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University of Pittsburgh

School of Medicine

Carnegie Mellon University

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EDUCATION

Doctor of Medicine

2017-2024

University of Pittsburgh

Medical Scientist Training Program (MSTP), Focus: Anesthesia, Addition Medicine

Doctor of Philosophy, Computational Biology

2019-2023

Carnegie Mellon University

Thesis advisor: Andreas Pfenning, PhD

Bachelor of Science, Biomedical Engineering

2012-2016

Johns Hopkins University

General and Departmental Honors. Academic/Research advisors: JJ Green, BJ Maher, AE Jaffe

RESEARCH EXPERIENCE

MD/PhD student

2017-2023

Carnegie Mellon University, Department of Computational Biology

Mentor: Andreas Pfenning, PhD, Conserved epigenetics in the reward circuit and interpreting impacts of human genetic variants associated with addiction

Research Assistant

2014-2017

Lieber Institute for Brain Development

Mentors: Andrew Jaffe, PhD, Brady Maher, PhD, Convergent gene pathways across intellectual disability syndromes using RNAseq of murine models

Summer Research Assistant

Summer 2015

Oxford University, Department of Psychiatry

Mentor: Paul Harrison, DM, FRCPsych, Novel ZNF804a transcripts in postmortem fetal human brain

TEACHING

- June 2021-Present: **BIOF 017, 018, 019, 501, Intro/Intermediate R, NIH FAES**
Teaching assistant in data analyses in R. Instructor: Lisa Federer, PhD; Kyung-dae Ko, PhD
- Nov 2021-Present: **BIOF 515, Intermediate Statistics, NIH FAES**
Teaching assistant in intermediate statistical concepts in R. Instructor: Amanda Kolwaczyk, PhD
- Dec 2022, June 2023: **BIOF 048, Single Cell RNA-seq Analysis, NIH FAES**
Instructor and teaching assistant in single cell RNA-seq analyses in R. Instructor: Kyung-dae Ko, PhD
- Sep 2022: **GENE 540, Gene Expression Analysis, NIH FAES**
Teaching assistant in gene expression, regulation, and their analyses. Instructor: Jason Hoskins, PhD

- Spring 2021: **MED 5133 Medical Neuroscience, University of Pittsburgh**
Small group facilitator for medical students covering neuroanatomy. Instructor: Cynthia Lance-Jones, PhD
- Fall 2020: **CB02-319/519 Genomics and Epigenetics of the Brain, Carnegie Mellon University**
Teaching Assistant for graduate course on neuro-genomics in health and disease. Instructor: Andreas Pfenning, PhD
- 2018-2020: **MCAT Test Prep, Kaplan Test Prep**
MCAT instructor, tutor, and coach for pre-medical students.
- Spring 2016 & 2017: **580.222 Systems and Controls, Johns Hopkins University**
Teaching Assistant for sophomore BME students in the department's signals, systems, and control theory course.
Instructors: Michael Miller, PhD; Sridevi Sarma, PhD
- Fall 2015: **580.221 Molecules and Cells, Johns Hopkins University**
Teaching Assistant for sophomore BME students in the department's biochemistry and cellular/molecular biology course.
Instructor: Eileen Haase, PhD

PUBLICATIONS [[Google Scholar](#)][[ORCID](#)]

Bold font denotes first or co-first authorship, * denotes equal contribution

20. Kaplow IM*, Lawler AJ*, Schäffer DE*, Srinivasan C, Sestili HH, Wirthlin ME, Phan BN, Prasad K, Brown AR, Zhang X, Foley K, Genereux DP; Zoonomia Consortium*; Karlsson EK, Lindblad-Toh K, Meyer WK, Pfenning AR, “[Relating enhancer genetic variation across mammals to complex phenotypes using machine learning](#)”. *Science* **28**, Apr (2023).
19. Sullivan PF*, Meadows JRS*, Gazal S*, Phan BN, Li X, Genereux DP, Dong MX, Bianchi M, Andrews G, Sakthikumar S, Nordin J, Roy A, Christmas MJ, Marinescu VD, Wang C, Wallerman O, Xue J, Yao S, Sun Q, Szatkiewicz J, Wen J, Huckins LM, Lawler A, Keough KC, Zheng Z, Zeng J, Wray NR, Li Y, Johnson J, Chen J; Zoonomia Consortium§; Paten B, Reilly SK, Hughes GM, Weng Z, Pollard KS, Pfenning AR, Forsberg-Nilsson K, Karlsson EK#, Lindblad-Toh K#, “[Leveraging base-pair mammalian constraint to understand genetic variation and human disease](#)”. *Science* **28**, Apr (2023).
18. Christmas MJ*, Kaplow IM*, Genereux DP, Dong MX, Hughes GM, Li X, Sullivan PF, Hindle AG, Andrews G, Armstrong JC, Bianchi M, Breit AM, Diekhans M, Fanter C, Foley NM, Goodman DB, Goodman L, Keough KC, Kirilenko B, Kowalczyk A, Lawless C, Lind AL, Meadows JRS, Moreira LR, Redlich RW, Ryan L, Swofford R, Valenzuela A, Wagner F, Wallerman O, Brown AR, Damas J, Fan K, Gatesy J, Grimshaw J, Johnson J, Kozyrev SV, Lawler AJ, Marinescu VD, Morrill KM, Osmanski A, Paulat NS, Phan BN, Reilly SK, Schäffer DE, Steiner C, Supple MA, Wilder AP, Wirthlin ME, Xue JR; Zoonomia Consortium§; Birren BW, Gazal S, Hubley RM, Koepfli KP, Marques-Bonet T, Meyer WK, Nweeia M, Sabeti PC, Shapiro B, Smit AFA, Springer MS, Teeling EC, Weng Z, Hiller M, Levesque DL, Lewin HA, Murphy WJ, Navarro A, Paten B, Pollard KS, Ray DA, Ruf I, Ryder OA, Pfenning AR, Lindblad-Toh K#, Karlsson EK#, “[Evolutionary constraint and innovation across hundreds of placental mammals](#)”. *Science* **28**, Apr (2023).
17. Desai DD, Yu SE, Salvatore B, Goldberg Z, Bowers EM, Moore JA, Phan BN, Lee SE., “[Olfactory and Neurological Outcomes of SARS-CoV-2 From Acute Infection to Recovery](#)”. *Frontiers in Allergy* **October**, 26 (2022).
16. Lawler AJ, Ramamurthy, Brown AR, Shin N, Kim Y, Toong N, Kaplow IM, Wirthlin ME, Zhang X, Phan BN, Fox GA, Wade K, He J, Ozturk BE, Byrne LC, Stauffer WR, Fish KN, Pfenning AR, “[Machine learning sequence prioritization for cell type-specific enhancer design](#)”. *eLIFE*, (2022).
15. Morris J*, Olonisakin T*, Moore J, Phan BN, Parker D, Uribe B, Barel S, Bowers E, Buchheit T, Laidlaw TM, Lee S, “[Inhibiting the Type 2 Inflammatory Pathway with Dupilumab is Associated with an Increase in IL-4 and IL-18 Production](#)”. *International Forum of Allergy and Rhinology* **March**, 22 (2022).
14. Xue X, Zong W, Glausier JR, Kim SM, Shelton MA, Phan BN, Srinivasan C, Pfenning AR, Tseng GC, Lewis DA, Seney ML, Logan RW, “[Molecular rhythm alterations in prefrontal cortex and nucleus accumbens associated with opioid use disorder](#)”. *Translational Psychiatry* **12**, 123 (2022).

13. Ramnauth AF*, Maynard KR*, Kardian AS, [Phan BN](#), Tippani M, Rajpurohit S, Hobbs JW, Page SC, Jaffe AE, Martinowich K, “[Induction of Bdnf from promoter I following electroconvulsive seizures contributes to structural plasticity in neurons of the piriform cortex](#)”. *Brain Stimulation* **15**, 2 (2022).
12. Srinivasan C*, [Phan BN*](#), Lawler AJ, Ramamurthy E, Kleyman M, Brown AR, Kaplow IM, Wirthlin ME, Pfenning AR, “[Addiction-associated genetic variants implicate brain cell type- and region-specific cis-regulatory elements in addiction neurobiology](#)”. *Journal of Neuroscience* **9**, 1 (2021).
11. Seney ML, Kim SM, Glausier JR, Hildebrand MA, Xue X, Zong W, Wang J, Shelton MA, [Phan BN](#), Srinivasan C, Pfenning AR, Tseng GC, Lewis DA, Freyberg Z, Logan RW, “[Transcriptional alterations in dorsolateral prefrontal cortex and nucleus accumbens implicate neuroinflammation and synaptic remodeling in opioid use disorder](#)”. *Biological Psychiatry* **12**, 6 (2021).
10. Eagles NJ, Burke EE, Leonard J, Barry BK, Stolz JM, Huuki L, [Phan BN](#), Serrato VL, Gutiérrez-Millán E, Aguilar-Ordoñez I, Jaffe AE, Collado-Torres L, “[SPEAQeasy: a Scalable Pipeline for Expression Analysis and Quantification for R/Bioconductor-powered RNA-seq analyses](#)”. *BMC Bioinformatics* **22**, 1 (2021).
9. Maynard KR, Tippani M, Takahashi Y, [Phan BN](#), Hyde TM, Jaffe AE, Martinowich K, “[dotdotdot: an automated approach to quantify multiplex single molecule fluorescent in situ hybridization \(smFISH\) images in complex tissues](#)”. *Nucleic Acid Research* **48**, 11 (2020).
8. [Phan BN*](#), Bohlen JF*, Davis BA, Ye Z, Chen HY, Mayfield B, Sripathy SR, Cerceo Page S, Campbell MN, Smith HL, Gallop D, Kim H, Thaxton CL, Simon JM, Burke EE, Shin JH, Kennedy AJ, Sweatt JD, Philpot BD, Jaffe AE, Maher BJ, “[A Myelin-Related Transcriptomic Profile Is Shared by Pitt-Hopkins Syndrome Models and Human Autism Spectrum Disorder](#)”. *Nature Neuroscience* **1**, 1-11 (2020).
7. Burke EE, Chenoweth JG, Shin JH, Collado-Torres L, Kim SK, Micali N, Wang Y, Straub RE, Hoepfner DJ, Chen HY, Lescure A, Shibbani K, Hamersky GR, [Phan BN](#), Ulrich WS, Valencia C, Jaishankar A, Price AJ, Rajpurohit A, Semick SA, Bürli R, Barrow JC, Hiler DJ, Page SC, Martinowich K, Hyde TM, Kleinman JE, Berman KF, Apud JA, Cross AJ, Brandon NJ, Weinberger DR, Maher BJ, McKay DG, Jaffe AE, “[Dissecting transcriptomic signatures of neuronal differentiation and maturation using iPSCs](#)”. *Nat Comm* **11**, 462 (2020).
6. Perez JL, Ozpinar A, Kano H, [Phan BN](#), Niranjan A, Lunsford LD, “[Salvage Stereotactic Radiosurgery in Breast Cancer Patients with Multiple Brain Metastases](#)”. *World Neurosurg* **125**, e479-e486 (2019).
5. Chen HC, Polisetty TS, Zhu K, [Phan BN](#), Durr NJ, Tian J, Mahoney NR, “[A quantitative analysis of factors influencing lower lid retraction and involutional ectropion](#)”. *JPRAS* **72**, 1 (2018).
4. Maynard KR, Hobbs JW, [Phan BN](#), Gupta A, Rajpurohit S, Williams C, Rajpurohit N, Shin JH, Jaffe AE, Martinowich K, “[BDNF-TrkB signaling in oxytocin neurons contributes to maternal behavior](#)”. *eLIFE* **7**, e33676 (2018).
3. Haase EB, [Phan BN](#), Goldberg H, “[Molecules and Cells: Team-based and Multi-modal Learning Improves Comprehension and Increases Content Retention](#)”. *ASEE Annual Conference & Exposition* **78**, 19703 (2017).
2. Page SC, Hamersky GR, Gallo RA, Rannals MD, Calcaterra NE, Campbell MN, Mayfield B, Briley A, [Phan BN](#), Jaffe AE, Maher BJ, “[The schizophrenia- and autism-associated gene, transcription factor 4 regulates the columnar distribution of layer 2/3 prefrontal pyramidal neurons in an activity-dependent manner](#)”. *Mol Psychiatry* **23**, 304–315 (2016).
1. Rannals MD, Hamersky GR, Page SC, Campbell MN, Briley A, Gallo RA, [Phan BN](#), Hyde TM, Kleinman JE, Shin JH, Jaffe AE, Weinberger DR, Maher BJ, “[Psychiatric Risk Gene Transcription Factor 4 Regulates Intrinsic Excitability of Prefrontal Neurons via Repression of SCN10a and KCNQ1](#)”. *Neuron* **90**, 43-55 (2016).

Manuscripts in Progress:

- Brown AR, Fox GA, Kaplow IM, Lawler AJ, [Phan BN](#), Wirthlin ME, Ramamurthy, May GE, Ziheng Chen Z, Su Q, McManus CJ, Pfenning AR, “[An in vivo massively parallel platform for deciphering tissue-specific regulatory function](#)”, *bioRxiv/10.1101/2022.11.23.517755v1*.

- Ramamurthy E, Agarwal S, Toong N, Kaplow IM, Phan BN, Pfenning AR, “Regression convolutional neural network models implicate peripheral immune regulatory variants in the predisposition to Alzheimer’s disease”, *bioRxiv/10.1101/2022.12.02.518903v1*.
- Wirthlin ME, Kaplow IM, Lawler AJ, He J, Phan BN, Brown AR, Stauffer WR, Pfenning AR, “The Regulatory Evolution of the Primate Fine-Motor System”, *bioRxiv/10.1101/2020.10.27.356733v1*.
- Phan BN, Ray MH, Xue X, Fenster RJ, Kohut RJ, Bergman J, Haber SN, Mccullough KM, Fish MK, Glausier JR, Su Q, Tipton AE, Lewis DA, Freyberg Z, Tseng GC, Ressler KJ, Russek SJ, Alekseyev Y, Seney ML, Pfenning AR, Logan RW, “Single nuclei transcriptomics of human and monkey striatum implicates DNA damage, neuroinflammation, and neurodegeneration signaling in opioid use disorder.”, *bioRxiv/10.1101/2023.05.17.541145v2*.

TALKS

4. “Whole-animal massively parallel reporter assay dissects the region-specific transcriptional impact of human addiction genetic variants”. NIDA Genetics and Epigenetics Cross-Cutting Research Conference, NIH Main Campus (5/17/2023).
3. “Cell type-specific gene therapy targeting neurons of the reward brain in rodents and non-human primates”. Bridging Connections in Addiction Research Scientific Conference, Pittsburgh, PA (2/1/2023).
2. “Single cell multi-omics of the rhesus macaque striatum reveal regulatory mechanisms underlying the genetic basis of addiction”. NIDA Genetics and Epigenetics Cross-Cutting Research Conference, Virtual (5/11/2022).
1. “Transcripts in GWAS gene-desert loci introduce new players into human health”. Three Rivers Evolution Event, Pittsburgh (9/22/18).

POSTER

Bold font denotes poster presenter. * denotes equal contribution

9. Phan BN, Ray MH, Xue X, Fish MK, Glausier JR, Lewis DA, Freyberg Z, Seney ML, Pfenning AR, Logan RW, “Single nuclei transcriptomics of human and monkey striatum implicates DNA damage, neuroinflammation, and neurodegeneration signaling in opioid use disorder.”. **NIDA Genetics and Epigenetics Cross-Cutting Research Conference**, Bethesda, MD (5/16/23-5/17/23).
8. **He J***, Phan BN*, Sedorovitz M, Wirfel O, Kerkhoff W, Dauby S, Ozturk E, Chen J, Wang AZ, Bostan AC, Hooks BM, Byrne LCT, Pfenning AR, Stauffer WR, “Cell Type Specific AAVs for Targeting Cognitive and Reward Systems”. **Society for Neuroscience**, San Diego, CA (11/11/22-11/16/22).
7. Phan BN, Lawler AJ*, Jing He*, Brown AR*, Kaplow IM, Kowalczyk A, Srinivasan C, Fox GA, Chen Z, Wirthlin ME, Zoonomia Consortium, Stauffer WR, Pfenning AR, “Fine-Mapping Candidate Neuropsychiatric Regulatory Variants Using Cell Type-Aware Comparative Genomics across Mammalian Genomes”. **Neurobiology of Addiction Gordon Conference**, Newry, ME (8/14/22-8/19/22).
6. Tarfa RA, Morris JM, Anyaeche VI, Ekanem UO, Phan BN, **Nance M**, “Addressing the health disparities in Head and Neck Cancer among Black Americans: assessing perceptions and awareness of the disease”. **AHNS 2022 Annual Meeting @ COSM**, Austin, TX (4/27/22).
5. Phan BN, Lawler AJ, He J, Kaplow IM, Schaffer D, Brown AR, Zoonomia Consortium, Stauffer WR, Pfenning AR, “Fine-Mapping Candidate Neuropsychiatric Regulatory Variants Using Cell Type-Aware Comparative Genomics across Mammalian Genomes”. **Molecular Psychiatry Conference**, Maui, HI (3/6/22).
4. Phan BN, Lawler AJ, He J, Kaplow IM, Schaffer D, Brown AR, Zoonomia Consortium, Stauffer WR, Pfenning AR, “Fine-mapping candidate addiction-associated regulatory variants using cell type-aware comparative genomics across mammalian genomes”. **Society for Neuroscience**, Virtual (11/9/21).

3. **Srinivasan C***, [Phan BN*](#), Lawler AJ, Ramamurthy E, Kleyman E, Brown AR, Kaplow IM, Wirthlin EM, Pfenning AR, “Addiction-associated genetic variants implicate brain cell type- and region-specific cis-regulatory elements in addiction neurobiology”. **Society for Neuroscience**, Virtual (11/9/21).
2. **Chen HY**, [Phan BN](#), Sripathy S, Hamersky GR, Bohlen J, Shim G, O'Donnell T, Pfenning AR, Maher BJ, “The psychiatric risk gene **Transcription Factor 4 (TCF4)** regulates the density and connectivity of a specific subclass of inhibitory interneurons”. **Society for Neuroscience**, Virtual (11/10/21).
1. **Tarfa RA**, Morris JM, Anyaeche VI, Ekanem UO, [Phan BN](#), Nance M, “Head and Neck Cancer disparities among Black Americans in Pittsburgh: Understanding prevailing perceptions among the population”. **AHNS Annual Meeting**, Virtual (6/22/2021).

AWARDS & HONORS

- 2021-present F30 Pre-doctoral Fellowship, NIH National Institute on Drug Abuse (F30DA053020)
- 2023 Biological Psychiatry Somerfeld-Ziskind Research Award finalist, PMID: 34380600
- 2023 Graduate Student Assembly/Provost Conference award, Carnegie Mellon University
- 2022 Student Service Award, CMU & Pitt Computational Biology PhD Program
- 2022 Travel Award, Neurobiology of Addiction Gordon Conference
- 2022 BGSA Travel Award, University of Pittsburgh School of Medicine
- 2022 Young Investigator Travel Award, Molecular Psychiatry Annual Conference
- 2021 Trainee Professional Development Award, Society for Neuroscience
- 2021 Graduate Student Assembly/Provost Conference award, Carnegie Mellon University
- 2021 One of best posters in *Education/Care Delivery*, American Head and Neck Society
- 2020 BGSA Travel Award, University of Pittsburgh School of Medicine
- 2018 Recognition of Excellence in Collaborative Learning, University of Pittsburgh School of Medicine
- 2017 T32 Pre-doctoral Fellowship, University of Pittsburgh School of Medicine (T32-GM8208)
- 2016 David T. Yue Memorial Award “outstanding teaching or mentoring as an undergraduate teaching assistant”, JHU Department of Biomedical Engineering
- 2016 Provost Undergraduate Research Award, Johns Hopkins University
- 2015 Vredenburg Scholarship for study abroad at Oxford University, JHU School of Engineering
- 2013 Technology Fellowship Grant for developing tutorial videos for undergraduate biomedical engineering students, JHU Center for Educational Resources
- 2013 Benjamin A. Gilman International Scholarship for study abroad at the National University of Singapore, U.S. Department of State

SERVICE

- 2022 Neurobiology of Drug Addiction Gordon Research Seminar moderator and discussion leader for: *Beyond Rodent Models for Studying Drug-Abuse*
- 2020-2022: Treasurer, American Physician Scientist Association, University of Pittsburgh Chapter, promoting outreach and career development of physician scientists in training
- 2018-2019: Coordinator, Knitt Med Student Group, University of Pittsburgh, mental health awareness and community service for students and patients through knitting and crocheting