine head diameter, among others. These parameters were exported and collected in Microsoft (Redmond, WA) Excel. Derived measurements, such as spine density per dendrite surface area, were calculated from raw measurement data. For spine classification, the following established parameters were used: head-to-neck ratio, 1.1; length-to-head ratio, 2.5; mushroom head size, 0.35 mm; filopo- dium length, 3.0 lm. Spines with a head-to-neck ratio $>$ 1.1 and head diameter $>$ 0.35 lm were classified as mushroom. Spines were classified as filopodia, or thin, if head-to-neck ratio was $<$ 1.1, and either (1) length-to-head ratio was $>$ 2.5 or (2) head size was $<$ 0.35 lm. Of these, if the total length was

$>$3.0 lm, the spine was classified as filopodia, and if $<$3.0 lm

as thin. Spine density was calculated by determining the num- ber of spines per micrometer of dendrite length or the number of spines per square micrometer of dendrite surface area. Spine extent was defined as the curvilinear backbone length from the insertion point to the most distal point of the spine head. Head diameter was defined as the breadth of the spine head at its widest cross-sectional point. Both morphological measurements and corresponding backbone reconstructions were verified.

Notably, our spine structure and density measurements are consistent with similar studies assessing dendritic spine den- sity and morphology in human samples. Prior investigations using electron microscopy in aged neocortex exhibit strong sim- ilarities to our reported spine length and head diameter.[18–20] Additional studies measuring spine structure characteristics in human and nonhuman primates using confocal and light microscopy report spine measurements that are highly consis- tent with our findings.[21–24] In total, 5,569 mm of dendrite length and 4,297 spines were analyzed in this study. Approxi- mately 118 spines per control case, 109 spines per CAD case, and 95 spines per AD case were analyzed.

Statistical Analysis

Statistical analyses were conducted with Prism 6.0 (GraphPad Software, La Jolla, CA). Data are presented as mean 6 standard

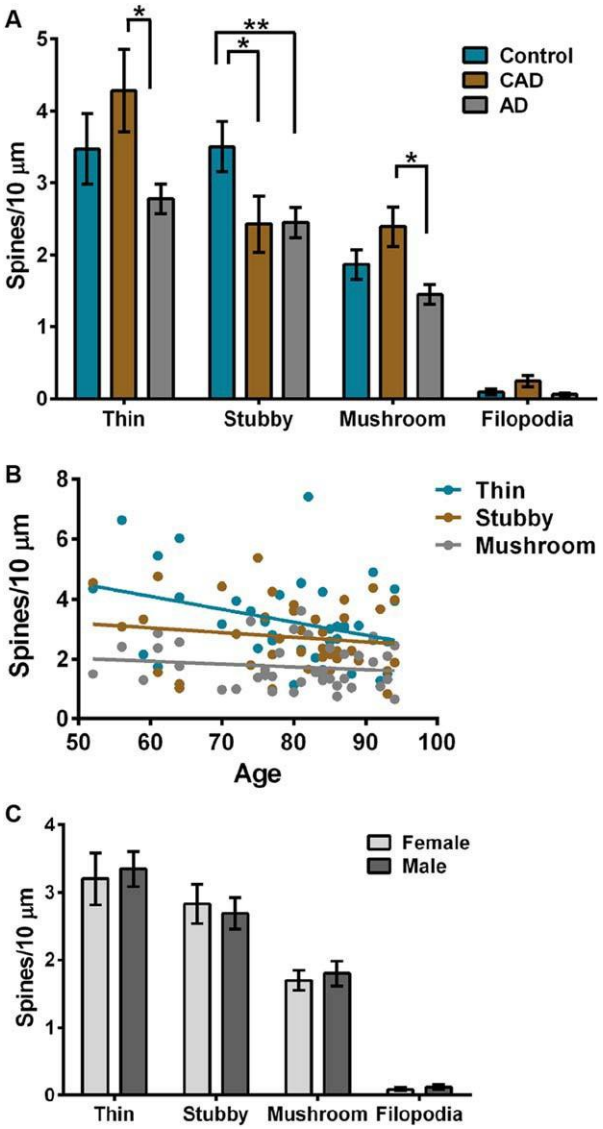


FIGURE 4: Comparison of dendritic spine morphology classes in controls, cognitively normal individuals with high Alzheimer's disease (AD)pathology(CAD),and AD cases.(A) Mean number of thin, stubby, or mushroom spines and filopodia per 10 mm. Thin spines are reduced significantly in AD cases compared to CAD (2-way analysis of variance: p 5 0.0003; Tukey: CAD, *p50.0004). Stubby spines are reduced in CAD and AD cases compared to controls (Tukey: CAD, *p 5 0.031; AD, **p 5 0.0054). Mushroom spines are reduced significantly in AD cases compared to CAD (Tukey: CAD, *p50.041). (B) Linear regression analysis of spine classification densities measured per 10 mm of dendrite in all cases with age. Each dot represents the average spine class density per 10mm for each individual case. The density of spine class per 10 mm of dendrite was plotted against the age of each individual. Age is represented in years. (C) Average spine class density per 10 mm of dendrite for each individual was graphed based on sex. Lines represent the mean 6standard error of the mean.

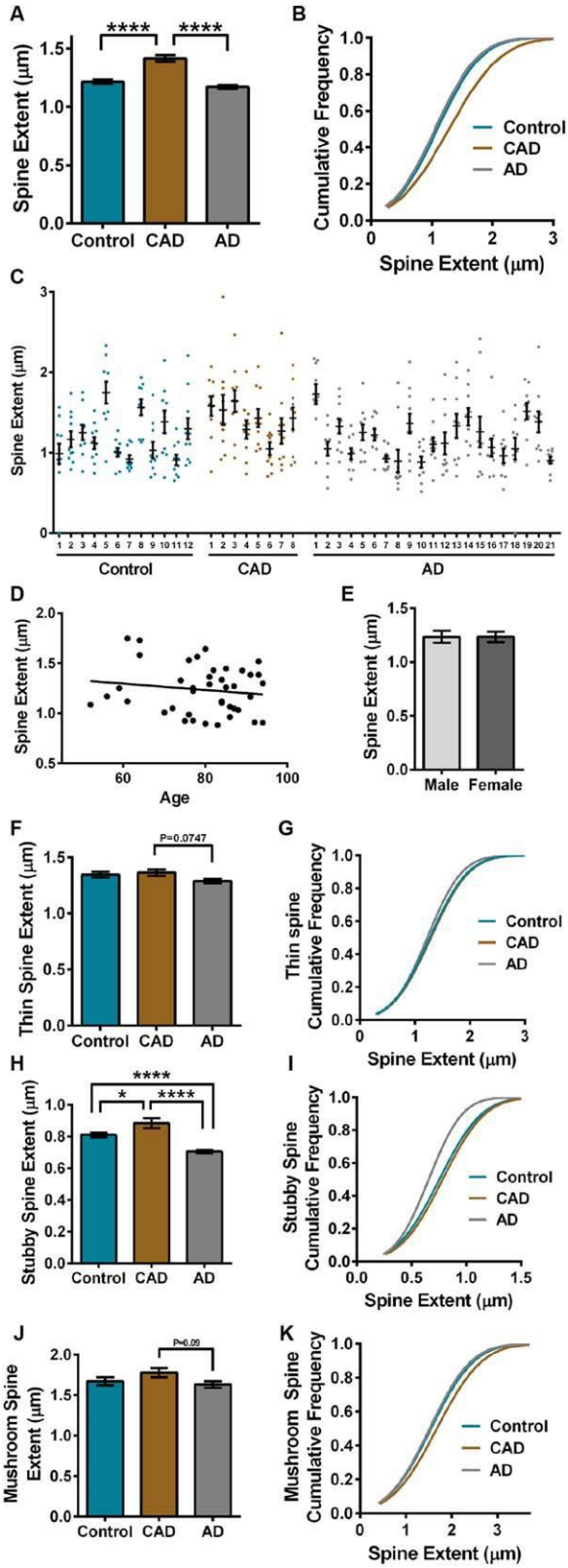
error of the mean (SEM), and all graph error bars represent SEM. All statistical tests were 2-tailed, with the threshold for statistical significance set at 0.05. To compare aggregate spine densities among conditions, the mean spine density per patient was calculated. These patient means were then averaged per condition and reported as a condition mean. Mean spine densi- ties for each spine class were similarly accumulated. Statistical comparisons included unpaired t test, 1-way analysis of variance (ANOVA) with Tukey comparisons test, 2-way ANOVA with Tukey or Bonferroni multiple comparison test, linear regression analysis, and 2-sample Kolmogorov–Smirnov test. Possible cova- riants were assessed for spine densities and morphology. Sex, age, and postmortem interval were compared against the patient means for each parameter using 2-way ANOVA, linear regres- sion, or t tests. For spine morphology, cumulative distributions of dendritic spine extent or head diameter are reported for each condition. The D'Agostino and Pearson omnibus normality test determined that these spine morphology parameters were not normally distributed, so nonparametric Kolmogorov–Smirnov tests were used. Two-sample Kolmogorov–Smirnov tests com- pared the frequency of spine morphology among spine popula- tions between each pair of conditions.[25,26] Additionally, 1-way ANOVA with Tukey post hoc test was performed to compare morphology among conditions.

Results

Using the Golgi–Cox technique, we compared the density of dendritic spines within layers II and III pyramidalneu- ron dendrites of BA46 dorsolateral prefrontal cortex (DLPFC) in controls, CAD, and AD cases (see Tables 1 and 2). BA46 was selected because it is a region tightly linked to cognitive performance, including working mem- ory, and is highly vulnerable in AD.[27,28] We developed and optimized a method to trace impregnated dendrites from bright-field microscopic images that enabled accurate 3-dimensional digital reconstruction of dendriticstructure (Fig 1). Spine density, measured per dendrite length or dendrite surface area, was similar among control and CAD cases but reduced in AD (Fig 2, Supplementary Tables 1 and 2). The mean ages of the control, CAD, and AD groups were not significantly different. Linear regression analysis indicated that spine density was independent of sex or postmortem interval and that spine density changes within disease states were not associated with age (Supple- mentary Tables 2 and 3). However, collective analysis of all cases revealed that age was inversely proportional to spine density ($F_{1,39}$ 5 6.570, R^2 5 0.1442, p 5 0.0143), which supports past findings in aging mammals.[29,30]

The amyloid hypothesis of AD posits that increased soluble and insoluble Ab levels induce a cascade of pro- cesses that manifest in NFT formation and synaptic loss, resulting in clinical dementia.[31] Linear regression analysis of all cases indicated that, irrespective of disease state, spine density was not associated with Ab plaque severity (neuritic or diffuse plaque scores) but did display nega- tive correlation with the degree of NFT distribution ($F_{1,39}$ 5 6.495, R^2 5 0.1428, p 5 0.0149) and Braak

staging ($F_{1,37}$ 5 22.65, R^2 5 0.4754, $p < 0.0001$; Fig 3A–D, Supplementary Table 3). Notably, among AD cases there was no correlation with spine density and Braak staging (see Fig 3E, Supplementary Table 3).



Despite high levels of Ab plaques and NFTs in CAD brains, the mean spine density measurements were not significantly different from controls (see Fig 2A–D, Supplementary Tables 1 and 2). This may contribute to the lack of cognitive impairment in CAD cases; however, we hypothesized that maintenance of cognitive function in an environment of AD pathology would involve struc- tural remodeling of dendritic spines. To test this, we assessed spine morphology across control, CAD, and AD cases. Dendritic spine morphology influences excitatory neurotransmission and synaptic plasticity, and spines can be classified on the basis of their 3-dimensional structure as stubby, mushroom, or thin.[13,32,33] Stubby spines are theorized to be transitional, mushroom spines represent more stable structures, and thin spines are more dynamic. Dendritic filopodia are actin-rich protrusions that are widely considered the precursors of spines.[34] Thin spines were reduced significantly in AD compared to CAD cases (2-way ANOVA: p 5 0.0003; Tukey: p 5 0.0004), whereas stubby spine density was decreased significantly in CAD and AD compared to controls

FIGURE 5: Comparison of dendritic spine extent in controls, cognitively normal individuals with high Alzheimer's disease (AD) pathology (CAD), and AD cases. (A) Mean spine extent was increased significantly in CAD compared to controls or

AD (analysis of variance [ANOVA]: $p <$ 0.0001; Tukey: con- trols, ****$p <$ 0.0001; AD, ****$p <$ 0.0001). (B) The cumulative frequency plots of individual spines indicate that CAD seg-

regates based on spine extent (Kolmogorov–Smirnov: con- trols, D 50.1221, $p <$ 0.0001; AD, D 50.1455, $p <$ 0.0001).

(C) Distribution of spine extent in control, CAD, and AD

cases. Each dot represents the average spine extent per individual dendrite that was imaged. (D) Linear regression analysis of spine extent measured across all cases with age. Each dot represents the average spine extent for each indi- vidual case. The average spine extent was plotted against the age of each individual. Age is represented in years. (E) Average spine extent per individual was graphed based on sex. (F) Mean extent for thin spines was reduced in AD cases compared to CAD (ANOVA: p 50.0486; Tukey: AD,

p 5 0.0748). (G) The cumulative distribution of thin spine

extent for each disease state was plotted. (H) Mean extent for stubby spines was increased significantly in CAD com- pared to controls or AD (ANOVA: $p <$ 0.0001; Tukey: con-

trols–CAD, *p 5 0.0204; controls–AD, ****$p <$ 0.0001; CAD–

AD, ****$p <$ 0.0001). (I) The cumulative distribution of stubby spine extent for each disease state was plotted. The cumu-

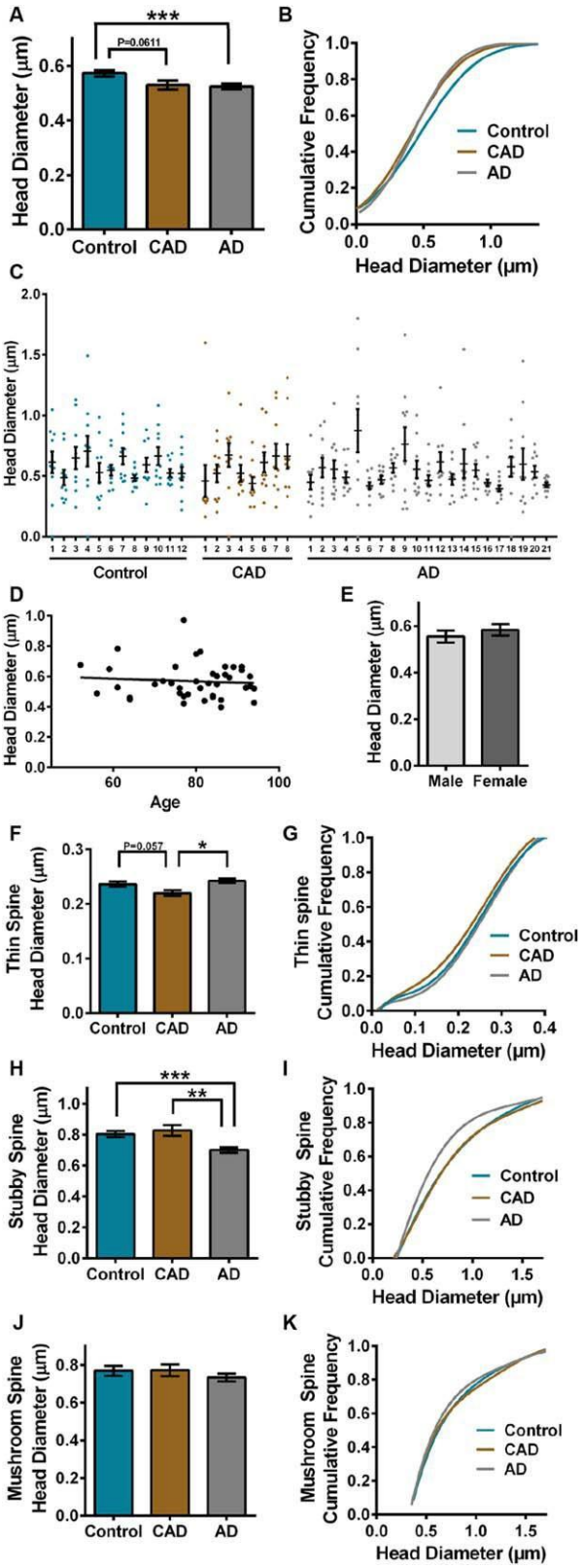
lative frequency plots indicated that AD cases segregate from controls and CAD based on stubby spine extent (Kol-

mogorov–Smirnov: controls, D 5 0.1502, $p <$ 0.0001; CAD, D 5 0.2190, $p <$ 0.0001). (J) A trending increase in mean extent for mushroom spines was observed in CAD cases

compared to controls and AD (ANOVA: p 50.1105; Tukey: AD, p 5 0.0914). (K) The cumulative distribution of mush-

room spine extent for each disease state was plotted. The cumulative frequency plots indicated that CAD cases segre- gate from AD based on mushroom spine extent (Kolmogo- rov–Smirnov: AD, D 50.1165, p 50.0410). Lines represent the mean 6 standard error of the mean.

(Tukey: CAD, p 5 0.031; AD, p 5 0.0054). Numbers of mushroom spines were reduced significantly in AD com- pared to CAD (Tukey: p 5 0.0405), but filopodia did not differ significantly among disease states (Fig 4A,



Supplementary Tables 1 and 2). Linear regression analysis across all cases revealed that age and sex did not correlate with spine classification densities (see Fig 4B, C, Supple- mentary Table 3).

To further analyze spine structure, spine extent (length) was measured among control, CAD, and AD dendrites. Mean spine extent was increased significantly in CAD cases compared to controls or AD (ANOVA: $F_{2,4548} = 36.17$, $p < 0.0001$; Tukey: controls, $p < 0.0001$;

AD, $p < 0.0001$; Fig 5, Supplementary Tables 1 and 2).

To examine this change in length in more detail, the cumulative distribution of spine extents for each disease state was plotted. The cumulative frequency plots indi- cated that CAD cases segregate from controls and AD based on spine extent (Kolmogorov–Smirnov: controls, $D = 0.1221$, $p < 0.0001$; AD, $D = 0.1455$, $p < 0.0001$).

Notably, age and sex did not influence overall mean

FIGURE 6: Comparison of dendritic spine head diameter in controls, cognitively normal individuals with high Alzheimer's disease (AD) pathology (CAD), and AD cases. (A) Mean spine head diameter was reduced significantly in AD compared to

controls (analysis of variance [ANOVA]: $p = 0.0032$; Tukey: AD, $^{***}p = 0.0032$), and CAD was reduced compared to con- trols (ANOVA: CAD, $p = 0.0611$). (B) The cumulative fre- quency plots of individual spines indicate that each group

segregates based on spine head diameter (Kolmogorov– Smirnov: controls–CAD, $D = 0.09061$, $p = 0.0002$; controls–

AD, $D = 0.06866$, $p = 0.0005$; CAD–AD, $D = 0.06968$,

$p = 0.0070$). (C) Distribution of spine head diameter in con- trol, CAD, and AD cases. Each dot represents the average

spine head diameter per individual dendrite that was imaged. (D) Linear regression analysis of spine head diameter measured across all cases with age. Each dot represents the average spine head diameter for each individual case. The average spine head diameter was plotted against the age of each individual. Age is represented in years. (E) Average spine head diameter per individual was graphed based on sex. (F) Mean head diameter for thin spines was reduced in CAD cases compared to controls and AD (ANOVA:

$p = 0.0036$; Tukey: controls, $p = 0.057$, AD, $^{*}p = 0.0024$). (G) The cumulative distribution of thin spine head diameters for

each disease state was plotted. The cumulative frequency plots indicated that CAD cases segregate from AD based on thin spine head diameter (Kolmogorov–Smirnov: AD, $D = 0.1034$, $p = 0.0101$). (H) Mean head diameter was reduced significantly for stubby spines in AD compared to

CAD and controls (ANOVA: $p < 0.0001$; Tukey: CAD, $^{**}p = 0.0015$; controls, $^{***}p = 0.0003$). (I) The cumulative distribution of stubby spine head diameters for each disease

state was plotted. The cumulative frequency plots indicated that AD cases segregate from controls and CAD based on stubby spine head diameter (Kolmogorov–Smirnov: controls,

$D = 0.1421$, $p < 0.0001$; CAD, $D = 0.1512$, $p = 0.0010$). (J)

Mean head diameter for mushroom spines was similar

among control, CAD, and AD cases. (K) The cumulative distribution of mushroom spine head diameters for each disease state was plotted. The cumulative frequency plots indicated overlap among controls, CAD, and AD cases based on mushroom spine head diameter. Lines represent the mean ± standard error of the mean.

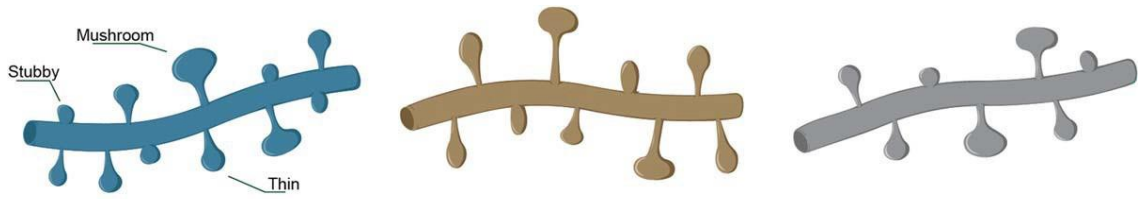


FIGURE 7: Representative illustration of dendrites from control, cognitively normal individuals with high Alzheimer's disease (AD) pathology, and AD cases (not to scale).

spine extent (see Supplementary Tables 2 and 3). Com- parison among spine classes revealed that stubby spine extent was increased selectively and significantly in CAD cases compared to controls and AD (Kolmogorov–Smir- nov: controls, D 5 0.1502, $p < 0.0001$; AD, D 5 0.2190, $p < 0.0001$; see Supplementary Tables 1 and 2). Thin spine extent was reduced in AD cases compared to CAD, and mushroom spine extent was increased in CAD cases compared to controls and AD. However, these results were not significant.

Next, spine head diameter was measured among control, CAD, and AD dendrites. Mean spine head diameter was reduced significantly in AD cases compared to controls (ANOVA: $F_{2,4407}$ 5 5.763, p 50.0032; Tukey: AD, p 5 0.0032; Fig 6, Supplementary Tables 1 and 2). Toexamine this change in size in more detail, the cumulative distribution of spine head diameters for each disease state was plotted. The cumulative frequency plots indicated that each group segregates based on spine head diameter (Kolmogorov–Smirnov: controls–CAD, D 5 0.09061, p 5 0.0002; controls–AD, D 5 0.06866, p 5 0.0005; CAD–AD, D 5 0.06968, p 5 0.0070).

Notably, controls segregate from CAD at <0.4 μm head diameter, likely due to reduced thin spine head diameter in CAD cases. Notably, age and sex did not influence overall mean spine head diameter (see Supplementary Tables 2 and 3). Analysis of spine classes revealed that thin spine head diameter was reduced selectively in CAD cases compared to controls and AD (ANOVA: $F_{2,1635}$ 5 5.652, p 5 0.0036; Tukey: controls, p 5 0.057; AD, p 5 0.0024; see Supplementary Tables 1 and 2). Stubby spine head diameter was reduced significantly in AD compared to controls and CAD (ANOVA: $F_{2,1483}$ 5 10.33, $p < 0.0001$; Tukey: controls, p 5 0.0003; CAD, p 50.0015). Mushroom spine head diameter was similar among controls, CAD, and AD.

Discussion

In this study, we used optimized 3-dimensional modeling of dendritic spines to reveal that maintenance of thin and mushroom spine populations combined with cumu- lative increased spine extent distinguished CAD cases from AD. These observations provide cellular evidence to support the hypothesis that spine plasticity is a mecha- nism of cognitive resilience that protects older individuals with AD pathophysiology from developing dementia.[35]

Concomitant alternations in extent and head diam- eter among spine classes in CAD cases may reflect more rapid plasticity to maintain information storage.[36] For instance, cumulative increases in spine extent through the DLPFC could sustain working memory in an environ- ment of Ab plaques and NFTs by extending their reach to maintain degenerating connections or facilitating new synaptic inputs. Moreover, preservation of thin and mushroom spine density in CAD appears to be impor- tant for cognitive maintenance, whereas stubby spines may be less essential. These results support findings in rhesus monkeys, where selective loss of thin spines in BA46 is associated with age-related memory impair- ment.[30] Maintenance of thin spines suggests preservation of dynamic synapses that are formed or remodeled dur- ing learning and memory in adulthood.[37,38]

Recently, positron emission tomography (PET) imaging of tau indicated that NFT distribution across cognitively normal older individuals and AD patients strongly correlated to Braak staging in postmortem tis- sue.[39] Using the findings here, a comparison of PET tau imaging and its correlative Braak stage could be used to extrapolate a hypothetical representation of synaptic den- sity and structure in the DLPFC. However, no correla- tion with spine density and Braak staging was observed among AD cases, suggesting that a clinical diagnosis of AD is associated with reduced spine density irrespective of Braak stage (see Fig 3E, Supplementary Table 3). However, the limited numbers of AD cases that display Braak stage I–III at autopsy hinder this analysis.

^{11}C-Pittsburgh compound B imaging studies sug- gest that only 13% of cognitively normal individuals who are positive for Ab will transition to mild cognitive impairment or AD.[40] Based on this, comparison of struc- tural plasticity among controls, and CAD and AD cases may be interpreted in 2 ways. If the CAD individuals lived to develop dementia, then the observed phenotypes could reflect necessary synaptic structure changes during

the transition from preclinical to symptomatic AD. Alter- natively, if the CAD individuals lived and remained immune to dementia, then the observed phenotypes could represent an inherent protective mechanism that prevents the onset of dementia (Fig 7). In either scenario, these findings emphasize spine plasticity as a mechanism of cognitive resilience and highlight structural plasticity as a substrate for therapeutic intervention during the pre- clinical phase of AD.

Acknowledgment

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Author Contributions

J.H.H., B.D.B., and M.G. conceived the experiments; all authors performed the experiments and analyzed the data; B.D.B. and J.H.H. wrote the article.

Potential Conflicts of Interest

Nothing to report.

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AHA/ASA Presidential Advisory Appendix H

Defining Optimal Brain Health in Adults

A Presidential Advisory From the American Heart Association/ American Stroke Association

Philip B. Gorelick, MD, MPH, FAHA, Chair*; Karen L. Furie, MD, MPH, FAHA, Co-Chair†; Costantino Iadecola, MD, FAHA, Co-Chair†; Eric E. Smith, MD, MPH, FAHA‡; Salina P. Waddy, MD§; Donald M. Lloyd-Jones, MD, ScM, FAHA‖; Hee-Joon Bae, MD, PhD, FAHA; Mary Ann Bauman, MD; Martin Dichgans, MD; Pamela W. Duncan, PhD, PT, FAHA; Meighan Girgus; Virginia J. Howard, PhD, FAHA; Ronald M. Lazar, PhD, FAHA; Sudha Seshadri, MD, FAHA; Fernando D. Testai, MD, PhD, MS, FAHA; Stephen van Gaal, MD; Kristine Yaffe, MD, FAHA; Hank Wasiak, MBA; Charlotte Zerna, MD, MSc; on behalf of the American Heart Association/ American Stroke Association

Abstract—Cognitive function is an important component of aging and predicts quality of life, functional independence, and risk of institutionalization. Advances in our understanding of the role of cardiovascular risks have shown them to be closely associated with cognitive impairment and dementia. Because many cardiovascular risks are modifiable, it may be possible to maintain brain health and to prevent dementia in later life. The purpose of this American Heart Association (AHA)/American Stroke Association presidential advisory is to provide an initial definition of optimal brain health in adults and guidance on how to maintain brain health. We identify metrics to define optimal brain health in adults based on inclusion of factors that could be measured, monitored, and modified. From these practical considerations, we identified 7 metrics to define optimal brain health in adults that originated from AHA's Life's Simple 7: 4 ideal health behaviors (nonsmoking, physical activity at goal levels, healthy diet consistent with current guideline levels, and body mass index <25 kg/m^2) and 3 ideal health factors (untreated blood pressure <120/<80 mm Hg, untreated total cholesterol <200 mg/dL, and fasting blood glucose <100 mg/dL). In addition, in relation to maintenance of cognitive health, we recommend following previously published guidance from the AHA/ American Stroke Association, Institute of Medicine, and Alzheimer's Association that incorporates control of cardiovascular risks and suggest social engagement and other related strategies. We define optimal brain health but recognize that the truly ideal circumstance may be uncommon because there is a continuum of brain health as demonstrated by AHA's Life's Simple **7.** Therefore, there is opportunity to improve brain health through primordial prevention and other interventions. Furthermore, although cardiovascular risks align well with brain health, we acknowledge that other factors differing from those related to cardiovascular health may drive cognitive health. Defining optimal brain health in adults and its maintenance is consistent with the AHA's Strategic Impact Goal to improve cardiovascular health of all Americans by 20% and to reduce deaths resulting from cardiovascular disease and stroke by 20% by the year 2020. This work in defining optimal brain health in adults serves to provide the AHA/American Stroke Association with a foundation for a new strategic direction going forward in cardiovascular health promotion and disease prevention. **(*Stroke*. 2017;48:e00-e00. DOI: 10.1161/STR.0000000000000148.)**

Key Words: AHA Scientific Statements □ aging □ brain □ cognitive dysfunction ■ prevention and control □ risk factors □ stroke

*Also a member of Maintenance of Brain Health writing group section. †Also a member of Optimal Brain Health writing group section. ‡Lead of Maintenance of Brain Health writing group section. §Lead of Public Health Impact of Cognitive Impairment, Dementia, Stroke, and Cardiovascular and Stroke Risks writing group section. ‖Senior reviewer.

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