

Education

- Currently* **Washington University in St. Louis**
Post-doctoral fellow with Todd Braver, Ph.D and Deanna Barch, Ph.D.
- 2009 **University of Pittsburgh and Carnegie Mellon University**
Ph.D. in Neuroscience and affiliated with the Center for the Neural Basis of Cognition
Dissertation: *The Biological Basis of Rapid Instructed Task Learning*
Advisor: Walter Schneider
Committee: Julie Fiez, Anthony Wagner, Mark Wheeler, Marc Sommer, Raymond Cho
- 2003 **University of California, Berkeley**
B.A. in Cognitive Science (Highest Honors)

Research and Work Experience

- 2009 – Post-doctoral research with Todd Braver and Deanna Barch (Washington University in St. Louis)
Present *Investigations of prefrontal cortex, cognitive control, learning, and intelligence*
Methods: fMRI, MVPA, functional connectivity, individual differences
- 2004 – Ph.D. research with Walter Schneider, Ph.D. (University of Pittsburgh)
2009 *Investigations of prefrontal cortex, cognitive control, and learning/memory*
Methods: fMRI, MEG, EEG, functional connectivity, Granger causality
- 2001 – Undergraduate and post-baccalaureate research with Mark D'Esposito, M.D. (UC Berkeley)
2004 *Investigations of prefrontal cortex and cognitive control*
Methods: fMRI, GLM analysis, event-related time series analysis
- 2003 Undergraduate research with William DeBello, Ph.D. (UC Davis)
Investigations of the genetic basis of learning and memory
Methods: PCR, analysis of gene expression, gene sequence identification
- 2001 – Software engineering, networking, and web development for Apple Computer
2003

Honors and Fellowships

- 2010 NeuroImage Editor's Choice Award, Methods and Modeling Section
For Cole et al. 2010, "Identifying the brain's most globally connected regions"
Awarded by the editors in acknowledgement of a study's importance and high impact
- 2005 – National Science Foundation Graduate Research Fellowship
2008 *Awarded to graduate students whose plans for research have "intellectual merit and beneficial implications for society"*
- 2007 National Science Foundation Integrative Graduate Education and Research Traineeship (IGERT) Fellowship
Awarded to science graduate students "who will pursue careers in research and education, with the interdisciplinary backgrounds, deep knowledge in chosen disciplines, and technical, professional, and personal skills to become leaders and creative agents for change."
- 2003 Highest Honors in Cognitive Science at UC Berkeley
Awarded highest honors based on significant contribution to a research project and high quality honors thesis as judged by professors Mark D'Esposito, M.D. and Robert Knight, M.D.

Professional Memberships

- 2004 – Present Society for Neuroscience
Cognitive Neuroscience Society
- 2010 - Present Psychonomic Society
- 2009 – Present Neuroethics Society
- 2006 – Present Organization for Human Brain Mapping
- 2004 – 2009 Center for the Neural Basis of Cognition, Carnegie Mellon & University of Pittsburgh
Center for Neuroscience, University of Pittsburgh
Learning Research and Development Center
- 2006 – 2007 President of the Department of Neuroscience Graduate Student Organization, University of Pittsburgh
- 2002 – 2003 President of the Cognitive Science Student Association, UC Berkeley

Publications

Cole M.W., Etzel J.A., Zacks J.M., Schneider W., Braver T.S. (in press). "Rapid transfer of abstract rules to novel contexts in human lateral prefrontal cortex". *Frontiers in Human Neuroscience*.

Cole M.W., Anticevic A., Repovs G., Barch D. (2011). "Variable global dysconnectivity and individual differences in schizophrenia". *Biological Psychiatry*. 70(1):43-50.
doi:10.1016/j.biopsych.2011.02.010

Cole M.W., Bagic A., Kass R., Schneider W. (2010). "Prefrontal Dynamics Underlying Rapid Instructed Task Learning Reverse With Practice". *Journal of Neuroscience* 30(42): 14245–14254.
doi:10.1523/JNEUROSCI.1662-10.2010

Cole M.W., Yeung N., Freiwald W., Botvinick M. (2010). "Conflict Over Cingulate Cortex: Between-Species Differences in Cingulate May Support Enhanced Cognitive Flexibility in Humans". *Brain, Behavior, and Evolution* 75(4): 239-240. doi:10.1159/000313860

Braver T.S., **Cole M.W.**, Yarkoni T. (2010). "Vive les differences! Individual variation in neural mechanisms of executive control", *Current Opinion in Neurobiology* 20(2): 242-250.
doi: 10.1016/j.conb.2010.03.002

Cole M.W., Pathak S., Schneider W. (2010). "Identifying the brain's most globally connected regions", *NeuroImage* 49(4): 3132-3148. doi: 10.1016/j.neuroimage.2009.11.001

Cole M.W., Yeung N., Freiwald W., Botvinick M. (2009). "Cingulate Cortex: Diverging data from humans and monkeys". *Trends in Neurosciences*. 32(11): 566-574. doi: 10.1016/j.tins.2009.07.001

Schneider, W., Pathak, S., Phillips J., and **Cole, M.** (2009). "High Definition Fiber Tracking Exposes Circuit Diagram for Brain Showing Triarchic Representation, Domain General Control, and Metacognitive Subsystems". In Samsonovich, A. V., Noelle, D., and Mueller, S. (Eds.). *Biologically Inspired Cognitive Architectures II: Papers from the AAAI Fall Symposium*. AAAI Technical Report FS-09-01, Menlo Park, CA: AAAI Press.

Schneider, W., **Cole, M.**, and Pathak, S. (2008). "Reverse engineering the brain with a circuit diagram based on a segmented connectome and system dynamics". In Samsonovich, A. V., Khosla, D., Itti, L., Shanahan, M., Chella, A., Granger, R. H., Mueller, S., Goertzel, B., and Noelle, D. (Eds.). *Biologically Inspired Cognitive Architectures: Papers from the AAAI Fall Symposium*. AAAI Technical Report FS-08-04, Menlo Park, CA: AAAI Press.

Cole, M.W., Schneider, W. (2007). "The Cognitive Control Network: Integrated cortical regions with dissociable functions", *NeuroImage*. 37(1): 343-360. doi: 10.1016/j.neuroimage.2007.03.071

Schumacher E.H., **Cole M.W.**, D'Esposito M. (2007). "Selection and Maintenance of Stimulus-Response Rules during Preparation and Performance of a Spatial Choice-Reaction Task", *Brain Research* 1136(1):77-87.

Hester, R., D'Esposito M., **Cole M.W.**, Garavan, H. (2007) "Neural mechanisms for response selection: comparing selection of an item with a response from working memory", *NeuroImage* 34(1):446-54.

Curtis C.E., **Cole M.W.**, Rao V., Ollinger J., D'Esposito M. (2005). "Canceling Planned Action: An fMRI Study of Countermanding", *Cerebral Cortex* 15(9): 1281-9.

Manuscripts Submitted or in Preparation

Cole M.W., Yarkoni T., Repovs G., Anticevic A., and Braver T.S (submitted). "Global connectivity of prefrontal cortex predicts cognitive control and intelligence"

Anticevic, A., Brumbaugh, M.S., Lombardo, L.E., Barrett, J., Gruber, J., Corlett, P.R., Repovs, G., **Cole, M.W.**, Winkler, A.M., Krystal, J.H., Glahn, D.C. (submitted). Prefrontal Dysconnectivity in Bipolar I Disorder.

Cole M.W., Stocco, A., Braver T. (invited review). "Rapid instructed task learning and the neural basis of flexible cognitive control". *Cognitive, Affective, & Behavioral Neuroscience*.

Repovs, G., Anticevic, A., **Cole, M.W.**, & Barch, D.M. (in preparation). "Simulated comparisons of slow and rapid event-related task-based functional connectivity."

Cole M.W., Savine A., Braver T. (in preparation) "Experimenter as a motivational factor enhancing cognitive control"

Cole M.W., Braver T. (in preparation) "Task Set Formation: Switching to a Completely Novel Task Enhances Task Switching Costs"

Cole M.W., Kass R., Bagic A., Wheeler M., Bostan A., Schneider W. (in preparation) "Validating Time-Variant Granger Causality in an Associative Memory Task using Combined MEG and fMRI"

Poster Presentations

Repovs, G., Anticevic, A., **Cole, M.W.**, & Barch, D.M. (May, 2011). Simulated comparisons of slow and rapid event-related task-based functional connectivity. Poster presented at Society for Biological Psychiatry; San Francisco, CA.

Cole M.W., Yarkoni T., Repovs G., Braver T.S. (April, 2011). Flexible hubs: Global brain connectivity correlates of human intelligence. Poster presented at Cognitive Neuroscience Society, San Francisco, CA.

Cole M.W., Zacks J., Etzel J.A., and Braver T. (November, 2010). Independent and distributed coding of task-set decision rules within prefrontal cortex. Poster presented at Society for Neuroscience, San Diego, CA.

Cole M.W., Anticevic A., Repovs G., Barch D. (August, 2010). Locus of dysconnectivity: Dorsolateral prefrontal connectivity correlates with the cardinal symptoms of schizophrenia. Poster presented at the Gordan Research Conference: Neurobiology of Cognition, Waterville Valley, NH.

Cole M.W., Bagic A., Kass R., Schneider W. (October, 2009). Rapid Task Learning as a Window into the Neural Basis of Executive Control. Poster presented at Society for Neuroscience, Chicago, IL.

Cole M.W., Schneider W. (June, 2009). From Symbols to Rules to Complex Behaviors: The Neural Basis of Rapid Instructed Task Learning. Poster presented at Human Brain Mapping, San Francisco, CA.

Cole M.W., Pathak S., Schneider W. (June, 2009). Identifying the Brain's Most Globally Interactive Regions. Poster presented at Human Brain Mapping, San Francisco, CA

Cole M.W., Kunkel A., Martins B., Schneider W. (November, 2008). The Neural Basis of Rapid Instructed Task Learning. Poster presented at Society for Neuroscience, Washington, DC.

Pathak S.*, **Cole M.W.***, Schneider W. (November, 2008). Identifying the Brain's Most Globally Interactive Regions. Poster presented at Society for Neuroscience, Washington, DC. **First two authors contributed equally*

Cole M.W., Laurent P. (November, 2008). Neurevolution: An Example Of Blogging To Enhance Scientific Communication. Poster presented at Society for Neuroscience, Washington, DC.

Cole M.W., Martins B., Schneider W. (April, 2008). The Neural Basis of Rapid Instructed Task Learning. Poster presented at Cognitive Neuroscience Society, San Francisco, CA.

Pathak S., Martins B., **Cole M.W.**, Schneider W. (April, 2008). Anatomical and Functional Segmentation of the Cognitive Control Network: Supporting a preliminary cognitive control network connectome. Poster presented at Cognitive Neuroscience Society, San Francisco, CA.

Cole M.W., Pathak S., Schneider W. (April, 2008). Medial Frontal Cortex Directs Attention along Multiple Pathways to Resolve Perceptual Decision Difficulty. Poster presented at Cognitive Neuroscience Society, San Francisco, CA.

Cole M.W., Schneider W. (June, 2007). Perceptual Decision Making Is Mediated by the Cognitive Control Network via ACC/pre-SMA to DLPFC Connectivity. Poster presented at Human Brain Mapping, Chicago, IL.

Cole M.W., Schneider W. (May, 2007). Causal Connectivity Within a Cognitive Control Network During Perceptual Decision Making. Poster presented at Cognitive Neuroscience Society, New York, NY.

Cole M.W., Schneider W. (June, 2006). Dissociation of anterior cingulate, dorsolateral prefrontal, and premotor cortex during a visual search task reveals specialized roles within a commonly activated fronto-parietal network. Poster presented at Human Brain Mapping, Florence, Italy.

Schneider W., Siegle G., McHugo M., Gemmer L., Jones D., Fissell K., Koerbel L., Suzuki I., Jung K., Goldberg R., Wheeler M., **Cole M.W.**, Hill N. (June, 2006). 2006 Pittsburgh Brain Activity Interpretation Competition: Inferring Experience Based Cognition from fMRI Data. Poster presented at Human Brain Mapping, Florence, Italy.

Cole M.W., Schneider W. (April, 2006). Dissociation of anterior cingulate, dorsolateral prefrontal, and fronto-polar cortex during a visual search task reveals specialized roles within a commonly activated fronto-parietal network. Poster presented at Cognitive Neuroscience Society, San Francisco, CA.

Schumacher E.H., **Cole M.W.**, Singer A., D'Esposito M. (October, 2004). Distinguishing Response Selection Sub-processes with Functional Magnetic Resonance Imaging. Poster presented at Society for Neuroscience, San Diego, CA

Schumacher E.H., **Cole M.W.**, Singer A., D'Esposito M. (April, 2004). Distinguishing Response Selection Sub-processes with Functional Magnetic Resonance Imaging. Poster presented at Cognitive Neuroscience Society, San Francisco, CA

Curtis C.E., **Cole M.W.**, Rao V., Ollinger J., D'Esposito M. (April, 2004). Canceling planned action: An fMRI study of countermanding saccades. Poster presented at Cognitive Neuroscience Society, San Francisco, CA

Curtis C.E., **Cole M.W.**, Rao V., Ollinger J., D'Esposito M. (October, 2003). Canceling planned action: An fMRI study of countermanding saccades. Poster presented at Society for Neuroscience, New Orleans, LA

Invited Talks and Symposia

Cole M.W., Yarkoni T., Repovs G., and Braver T.S. (November 2011). Flexible hubs: Global brain connectivity correlates of human intelligence. Talk to be presented at Society for Neuroscience, Washington, D.C.

Cole M.W., Braver T. (November, 2010). Task Set Formation: Switching to a Completely Novel Task Enhances Task Switching Costs. Talk presented at Psychonomics, St. Louis, MO.

Cole M.W. (March 3, 2010). Multiple Network Mechanisms Underlying Flexibility in Prefrontal Cortex. Talk presented at the Brain, Behavior, and Cognition seminar series, St. Louis, MO.

Cole M.W. (January 4, 2010). Network Mechanisms Underlying Flexibility in Prefrontal Cortex. Invited talk presented as part of the Center for Mind and Brain seminar series, Davis, CA.

Cole M.W. (May 13, 2008). Source Localization with MEG: An MNE Software Overview. Talk presented for the University of Pittsburgh MEG center, Pittsburgh, PA.

Cole M.W. (January 22, 2008). Connectomics of the Human Cognitive Control Network. Invited talk presented for Beatriz Luna's lab, Pittsburgh, PA.

Cole M.W. (October 28, 2006). Using Functional MRI to Inform Neural Models of Decision Making. Talk presented at the annual CNBC retreat, Pittsburgh, PA.

Cole M.W. (October 2, 2006). Specialization and integration within a cortical cognitive control network. Talk presented at the CNBC 'Brain Bag', Pittsburgh, PA.

Cole M.W. (March 27, 2006). Innate functional connectivity from resting state linear correlations. Invited talk presented at the Clinical Cognitive Neuroscience Lab's Methods Monday forum, Pittsburgh, PA.

Cole M.W., Schneider W. (November 2005). Less Working Memory, More Control: Greater BOLD Response to Overcoming Prepotency in Prefrontal and Parietal Cortices. Talk presented at Society for Neuroscience, Washington, D.C.

Cole M.W. (November 2, 2005). Dissociations in Cognitive Control: The Specialized Roles of Lateral and Medial Prefrontal Cortex. Talk presented at the Cognitive Psychology 'Brown Bag', Pittsburgh, PA.

Cole M.W. (October 1, 2005). Results and statistics in fMRI. Talk presented at the 2005 CNBC fMRI Workshop, Pittsburgh, PA.

Co-authored Presentations by Others

Schneider W., Hill N., **Cole M.W.** (November 2005). Native and Supported Mode Processing in Attentional Control Network. Talk presented at Psychonomics, Toronto, Canada.

Schneider W., Hill N., Chein J., McHugo M., **Cole M.W.** (November, 2004). Subsystems Supporting attention, decision making, learning, and skilled performance. Talk presented at Psychonomics, Minneapolis, MN.

Reviewer for Journals

Journal of Neuroscience, Brain, NeuroImage, Cerebral Cortex, Human Brain Mapping, Current Directions in Psychological Science, Brain Research, Quarterly Journal of Experimental Psychology

Grants Written / Contributed To

- Network Mechanisms of Flexible Cognitive Control. *NIH K99/R00*. PI: Michael W. Cole (under review).

- Motivational State As A Mechanism Of Cognitive Self-Regulation. *NIH R21*. PI: Todd Braver (2011)
- Beyond Localization of Memory Functions: Learning Statistical Methods for Estimating Directed Connectivity among Cortical Regions Using Multiple Neuroimaging Technologies. *NSF IGERT grant*. PI: Michael W. Cole (2007)
- *NSF Graduate Research Fellowship*. PI: Michael W. Cole (2004 & 2005)
- Brain System Mapping for Pre-Surgical Planning and Brain Assessment. *NIH SBIR*. PI: Anthony P. Zuccolotto (2008)
- Biologically Accelerated Learning Technology (BALT). *DARPA grant*. PI: Walter Schneider (2007)

Mentoring and Teaching Experience

Currently preparing to be co-instructor with Professor Todd Braver for Functional Neuroimaging Methods – a semester-long graduate-level course (Spring 2012).

Mentoring two graduate students and two research assistants, contributing to Cole, et al. (2011), Cole, Savine, et al. (in preparation), Cole & Braver (in preparation), and Cole, et al. (in press).

Mentored two undergraduate research assistants during graduate school, contributing to Cole, Bagic, et al. (2010) and Cole, Kass, et al. (in preparation).

Guest lecturer (2010-2011) for *Cognitive Neuroscience* (Instructor: Todd Braver), Washington University in St. Louis

Teaching assistant (Fall, 2006) for *Introduction to Neuroscience* (Instructor: David Wood), University of Pittsburgh

Guest lecturer (Spring, 2006) for *Laboratory on fMRI Data Acquisition and Analysis* (Instructor: Walter Schneider), University of Pittsburgh

Lectures:

Jitter, Deconvolution, and Mixed Designs (March 13, 2006)

Brain Connectivity Using fMRI (March 29, 2006)

Teaching assistant (Spring, 2003) for *The Neural Basis of Language and Thought* (Instructors: Jerome Feldman and George Lakoff), UC Berkeley

References

Todd Braver, Ph.D.

Professor of Psychology, Radiology, and Neuroscience

tbraver@artsci.wustl.edu

314-497-7910

Washington University, Department of Psychology,

Campus Box 1125, St. Louis, Missouri 63130

Walter Schneider, Ph.D.

Professor of Psychology

wws@pitt.edu

412-901-4176

629 Learning Research and Development Center

3939 O'Hara St, Pittsburgh, PA 15260

Julie Fiez, Ph.D.
Professor of Psychology and Neuroscience
fiez@pitt.edu
412-624-7078
605 Learning Research and Development Center
3939 O'Hara St, Pittsburgh, PA 15260

Deanna Barch, Ph.D.
Professor of Psychology and Director of the Conte Center for the Neuroscience of Mental Disorders
dbarch@artsci.wustl.edu
314-601-2716
Washington University, Department of Psychology,
Campus Box 1125, St. Louis, Missouri 63130