My thesis work focuses on dissecting the genes and variants underlying signals from genome-wide association studies (GWAS) of neurological phenotypes, including Parkinson disease (PD) and schizophrenia. Since the majority of variants associated with complex genetic disorders fall in non-coding DNA, our lab focuses on the impact that those variants have on regulatory DNA and, in turn, gene expression. We have begun by defining the landscape of regulatory DNA and the transcriptome in relevant cell-types for these disorders including midbrain dopaminergic neurons (PD).

We recently demonstrated that through the use of single-cell RNA-seq in mouse dopaminergic neurons, we could biologically inform the prioritization of gene candidates underlying PD GWAS signals. I am currently functionally testing those genes. We are also prioritizing GWAS variants associated with PD and schizophrenia by using open chromatin data (ATAC-seq) in specific mouse central nervous system cell populations, allowing us to construct hypotheses about how specific variants impact the biology of these diseases for functional testing.

The Leena Peltonen School of Human Genomics would provide a unique forum in which I could expand my knowledge about genetics and human disease as well as cutting-edge approaches to the questions in the field. This course will not only allow me to interact with the current leaders in the field of human genetics but also the future leaders in the field: my peers. *By working closely with my peers and tutors, I expect to acquire a framework of experience that I will build upon in my career moving forward.*

Paul W. Hook

phook2@jhmi.edu | +1 (865) 719-5230 | pwh124.github.io
733 N. Broadway, MRB446, Baltimore, MD 21205, USA

EDUCATION

Johns Hopkins School of Medicine | Baltimore, MD, USA | 2014 - Present
Ph.D. Human Genetics (in progress)

The Pennsylvania State University | University Park, PA | 2008 - 2012
B.S. in Biochemistry and Molecular Biology (May 2012)

RESEARCH EXPERIENCE

Graduate Student | Advisor: Andrew McCallion | 2014 - Present
Johns Hopkins School of Medicine, Baltimore, MD

- Established strategies to isolate and characterize mouse dopaminergic neurons from a transgenic mouse model
- Designed, performed, and analyzed RNA-seq and single-cell RNA-seq experiments on mouse dopaminergic neurons
- Established a scoring paradigm for prioritizing candidate genes from Parkinson disease GWAS loci using single-cell RNA-seq data
- Analyzed publicly available ATAC-seq data in order to identify putative enhancers in central nervous system cell populations for subsequent functional testing
- Performed transgenic zebrafish assays in order to functionally validate putative enhancers found within deletions associated with autism

Research Technologist | PI: Andrew McCallion | 2012 - 2014
Johns Hopkins School of Medicine, Baltimore, MD

- Explored the functional consequences of disrupting genes in zebrafish including effects on somitogenesis and heart development
- Developed and implemented the use of Cas9 nuclease genome editing in zebrafish and human cell culture in the lab
- Managed the laboratory including being responsible for all ordering and working to maintain safety and compliance
- Trained lab members in relevant laboratory techniques and protocols

Science Undergraduate Laboratory Internship (SULI) | Advisor**:** Michael Huesemann | 2011
Department of Energy (DOE), Pacific Northwest National Laboratory, Sequim, WA

- Explored how temperature affected algal growth and algal lipid composition for the DOE's National Alliance for Advanced Biofuels and Bio-products team
- Built and established the use of an algal culture thermal gradient incubator

Chemical Research Intern | Advisor: Joseph T. Keiser | 2010 - 2011
The Pennsylvania University, University Park, PA

- Adapted and developed experiments focused on exploring the biochemical components of peanuts for an undergraduate laboratory class
- Assisted in designing and building demonstrations for undergraduate chemistry lectures

Paul W. Hook

phook2@jhmi.edu | +1 (865) 719-5230 | pwh124.github.io
733 N. Broadway, MRB446, Baltimore, MD 21205, USA

PUBLICATIONS

Hook, P. W., McClymont, S. A., Cannon, G. H., Law, W. D., Morton, A. J., Goff, L. A., & McCallion, A. S. (2018). Single-Cell RNA-Seq of Mouse Dopaminergic Neurons Informs Candidate Gene Selection for Sporadic Parkinson Disease. *The American Journal of Human Genetics*, *102*(3), 427–446.

Turner, T. N., Hormozdiari, F., Duyzend, M. H., McClymont, S. A., **Hook, P. W.**, Iossifov, I., … Eichler, E. E. (2016). Genome Sequencing of Autism-Affected Families Reveals Disruption of Putative Noncoding Regulatory DNA. *American Journal of Human Genetics*, *98*(1), 58–74.

Maragh, S., Miller, R. A., Bessling, S. L., Wang, G., **Hook, P. W.**, & McCallion, A. S. (2014). Rbm24a and Rbm24b are required for normal somitogenesis. *PLoS ONE*, *9*(8).

Van Wagenen, J., Miller, T.W., Hobbs, S., **Hook, P.**, Crowe, B., and Huesemann, M. (2012). Effects of light and temperature on fatty acid production in Nannochloropsis salina. *Energies 5*, 731–740.

PRESENTATIONS

Hook, P.W., McClymont, S.A., Goff, L.A., McCallion, A.S. (2016). RNA-seq analysis identifies phenotypic heterogeneity among *ex vivo* purified dopamine neurons and highlights their progressive temporal diversification; Abstract #319. Presented at the 66th Annual Meeting of *The American Society of Human Genetics*, October 22, 2016, Vancouver, BC, Canada. ***Platform talk***.

HONORS

Graduated with Distinction | The Pennsylvania State University | 2012
Dean's List | The Pennsylvania State University | 2008 – 2012
Kimberly Clark Bright Futures Scholarship | 2008 - 2012
Gail A. and Thomas G. Ernst Scholarship | 2009 - 2011

TEACHING

Teaching Assistant: Evolution of Ideas in Human Genetics (Graduate) | 2016
Presenter: Genome Geeks Are In | Smithsonian National Museum of Natural History | 2015
Peer Learning Assistant: Developmental Biology (Undergraduate) | 2011

LEADERSHIP

Student Representative: Human Genetics Pre-Doctoral Training Program | 2016 – Present

Andrew S. McCallion, Ph.D.
Associate Professor

McKusick-Nathans Institute of Genetic Medicine
733 N. Broadway / BRB Room 407
Baltimore, Maryland 21205-1832
410-955-7948 Office
410-502-7533 Lab
410-502-5677 Fax
andy@jhmi.edu

JOHNS HOPKINS
MEDICINE
SCHOOL OF MEDICINE

May 31, 2018

To Whom It May Concern:
It gives me great pleasure to state my enthusiastic recommendation of Paul Hook in his application to attend The Leena Peltonen School of Human Genomics. I have been on faculty at Hopkins for twelve years and have graduated twelve students (10 PhD and 2 MS). I also co-direct the Human Genetics Graduate Program at JHU. I presently mentor two PhD students and am fortunate to say that Paul is one of them. Consequently, I feel well equipped to comment on, and compare, Paul's potential to his peers. To that end I want you to know that he is the "real deal"! It was abundantly clear from our first meeting that Paul is an outstanding young person.

Paul first joined my lab (2012) as a technician upon completion of his degree at The Pennsylvania State University. Although for his undergraduate degree he majored in Biochemistry, Paul quickly also became a skillful and insightful molecular biologist/geneticist. Further, he has impressed me with his appetite for the literature – evident from his earliest time as a technician. Paul's plan was always to attend graduate school and so at the end of almost two years in my lab, having received many offers from many different schools, he joined the Human Genetics Program here at Hopkins. It is not necessary to say how pleased I was that he opted to return to my lab a few years later (late 2015), as a graduate student.

Paul displays all the qualities one wants in a PhD student – intellect, humility, a desire to learn, great experimental skill, attention to detail, an inquisitive and insightful mind, a willingness to immerse himself in the literature and an affable disposition. His written and oral communication skills are excellent. Intellectually he is easily among the top 5% of graduate students here at Johns Hopkins. I can say honestly that he is one of the most promising students I have encountered in my career so far; I expect his contributions to science and the broader community will be significant.

Paul excels in his experimental work. He has taken on challenging projects, acquired extensive computational skills and is making significant contributions to the community through his work. He has already published several papers from his work in my group. Most recently he published (Hook et al., 2018, *AJHG*) what I believe will be a seminal study, demonstrating the power of scRNA-seq to inform the prioritization of gene candidates for Parkinson disease (PD). Multiple additional papers will emerge in the incoming weeks/years from his work.

In summary, Paul is a fantastic candidate for this opportunity and, I anticipate, will establish a very strong, independent career. *Consequently, I believe that he is an ideal candidate for this opportunity*. He is an excellent young colleague and will benefit greatly from networking with peers and senior colleagues. Paul is an easy kind of student for whom to write this letter; I hope that my comments appropriately convey my enthusiasm. I ask that you give Paul's application your greatest consideration.

Sincerely yours,

Andrew S. McCallion Ph.D.