

# REBECCA SHAFEE

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## CURRENT POSITION

**Harvard Medical School and Broad Institute of MIT and Harvard** Cambridge, MA  
Postdoctoral Fellow in genetics 2013 – present

## EDUCATION

**Harvard University** Cambridge, MA  
PhD, Physics 2008  
Thesis: Measuring Black Hole Spin

**California Institute of Technology** Pasadena, CA  
BS, Physics (GPA 4.0) 2002

## CURRENT RESEARCH INTERESTS

Understanding the effects of psychiatric disease-associated genetic variants on the brain.  
Areas of Interest: Statistical genetics, cognition, brain MRI.

## GRANTS AND AWARDS

**Swartz Postdoctoral Fellowship in Computational Neuroscience** 2009 – 2012  
Harvard University Center for Brain Science

**“Measuring black hole spin,” grant NNH07ZDA001N-AFTP, \$200,000** 2008 – 2010  
Co-Investigator  
NASA

**Eric R. Keto Prize** 2009  
Best Ph.D. thesis in theoretical astrophysics  
Institute of Theory and Computation, Harvard-Smithsonian Center for Astrophysics

**Van Vleck Prize** (top applicants in entering PhD class) 2002  
Harvard University Physics Department

**Carnation Merit Award** 2000 – 2002  
Competition-based merit award for undergraduates  
California Institute of Technology

**Sigma Xi, National Research Honor Society** 2001  
Associate member, by faculty nomination at Caltech

**SURF Perpall Speaking competition, Caltech** 2000  
Semi-finalist

**Merit scholarship of the government of Bangladesh** 1993 – 1997  
Among top 50 out of 100,000+ examinees.

**Best speaker, Bangladesh Television School Debate Competition** 1994  
National debate competition organized for all school students of Bangladesh

**Second Prize, National Science Fair, Bangladesh** 1994  
Organized by the government of Bangladesh

## RESEARCH EXPERIENCE

**Harvard Medical School and the Broad Institute of MIT and Harvard** Cambridge, MA  
Postdoctoral Fellow 2013-present  
PI: Steven McCarroll, Elise Robinson

*Project: Understanding the effects of the common genetic risk of psychiatric disorders on cognition, behavior and brain anatomy.*

My goal is to understand how genetic variants associated with psychiatric disorders affect the human brain. Currently I am using multiple large-scale datasets including the UK Biobank (N = 500,000), which contains both phenotypic and genomic data, to better understand the full spectrum of phenotypic outcomes associated with common genetic risks of psychiatric disorders, specifically schizophrenia.

*Project: Association of the Structural variations of schizophrenia risk gene complement component 4 (C4) with behavioral and brain MRI phenotypes*

Structural variations of the complement component 4 (C4) genes have been recently linked to schizophrenia risk. Specifically, multiple C4 alleles that increase expression of the C4A gene associate with higher risk of schizophrenia. Whether this genetic risk manifests in detectable changes in brain anatomy and function at the mm-scale, as measured with magnetic resonance imaging (MRI), or with other behavioral and health-related phenotypes in healthy individuals, is an open question. By statistically imputing the structural alleles of C4 in multiple datasets, such as, UK Biobank, Brain Genomics Superstruct Project (GSP) and iPSYCH, I am looking for detectable effects of these variants on health-related, behavioral and MRI phenotypes.

**HHMI and Center for Brain Science, Harvard University**

Cambridge, MA  
2011-2012

Postdoctoral Research Associate

PI: Randy Buckner

Project: Gray matter myelination using T1 and T2-weighted MRI.

Description: We developed a new technique for calculating the partial-volume corrected myelin content of the human cortex *in vivo* using T1 and T2-weighted MRI images. We applied our technique on the Brain Genomics Superstruct Project (GSP) samples to construct partial volume corrected myelin maps of 1555 healthy controls and investigated the effect of age on cortical myelin.

**Swartz Program in Computational Neuroscience, Harvard University**

Cambridge, MA  
2009-2011

Swartz Postdoctoral Fellow in Computational and Theoretical Neuroscience

PI: Randy Buckner

Project: Anatomical and Functional connectivity of the human brain.

Description: Using structural and functional MRI we assessed the degree of overlap between the anatomical and functional networks of the brain.

**Harvard University and Harvard-Smithsonian Center for Astrophysics**

Cambridge, MA  
2005-2008

Graduate Researcher

Advisors: Ramesh Narayan and Jeffrey McClintock

Project: Measuring the spin of black holes.

- Numerical simulations and spectral modeling of the region near a spinning black hole.
- First author of publication reporting the first robust measurement of black hole spin.
- Co-Investigator of NASA grant NNH07ZDA001N-AFTP. \$200,000 for 2008 – 2010.
- Press releases:
  - [http://www.nasa.gov/vision/universe/starsgalaxies/spinning\\_blackhole.html](http://www.nasa.gov/vision/universe/starsgalaxies/spinning_blackhole.html)
  - <http://www.cfa.harvard.edu/news/2006/pr200630.html>

**California Institute of Technology**

Pasadena, CA  
2001

Undergraduate Researcher

Advisor: Stephen Quake

Project: Statistical analysis of microarray data to investigate gene expression correlations.

- Co-Investigator, US Patent No. 6,947,846:
  - “Non-metric tool for predicting gene relationships from expression data,” (2005).

Undergraduate Researcher (SURF)

2000

Advisor: S George Djorgovski

Project: Search for Type II QSOs using data from the Digital Palomar Observatory Sky Survey.

## TEACHING EXPERIENCE

### **Harvard University**

Teaching Fellow

Cambridge, MA  
2003 – 2008

- Seven semesters of experience
- Taught sections at both undergraduate and graduate level
- Lead discussion sections, designed assignments and exams
- Graduate courses: quantum mechanics, electricity and magnetism, biophysics  
Undergraduate courses: introductory physics, physics lab

### **California Institute of Technology**

Grader, Teaching Assistant

Pasadena, CA  
2000 – 2002

- Teaching assistant for freshman physics lab
- Grader for freshman physics course

## PUBLICATIONS

### In Peer-Reviewed Journals

**Shafee R**, Padmanabhan J, Nanda P, Tandon N, Kalapurakel S, Weiner DJ, Gershon ES, Hill SK, Pearlson GD, Sweeney JA, Bishop JR, Tamminga CA, Keshavan MS, McCarroll SA, Robinson EB (2018). “Polygenic risk for schizophrenia and measured domains of cognition in individuals with psychosis and controls”. *Trans Psych* 8(1):78.

Gershon ES, Pearlson G, Keshavan MS, Tamminga C, Clementz B, Buckley PF, Alliey-Rodriguez N, Liu C, Sweeney JA, Keedy S, Meda SA, Tandon N, **Shafee R**, Bishop JR, Ivleva EI (2017). “Genetic analysis of deep phenotyping projects in common disorders”. *Schizophr Res*. doi: 10.1016/j.schres.2017.09.031

Lencer R, Mills L, Alliey-Rodriguez N, **Shafee R**, Lee A, Reilly J, Sprenger A, McDowell J, McCarroll SA, Keshavan MS, Pearlson GD, Tamminga CA, Clementz BA, Gershon ES, Sweeney JA (2017). “Genome-wide association studies of smooth pursuit and antisaccade eye movements in psychotic disorders: findings from the B-SNIP study”. *Trans Psych* 7(10):e1249.

**Shafee R**, Buckner RL, Fischl B (2015). “Gray matter myelination of 1555 human brains using partial volume corrected MRI images.” *Neuroimage*, 105:473-85.

Mueller S, Wang D, Fox MD, Yeo BT, Sepulcre J, Sabuncu MR, **Shafee R**, Lu J, Liu H (2013). “Individual variability in functional connectivity architecture of the human brain.” *Neuron*, 77:586- 95.

Penna RF, McKinney JC, Narayan R, Tchekhovskoy A, **Shafee R**, McClintock JE (2010). “Simulations of magnetized discs around black holes: effects of black hole spin, disc thickness and magnetic field geometry.” *MNRAS*, 408:752-782.

**Shafee R**, McKinney JC, Narayan R (2008). “Three-Dimensional Simulations of Magnetized Thin Accretion Disks Around Black Holes: Stress in the Plunging Region.” *The Astrophysical Journal Letters*, 687:L25-L28.

**Shafee R**, Narayan R, McClintock JE (2008). “Viscous Torque and Dissipation in the Inner Regions of a Thin Accretion Disk: Implications for Measuring Black Hole Spin.” *The Astrophysical Journal*; 676:549-561.

McClintock JE, **Shafee R**, Narayan R, et al. (2006). “The Spin of the Near-Extreme Kerr Black Hole GRS 1915+105.” *The Astrophysical Journal*; 652:518-539.

**Shafee R**, McClintock JE, Narayan R, et al. (2006). “Estimating the Spin of Stellar-Mass Black Holes by Spectral Fitting of the X-Ray Continuum.” *The Astrophysical Journal Letters*; 236:L113- L116.

**In Preparation**

**Shafee R\***, Carey C\*, Walters R, Churchhouse C, Palmer D, McCarroll SA, Neale BM, Robinson EB. “Genetic associations between psychiatric disorder risk and phenotypic factors in UK Biobank”.

\*co-first authors.

**Shafee R**, Handsaker RE, Kamitaki N, Churchhouse C, Neale BM, McCarroll, SA, Robinson EB. “Structural variations of schizophrenia risk gene complement component 4 (*C4*) and brain MRI phenotypes”.

**PRESENTATIONS (genetics and neuroscience only)**

Shafee R, Handsaker RE, Kamitaki N, Churchhouse C, Neale BM, McCarroll, SA, Robinson EB. “Structural variations of schizophrenia risk gene complement component 4 (*C4*) and brain MRI phenotypes”. World Congress for Psychiatric Genetics (WCPG), 2018, Glasgow.

Shafee R, Buckner RL, Fischl B. “Gray Matter myelination of 1555 human brains”. Symposium presentation, Society of Biological Psychiatry (SOBP), 2016, Atlanta.

Shafee R, Holmes AJ, Genovese, G, Lee PH, Germine L, Roffman JL, Smoller JW, Buckner RL, McCarroll SA. “Common SNP heritability of brain structures and intracranial volume using MRI.” Nanosymposium presentation, Society for Neuroscience annual meeting (SFN), 2014, Washington DC.

Shafee R, Genovese G, Holmes AJ, Lee PH, Germine L, Roffman JL, Smoller JW, Buckner RL, McCarroll SA. “Significant role of height-associated variants in the variation of intracranial volume.” American Society for Human Genetics annual meeting (ASHG), 2014, San Diego.

Shafee R, Buckner RL, Fischl B. “Estimated cortical gray matter myelination of 1500 human brains using partial volume corrected T1- and T2-weighted MRI images.” Society for Neuroscience annual meeting (SFN), 2012, New Orleans.

Greve DN, Sabuncu MR, Shafee R, Schmansky N, Buckner RL, Fischl B. “Automated surface- based inter-hemispheric registration with FreeSurfer.” Human Brain Mapping (HBM), 2011.

Shafee R, Liu H, Sabuncu, M, Yeo BT, Sepulcre J, Buckner RL. “Relationship between human functional networks and covariance in cortical thickness.” Computational and Systems Neuroscience (COSYNE), 2011, Salt Lake City.

Shafee R, Liu H, Sabuncu MR, Yeo BT, Sepulcre J, Buckner RL. “Anatomical and Functional Asymmetry in the Cerebral Cortex.” Society for Neuroscience annual meeting (SFN), 2010, San Diego.

Shafee R, Meister M. “A model for retinal pattern adaptation”. Sloan-Swartz Centers annual meeting, 2009, Harvard University.

References available upon request.