CAREER SNAPSHOT

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LASHAE NICHOLSON

PROFILE

About Me: I am a Kavli Postdoctoral Research Fellow at Yale University. Currently, I am studying the molecular mechanisms linking neuronal and vascular dysfunction in the context of neurological trauma and disease.

Research Approach: Using transcriptomic profiling and multivariate analysis, I am characterizing and linking how clinical variables such as age, sex, diet, alter gene expression across multiple cell types during the pathological development of Alzheimer's Disease. This analysis method and findings are being curated into an open-source knowledge-based platform, developed within AWS cloud services.

RESEARCH METRICS

- H-Index: 8
- Total Citations: 320
- Publications
  - Published: 13
  - Under review: 1
  - In preparation: 2

OMICS & DATA SCIENCE SKILLS & EXPERIENCES

- MIT IDSS Course: Data Science and Machine Learning
- snRNA sequencing
  - Sample preparation
  - Seurat, Scanpy, scVI

RESEARCH AREAS

- Transcriptomics
- Alzheimer's Disease, neurodegeneration
- Spinal cord injury, neuro-regeneration
- Neurovascular signaling
- Gene therapy & gene editing
- Cell & biomaterial implantation
- Translational clinical research

RESEARCH EXPERIENCE

Postdoctoral Training
Yale University, Department of Neuroscience | New Haven, CT
Supervisor: Prof. Dr. Stephen Strittmatter, MD, PhD
2019-Present

Graduate Studies
Wolfgang Goethe University | Frankfurt, Germany
BLMS & MPI for Brain Research Institutes
Supervisor: Prof. Dr. Amparo Acker-Palmer, PhD
2013-2019

EXPERIMENTAL TECHNIQUES

- **Animal Models:** Rodent husbandry, post-operative care, drug delivery, cell & tissue preparations (Mice & Rats); viral gene therapy (Human & Monkey, SCI project)
- **Cell & Tissue Culture:** DRGs, CGNs, CHO, PC12, NPCs, iPSCs, SKPCs, astrocytes, fibroblasts, BMSCs, HCNs, OTCs, splenocytes, primary lung endothelial, neuronal cell cultures.
- **Assay Systems:** DNA / receptor binding, siRNA, gene regulation (Tet, CreERT, temperature inducible systems)
- **Biochemistry:** WB, ISH / FISH, IP, ICC, IHC, protein modifications, protein purification.
- **Microscopy:** Laser micro-dissection, Confocal LSM/SD, live cell imaging, FLIP/FRAP.
- **Gene and Molecular Biology:** Construct libraries, recombinant cloning (gateway, shuttle vector systems), site-directed mutagenesis, siRNA constructs, viral vector design & production
- **Electrophysiology:** Field and patch-clamp recordings
- **Virus Production:** AAV (including for human delivery), lentivirus, retrovirus

LaShae K. Nicholson

Curriculum Vitae, September 2024

Present Position

Kavli Postdoctoral Research Fellow

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Yale Profile; Strittmatter Lab Website

Education & Training

2019 **Doctoral Thesis, Dr. ret. nat. Biology**
Wolfgang Goethe University, Frankfurt, Germany

"The functional role of cell-type specific VEGF secretion during neuronal development"
Buchmann Institute for Molecular Life Sciences, Frankfurt, Germany
Supervisor: Prof. Dr. Amparo Acker-Palmer

2013 **Master's Degree, Biomedical Sciences & Technology**
University of Applied Sciences, Mannheim, Germany

"Whole-cell dynamics of protein exchange in developing neurons"
Max Planck Institute for Brain Research, Department of Synaptic Plasticity, Frankfurt, Germany
Supervisors: Prof. Dr. Erin Schuman, Dr. Cyril Hanus

Research Fellowships & Awards

2024 – Present	Broadening the Representation of Academic Investigators in NeuroScience (BRAINS) Fellow, University of Washington
2024 – Present	Careers through Mentoring and training in Omics and Data for Early-stage investigators (Career MODE) Fellow, Columbia University
2021 – Present	Kavli Postdoctoral Research Fellow, Yale University
2013 – 2014	Max Planck Graduate Student Fellowship, MPI for Brain Research, Frankfurt

Research Experience

Wolfgang Goethe University, Buchmann Institute for Molecular Life Sciences | 2013 - 2019
Supervisor: Prof. Dr. Amparo Acker-Palmer, Frankfurt, Germany
Investigated the role of the neurovascular guidance via VEGF-VEGFR2 signaling on the early postnatal development, orientation, and hippocampal circuitry integration of CA3 neurons.

Wolfgang Goethe University, Neuroscience Center | Nov 2013 - Mar 2014
Supervisor: Prof. Dr. Thomas Deller and Dr. Andreas Vlachos, Frankfurt, Germany
Trained in culturing organotypic hippocampal slice cultures, performing entorhinal cortex lesions, and whole-cell patch clamping. Cloned a cell-type specific AAV library for targeting various neuronal cell sub-populations.

Max Planck Institute for Brain Research, Dept. of Synaptic Plasticity | Mar - Sept 2013
Supervisor: Prof. Dr. Erin Schuman and Dr. Cyril Hanus, Frankfurt, Germany
Developed a computational model to quantify and correlate protein mobility with respect to neuronal cell morphology in post-microscopy time-lapse images.

Ruprecht-Karls-Universitäts Heidelberg, BioQuant | Aug - Oct. 2011
Supervisor: Prof. Dr. Dirk Grimm, Heidelberg, Germany
Trained in AAV virus production and purification. Optimized tissue laser dissection protocol for AAV shuttle vector collaboration project.

Heidelberg Universitätsklinikum, Klinik für Paraplegiologie | 2010 - 2013
Supervisor: Dr. Armin Blesch, Heidelberg, Germany
Worked in an interdisciplinary environment to develop translational combinatorial approaches (gene therapy, biomaterials, physiotherapy) for treating spinal cord-injured clinical patients.

UC San Diego, School of Medicine, Dept. of Neurosciences | 2006—2010
Supervisors: Dr. Mark Tuszynski and Dr. Armin Blesch, San Diego, California, USA
Developed viral vector systems to regulate gene expression *in vivo* to study neuronal degeneration and promote axonal regeneration in a spinal cord injury model.

Societies & Organizations

Society for Neuroscience | German Neuroscience Society | Hertie Foundation Alumni Association | FENS | Minerva FemmNet | Max Planck Society | SciMento | Young Entrepreneurs in Science (Falling Walls Organization) | Science Innovation Union | Deutsche Neurowissenschaften Olympiade e.V.

Leadership Positions

Diversity, Equity, and Inclusion Committee Co-Chair | 2020-2021
Department of Neurology, Yale University

International Brain Bee (IBB) Organization, World Neuroscience Championship | June 2018
11th FENS Forum of Neuroscience, Berlin, Germany
Invited committee chair on behalf of the IBB Organization and its board members: SfN, APA, FENS, Dana Alliance, iBro.
Position: Committee Chair, Host Country

IMPRS for Neural Circuits, Science Retreat | April 2018
Bordeaux NeuroCampus, Université de Bordeaux, Bordeaux, France
Position: Scientific coordinator co-chair

IMPRS for Neural Circuits, Science Retreat | April 2016
Champalimaud Center for the Unknown, Lisbon, Portugal
Position: Scientific coordinator

Teaching, Training & Mentorships

Graduate & Post-bachelor Student Research Projects

- Zheyun X (Graduate Student Rotation, 2024, Yale University):
  Comparative transcriptomic profiling of cortical gene expression changes in APOE2 and APOE4 mice post spinal cord injury.

- Christine W (Graduate Student Rotation, 2023, Yale University)
  Characterization of the spatial localization of mGluR5 and PrP proteins in iPSC, primary neuron cultures, and mouse brain tissues using expansion microscopy.

- Tejaswini K (Postbach trainee, 2021-2023, Yale University):
  The impact of Type 2 Diabetes on the pathological development of Alzheimer's Disease.

Master's Students

- Madhuri M. (Master's Thesis, 2016, Wolfgang Goethe University):
  Characterization of VEGF / VEGFR2 expression in cultured astrocytes under normal and KCl stimulation conditions
- Adesanoye B. (Rotation Project, 2015, Wolfgang Goethe University):
  Characterization of VEGF-induced VEGFR2 activation and downstream signaling in cultured neurons.

- Benjamin M. (Rotation Project 2014, Wolfgang Goethe University):
  Characterization of VEGF / VEGFR2 expression in the adult mouse hippocampus.

Bachelor Student Research Projects

- Habiba A. (Summer Research Intern, 2024, Yale University):
  Evaluation of Meis2 expression in L2 inhibitory neurons in WT and Alzheimer's Disease mouse models high-fat diet induce Metabolic Syndrome

- Jacqueline W. (Bachelor's Thesis, 2023-2024, Yale University):
  Characterization of vascular network changes during the pathological development of Alzheimer's Disease.

- Sapphire M.(Yale Summer Research Fellow, 2021, Yale University):
  Comparative analysis of the brain vasculature in two different Alzheimer's Disease mouse models.

- Christina O. (Bachelor's Thesis, 2020-2021, Yale University):
  Characterization of ROCK1 expression within the neurovascular unit in the Alzheimer's Disease mouse brain.

High School Student Research Project

- Jimin K. (IMPRS Scholar's program, 2018-2019, MPI for Brain Research):
  Cloning of endothelial cell-targeted AAV GCaMP6 vectors for functional vascular Imaging.

Seminars

- Modern topics in neuroscience: Gene & Molecular Networks
  Max Planck Institute for Brain Research, IMPRS for Neural Circuits, Doctoral Students

Teaching Lab & Practical Courses

- Introduction to basic methods in neuroscience: Histology preparations and microscopy
  Wolfgang Goethe University, Dept. of Molecular and Cellular Neurobiology, Master's Course

- Methods in neuroscience: Cloning, PCR, and genotyping techniques
  Max Planck Institute for Brain Research, Teaching Lab, High School Students

Talks & Presentations

Why vessels matter in neuronal brain diseases (Talk) | 2021
Neuroscience Seminar Series, Yale University, New Haven, CT

Growing dendritic trees with vascular endothelial growth factor (Talk) | March 2019
Neuroscience Seminar Series, MPI for Brain Research, Frankfurt, Germany

Driving connectivity in neuroscience research (Talk) | April 2019
Neuroscience Seminar Series, Donders Center for Cognition, Nijmegen, Netherlands

Vessels and astrocytes coordinate hippocampal development and circuit integration (Poster) | March 2018
Dutch-German Vascular Biology Meeting, Amsterdam, Netherlands

VEGFR2-ephrinB2 cooperative signaling controls dendritic arborization and synapse formation (Poster) | March 2017
German Neuroscience Society Conference, Göttingen, Germany

Extracurricular Activities

Business Start-Ups

NeuroXP | STEM program development consulting for academic, industry, and organizations.
Position: Founder

Deutsche Neurowissenschaften Olympiade e.V. (DNO e.V.) | Non-profit neuroscience outreach and educational platform for high school students.
Position: Brand & partnerships manager, Co-founding Member

Program Management (self-initiated)	**GRADE Brain:** University-wide career development training program for early career scientists. **Postdoc teaching training program:** A teaching training program for Postdocs working at non-university neuroscience research institutions.
Neuroscience Education Initiative	Working with several stakeholders to establish a neuroscience training program for high school teachers. The overall goal is to establish a high school-level neuroscience curriculum.

Publications (*First Author)

H-index: 8 **Total Citations:** 320

In preparation for submission

***Nicholson L**, Karra T, Tang J, Strittmatter SM. *Insulin resistance induced by high-fat diet exacerbates Alzheimer's phenotypes in knock-in mice with specific alterations in cortical inhibitory neurons and microglia.*

Under review:

Zhang L, He CH, Coffey S, Yin D, Hsu IU, Su C, Ye Y, Zhang C, Spurrier J, **Nicholson L**, Rothlin CV, Ghosh S, Gopal PP, Hafler DA, Zhao H, Strittmatter SM. *Single-cell transcriptomic atlas of Alzheimer's disease middle temporal gyrus reveals region, cell type, and sex specificity of gene expression with novel genetic risk for MERTK in females*. medRxiv [Preprint]. 2023 Feb 23:2023.02.18.23286037. PMID: 36865305, PMCID: PMC9980267, DOI: 10.1101/2023.02.18.23286037

Published

1. Stoner A, Fu L, ***Nicholson L**, Zheng C, Toyonaga T, Spurrier J, Laird W, Cai Z, Strittmatter S. *Neuronal transcriptome, tau and synapse loss in Alzheimer's knock-in mice require prion protein. Alzheimer's Research & Therapy* 2023, 15: 201. PMID: 37968719, PMCID: PMC10647125, DOI: 10.1186/s13195-023-01345-z.

2. Zheng C, Toyonaga T, Chen B, **Nicholson L**, Mennie W, Liu M, Spurrier J, Deluca K, Strittmatter SM, Carson RE, Huang Y, Cai Z. *Decreased synaptic vesicle glycoprotein 2A binding in a rodent model of familial Alzheimer's disease detected by [^{18}F]SDM-16*. Front Neurol. 2023, 14: 1045644. doi: 10.3389/fneur.2023.1045644. PMID: 36846134, PMCID: PMC9945093, DOI: 10.3389/fneur.2023.1045644

3. Zheng C, Mennie W, Gravel P, Balayeva T, Chen B, Holden D, Kapinos M, Felchner Z, **Nicholson L**, Toyonaga T, Zheng M, Fowles K, Ropchan J, Nabulsi N, Strittmatter, SM, Carson R, Huang Y, Cai Z. *Synthesis and preclinical evaluation of 18F-labeled radioligands for imaging rho-associated protein kinase 2 in the brain*. Journal of Nuclear Medicine. 2023;64(supplement 1):P779-P.

4. Zheng C, Chen B, Toyonaga T, **Nicholson L**, Holden D, Zhang L, Gao H, Zheng M, Fowles K, Ropchan J, Strittmatter SM, Carson R, Huang Y, Cai Z. *Preclinical evaluation of [11C]ROCK201 for imaging rho-associated protein kinase 2 in brain*. Journal of Nuclear Medicine. 2022;63(supplement 2):2301-2301.

5. Zheng C, Chen B, Toyonaga T, Liu M, **Nicholson L**, Deluca K, Strittmatter S, Carson R, Huang Y, Cai Z. *Visualization of synaptic vesicle protein 2A in a rodent model of familial Alzheimer's disease with a metabolically stable PET probe*. Alzheimer's & Dementia 2022, 18 DOI: 10.1002/alz.063890.

6. Spurrier J, ***Nicholson L**, Fang XT, Stoner AJ, Toyonaga T, Holden D, Siegert TR, Laird W, Allnutt MA, Chiasseu M, Brody AH, Takahashi H, Nies SH, Pérez-Cañamás A, Sadasivam P, Lee S, Li S, Zhang L, Huang YH, Carson RE, Cai Z, Strittmatter SM. *Reversal of synapse loss in Alzheimer mouse models by targeting mGluR5 to prevent synaptic tagging by C1Q*. Science Translational Medicine 2022, 14: eabi8593. PMID: 35648810, PMCID: PMC9554345, DOI: 10.1126/scitranslmed.abi8593.

7. ***Nicholson L**, Gervasi N, Falières T, Leroy A, Miremont D, Zala D, Hanus C. *Whole-Cell Photobleaching Reveals Time-Dependent Compartmentalization of Soluble Proteins by the Axon Initial Segment*. Frontiers In Cellular Neuroscience 2020, 14: 180. PMID: 32754013, PMCID: PMC7366827, DOI: 10.3389/fncel.2020.00180.

8. Harde E, **Nicholson L**, Cuadrado B, Bissen D, Wigge S, Urban S, Segarra M, de Almodóvar C, Acker-Palmer A. *EphrinB2 regulates VEGFR2 during dendritogenesis and hippocampal circuitry development*. ELife 2019, 8: e49819. PMID: 31868584, PMCID: PMC6927743, DOI: 10.7554/elife.49819.

9. Luck R, Urban S, Karakatsani A, Harde E, Sambandan S, **Nicholson L**, Haverkamp S, Mann R, Martin-Villalba A, Schuman EM, Acker-Palmer A, de Almodóvar C. *VEGF/VEGFR2 signaling regulates hippocampal axon branching during development*. ELife 2019, 8: e49818. PMID: 31868583, PMCID: PMC6927742, DOI: 10.7554/elife.49818.

10. Liu S, Sandner B, Schackel T, **Nicholson L**, Chtarto A, Tenenbaum L, Puttagunta R, Müller R, Weidner N, Blesch A. *Regulated viral BDNF delivery in combination with Schwann cells promotes axonal regeneration through capillary alginate hydrogels after spinal cord injury*. Acta Biomaterialia 2017, 60: 167-180. PMID: 28735026, DOI: 10.1016/j.actbio.2017.07.024.

11. McCall J, **Nicholson L**, Weidner N, Blesch A. *Optimization of adult sensory neuron electroporation to study mechanisms of neurite growth*. Frontiers In Molecular Neuroscience 2012, 5: 11. PMID: 22347167, PMCID: PMC3274834, DOI: 10.3389/fnmol.2012.00011.

12. Hou S, **Nicholson L**, van Niekerk E, Motsch M, Blesch A. *Dependence of Regenerated Sensory Axons on Continuous Neurotrophin-3 Delivery*. Journal Of Neuroscience 2012, 32: 13206-13220. PMID: 22993437, PMCID: PMC3513675, DOI: 10.1523/jneurosci.5041-11.2012.

13. Kenyon WJ, **Nicholson KL**, Rezuchova B, Homerova D, Garcia-Del Portillo F, Finlay BB, Pallen MJ, Kormanec J, Spector MP. *Sigma(s)-Dependent carbon-starvation induction of pbpG (PBP 7) is required for the starvation-stress response in Salmonella enterica serovar Typhimurium*. Microbiology (Reading, England) 2007, 153: 2148-2158. PMID: 17600059, DOI: 10.1099/mic.0.2007/005199-0.

References

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Chair Of Neuroscience

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Professional connection: Former Supervisor