

## **Summary of Intellectual Merit**

The question of how and why we think about the things we do lies at the very core of what it is to be human. To understand ourselves, we must understand how a complex system of chemicals and electrical impulses gives rise to the diversity of human experience. The field of cognitive neuroscience has made tremendous progress towards understanding the neural basis of complex cognition and behavior, and I can not think of a more interesting question to spend my life trying to answer.

## **Educational and Professional Development Plans / Career Goals**

To prepare myself for a career as a scientist, I plan to complete a PhD in cognitive neuroscience. Through intensive coursework and research training, a graduate education will allow me to build upon my existing knowledge and ensure a thorough understanding of the key concepts and theoretical issues in psychology and neuroscience, as well as strengthen the experimental and analytical skills necessary to investigate the questions that interest me most.

I hope to eventually become a professor at a major research university, where I can continue to ask interesting questions, expand our understanding of the mind and brain, and mentor the next generation of young scientists. Such a position would also allow me to contribute to the important effort of increasing public understanding of science, both through teaching and participation in open science efforts that increase scientific productivity and lower the barrier to entry for interested members of the public.

## **Educational and Professional Experience**

My educational and professional experiences so far have positioned me well for success in graduate school and in an eventual career as an academic scientist. I completed my undergraduate education in Cognitive Neuroscience and Philosophy of Mind at the City University of New York, graduating Cum Laude, Dean's List, and with Liberal Arts Honors. Through the CUNY Baccalaureate for Unique and Interdisciplinary Studies, I worked with faculty mentors to design a rigorous, individualized course of study that provided me an education in the scientific investigation of mind and brain as well as in more theoretical issues relating to the nature of mental phenomena.

As an undergraduate, I spent two years working with Dr. Jennifer Mangels as a research assistant in the Baruch College Dynamic Learning Lab. Upon joining the lab, I initially assisted in running EEG subjects and processing ERP data for a study examining how the 'fit' between environmental task goals and individual achievement mindset influences attention to feedback and subsequent learning. Later, working with other members of the lab and collaborators around the country, I designed and built a web-based stimulus presentation and data collection system for an ongoing multi-institution study to measure and manipulate implicit theories of intelligence in high school students by teaching them about neuroplasticity. In my senior year, I independently designed and piloted a study to investigate whether mind wandering during an incubation period can facilitate insight experiences, and how individual differences might modulate this effect.

Upon graduating, I joined the Child Mind Institute, where I currently work with Dr. Michael Milham and Dr. Cameron Craddock as a research assistant in the Center for the Developing Brain. Here, I have primarily focused on the analysis of resting-state fMRI (R-fMRI) data, and how individual differences in cognition and behavior may be reflected in the functional architecture of the resting brain.

One of my main responsibilities in this position has been to support the development and use of the Configurable Pipeline for Analysis of Connectomes (CPAC), an open-source software pipeline for the automated preprocessing and analysis of R-fMRI data. For this software, I have authored a comprehensive user guide, which in addition to technical instructions, provides a theoretical background and practical introduction to R-fMRI analysis. As the main support contact and test user, I have worked closely with collaborators to analyze large (>100 subject) datasets, and helped guide the development of CPAC to better meet the needs of researchers. Highly customizable and easy to use, CPAC allows even novice users to carry out complex analyses of R-fMRI data. The features and benefits of CPAC are more fully described in a manuscript currently in preparation, and were recently presented as a poster at the annual meeting of the Cognitive Neuroscience Society.

While at CMI, I have also been responsible for assisting in the preparation and open sharing of data through the 1000 Functional Connectomes Project and International Neuroimaging Data-Sharing Initiative (INDI). Working with a network of collaborators around the globe, INDI has made publicly available phenotypic and neuroimaging data for over 4500 subjects, resulting in at least 50 published scientific papers and 2,500 citations.

Using data collected at CMI and shared through INDI, I worked with collaborators in Germany and the United Kingdom to investigate how underlying brain activity reflects individual differences in the content and quality of the self-generated thoughts people experience at rest. In an exploratory analysis using CPAC, we identified a number of brain areas whose connectivity profile varied with the content and quality of self-generated thought. Our findings, which are described in a manuscript currently in revision, will also be presented as a poster at the upcoming Society for Neuroscience annual meeting.

### **Summary of Broader Impacts**

As researchers build on existing knowledge to ask increasingly complex questions about the mind and brain, it is more important than ever to ensure our methods are rigorous and our tools are reliable. Access to the analysis tools and data used in published studies allow others to replicate and extend existing findings, provide a research ecosystem that demonstrably increases scientific productivity. Further, such initiatives also lower the barrier to entry into scientific research for interested individuals who may otherwise lack access to the necessary resources. I am proud of my contribution to the culture of open science through my work on CPAC and INDI, and intend to make the use and support of such initiatives a core component of my scientific career.