KEVIN NIALL DUNBAR
CURRICULUM VITAE (SHORTENED)

Personal Information

Professor: Department of Human Development and Quantitative Methodology College of Education, University of Maryland, College Park
Director: The Laboratory for Scientific Thinking, Reasoning, and Education: Genes, Brains, Minds, and Creativity
Member: Neuroscience and Cognitive Science Program (NACS), University of Maryland
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Employment History

2011-present Full Professor: Department of Human Development and Quantitative Methodology University of Maryland, College Park
2011-present Director: Laboratory for Scientific Reasoning, Thinking & Education: Genes, Brains, & Creativity. University of Maryland, College Park
2011-present Full Professor (status only), Department of Psychology, University of Toronto, Canada
Director: Laboratory for Complex Thinking and Scientific Reasoning: Genes, Brains, Cognition
2007-2011 Full Professor, Department of Psychology, University of Toronto Scarborough, Toronto
Director: Laboratory for Complex Thinking and Scientific Reasoning: Genes, Brains, Cognition
2001-07 *Full Professor*, Department of Education, Dartmouth College, New Hampshire, USA
Full Professor, Department of Psychological & Brain Sciences, Dartmouth College, New Hampshire
Director, The Laboratory for Complex Cognition and Scientific Reasoning. Department of Psychological & Brain Sciences and Department of Education
2001-02 Full Professor, Dept of Psychology, McGill University, Montreal, Quebec, Canada
Director, Laboratory for Complex Thinking and Scientific Reasoning, Department of Psychology, McGill University
1998-99 Visiting Professor, Depts of Immunology and Cognitive Science, Ospedale San Raffaele, Milan,
1994-01 Associate Professor, Dept. of Psychology McGill University, Montreal, Canada
1988-94 Assistant Professor, Dept of Psychology McGill University, Montreal, Canada
1991-92 Visiting Scholar, Stanford University Department of Psychology and Department of Biochemistry and Immunology
1985-88 Postdoctoral Fellow, Department of Psychology, Carnegie-Mellon University, Pittsburgh, USA
1980-85 Ph.D., Department of Psychology, University of Toronto, Toronto, Canada
1979-80 Assistant Research Officer, Irish Industrial Training Authority, ANCO (FAS), Dublin, Ireland
1977-79 M.A., Department of Logic and Psychology, University College Dublin, Ireland
1974-77 B.A., (Honours), Department of Logic and Psychology, University College Dublin, Ireland

Recent Contracts and Grants 2004-2013

2009-14 NSERC (Canada) Operating Grant. "An investigation of brain and cognitive mechanisms involved in analogy, creativity, and categorization".

2007-10 Connaught Fund University of Toronto. "Investigations of mechanisms underlying complex cognition."

2006-09 National Science Foundation Informal Education Program. The Trail of Time: Informal Science Education at Grand Canyon: Karl Karlstrom PI (University of New Mexico). Dunbar consultant.

2005-07 National Science Foundation Science of Learning Center Grant (SLC). "Center for Cognitive and Educational Neuroscience." Michael Gazzaniga, Head PI; Kevin Dunbar, Laura-Ann Petitto, Todd Heatherton, and Scott Grafton Co-PIs. $22,000,000. Awarded April 1 2005-December 31 2006. Petitto and Dunbar: Major authors of the Center grant vision, mission, etc.

2004-09 National Science Foundation grant, "The Traveling Exhibitions At Museums of Science (TEAMS)" David Goudy PI; Dunbar head of research component. $2,300,000

Fellowships, Prizes, Awards and Honors 2004-2013

2012 Inducted into Sigma Chi honor society Georgetown University, Washington DC. September 20 2012

2010 WIRED international magazine (both web and print versions). Featured article on Dunbar's discoveries: " The Neuroscience of Screwing Up." January issue, 2010

2010 Invited National Academies of Science Committee on Science, Engineering and Public Policy (COSEPUP), Irvine, California, Feb 18, 2010. (Declined due to conflict with Dunbar's AAAS speech)

2007 Address to BOSE board of the National Academy of Sciences. Educational Neuroscience and Science Education, Los Angeles, Dec 3rd

2007 Member National Science Foundation workshop on Science of Learning, December 2007

2005 Phi Beta Kappa Society. Inducted as Honorary member for outstanding teaching and scientific scholarship. Conferred at Dartmouth College convocation exercises, June 2005

Recently Published journal Articles & Book Chapters 2005-2013

Dunbar, K.N. and Forster, E.A. Scientific Thinking. (2013). *Encyclopedia of the Mind*. Thousand Oaks, CA: Sage

Dunbar, K. N. & Klahr, D. (2012). Scientific Thinking & Reasoning. K.J. Holyoak, R. Morrison (Eds.) Oxford Handbook of Thinking & Reasoning.

Green, A.E., & Dunbar, K.N. (2012). Mental Function as Genetic Expression: Emerging Insights from Cognitive Neurogenetics. In K.J. Holyoak, R. Morrison (Eds.) Oxford Handbook of Thinking & Reasoning.

Dunbar K. N. (2012). Educational Neuroscience: Applying the Klahrian Method to Science Education. In S. Carver & J. Shrager (Eds.), The journey from child to scientist: Integrating cognitive development and the education sciences. Washington, D.C.: American Psychological Association.

Bassok, M., Dunbar, K. N., & Holyoak, K. J. (2012). Neural substrate of analogical reasoning and metaphor comprehension: Introduction to the special section. *Journal of Experimental Psychology: Learning, Memory, and Cognition.*

Green, A., Kraemer, D.J.M., Fugelsang, J., Gray, J.R., & Dunbar, K.N (2012) Mapping Across Semantic Distance in Creative Analogical Solution Generation. . *Journal of Experimental Psychology: Learning, Memory, and Cognition.*

Fischer, K.W., Goswami, U., Geake, J. & Task Force on the Future of Educational Neuroscience. Members of the Task Force: Daniel Bullock, James Byrnes, Kevin Dunbar, Guineviere Eden, Julie Fiez, Kurt Fischer (co-chair), Daniel J. Franklin, John Geake (co-chair), Usha Goswami (co-chair), Sharon Griffin, Patricia Kuhl, Bruce McCandliss, Vinod Menon, Ennio Mingolla, Nora Newcombe, Tomas Paus, Kevin Pelphrey, Russ Poldrack, L. Todd Rose, Reed Stevens, Rosemary Tannock, Jennifer Thomson, and Lee A. Thompson (2010) The future of educational neuroscience *Mind Brain and Education*. 4, 68-80.

Forster, E.A. and Dunbar, K.N. (2009). Creativity Evaluation through Latent Semantic Analysis. In N.A. Taatgen & H. van Rijn (Eds.), *Proceedings of the 31th Annual Conference of the Cognitive Science Society* (pp. 602–607). Austin, TX: Cognitive Science Society .

Green, A., Kraemer, D.J.M., Fugelsang, J., Gray, J.R., & Dunbar, K.N. (2009). Connecting Long Distance: Semantic Distance in Analogical Reasoning Modulates Frontopolar Cortex Activity. *Cerebral Cortex*

Roser, M., Fugelsang, J., Handy, T., Dunbar, K., & Gazzaniga, M. (2009). Representation of physical plausibility revealed by event-related potentials. *Cognitive Neuroscience and Nseuropsychology*, 20(12), 1081-1086.

Dunbar, K. N. (2009). The Biology of Physics: What the brain reveals about our understanding of the physical world. *Physics Education Research Conference,* 1179, 15-18.

Fugelsang, J. and Dunbar, K. (2009) "Brain-Based Mechanisms Underlying Causal Reasoning" In E. Kraft (Eds.) *Neural Correlates of Thinking*. (pp. 269-279). Germany :Springer Berlin Heidelberg.

Atkins, L. Velez, L, Goudy, D, & Dunbar, K. N. (2009) The unintended effects of interactive objects and labels in the science museum. *Science Education* 93, 161-184

Green, A., Fugelsang, J.A. Kraemer, D.J.M., & Dunbar, K.N. (2008). The microcategory account of analogy. *Cognition*, 106, 1004-116.

Dunbar, K. (2008) Learning, Arts, and the Brain. The Dana consortium report on Arts and Cognition. Dunbar section Arts, Education, The Brain and language pp 81-92

Dunbar, K., Fugelsang, J., & Stein, C. (2007). Do naïve theories ever go away? In M. Lovett, & P. Shah (Eds.), *Thinking with Data: 33rd Carnegie Symposium on Cognition*. Mahwah, NJ: Erlbaum.

Green, A., Fugelsang, J., Shamosh, N., Kraemer, D., & Dunbar, K.N. (2006). Frontopolar Cortex Mediates Abstract Integration in Analogy. Brain Research, 1096, 125-137.

Green, A., Fugelsang, J., Dunbar, K.N. (2006). Automatic activation of categorical and abstract analogical relations in analogical reasoning. *Memory and Cognition,34, 1414-1421.*

Dunbar, K., & Fugelsang, J. (2006). Problem solving and reasoning. In E. E. Smith & S. M. Kosslyn (Eds.), *Cognitive Psychology: Mind and Brain*. New York: Prentice Hall.

Fugelsang, J., Thompson, V., & Dunbar, K. (2006) Examining the representation of causal knowledge. *Journal of Thinking and Reasoning*, 12, 1-30.

Roser, M., Fugelsang, J., Dunbar, K., Corballis, P., & Gazzaniga, M. (2005). Dissociating causal perception and inference in the brain. *Neuropsychology*. 19, 591-602.

Fugelsang, J., Roser, M., Corballis, P., & Gazzaniga & Dunbar, K., (2005). Brain Mechanisms Underlying Perceptual Causality. *Cognitive Brain Research, 24, 41-47*

Fugelsang, J., & Dunbar, K. (2005). Brain-based mechanisms underlying complex causal thinking. *Neuropsychologia*. 43, 1204-1213

Dunbar, K., & Fugelsang, J. (2005). Causal thinking in science: How scientists and students interpret the unexpected. In M. E. Gorman, R. D. Tweney, D. Gooding & A. Kincannon (Eds.), *Scientific and Technical Thinking* (pp. 57-79). Mahwah, NJ: Lawrence Erlbaum Associates. Pp. 57-80.

Recent Invited Talks, Colloquia, and Keynotes

Dunbar, K. N. (2013). The interaction of Neural, Behavioral, and Genetic mechanisms underlying Creativity and Discovery. Invited talk American Psychological Society 25th annual Convention, Washington DC.

Dunbar, K. N. (2013). Increasing creativity through framing problems. MIT Innovation Laboratory. Sloan School of Management MIT, Cambridge MA. March 27.

Dunbar, K.N. (2013). What Scientists, Students and Neuroscience reveals about the Acquisition, Testing, and Understanding of Scientific Concepts. Kendon-Smith Lecture, University of North Carolina, Greensboro, NC. April 4.

Dunbar, K. N. (2012). Science, Education, and the Analogical Brain. Invited series of talks University of Linkoping, Sweden, November

Dunbar, K.N. (2012). The Engines of Science: Mistakes, Errors, & the Unexpected. Bochum Germany. July 4

Dunbar, K. N. (2012 Invited Keynote, March). Fifth Annual Convening of the National Science Foundation's Office of Emerging Frontiers in Research and Innovation. Washington, DC. March 24-25, 2012.

Dunbar, K.N. (2011 Invited address). Women scientists thinking and reasoning in the laboratory: Making discoveries through following up the unexpected. European Union summit on gender and Science. Brussels November 8th 2011.

Dunbar, K. N. (2010) From DNA to Complex Cognition: How we learn, Discover, and Create the world. Waterloo Institute for Complexity and Innovation (WICI). University of Waterloo, November 4, 2010.

Dunbar, K. N. (Invited, 2010). Turning failure into success. PopTech 2010 Conference. Camden, Maine, October 21, 2010.

Dunbar, K. N. (2010 KEYNOTE ADDRESS). Recontextualizing Science through the Trail of Time: An exhibition consistent with the findings from contemporary Educational Neuroscience Research. The Grand Opening of the Trail of Time Geoscience Education Exhibition. Grand Canyon National Park, October 14, 2010.

Dunbar, K. N. (2010). Psychology of Science: Implicit and Explicit Reasoning. Purdue University, June 4, 2010.

Dunbar, K. N. (March, 2010, Keynote Address). Toolbox of Discovery: Inside the mind, brain and culture of science. International Program in Molecular Medicine, Venice, March 10-13, 2010.

Petitto, L.A. and Dunbar, K.N. (2004). "New findings from Educational Neuroscience on Bilingual Brains, Scientific Brains, and the Educated Mind." Building Usable Knowledge in Mind, Brain, & Education Conference. Harvard University, Cambridge, MA. Oct 6.

Dunbar, K. N. (2004). Performing arts education and the brain. Presented at the Dana Foundation, New York, NY, September 28.

Dunbar, K. N. (March 19, 2004). The Brain and Science education. Presented at "The Brain in Education" mini conference at The Richmond Middle School, Hanover, NH.

Recent Conference proceedings.

Le, A., & Dunbar, K.N. (2013). Perceptual and Conceptual Causal thinking. Annual meeting of the Cognitive Neuroscience Society, San Francisco, CA. AERA

Dunbar, K. N. (2013). AERA. Isymposium on Critical Thinking

Jasinska, K., Jowkar-Baniani, G., Ahmed F., Forster, E., Bhasin-Laceman, S., Naimi, A., Petitto, L.A., Dunbar, K.N. (2011). Simultaneous Imaging of Neural Activations of Women and Men in Real-time Conversation using fNIRS. Society for Neuroscience Annual meeting, Washington DC.

Forster, E., & Dunbar, K.N. (2011). Timecourse of activation during analogical reasoning. Society for Neuroscience Annual meeting, Washington DC.

Bhasin, S., Jowkar-Baniani, Fugelsang, J., & Dunbar, K. N. (2010). fNIRS and fMRI reveal the involvement of frontal as well as temporal regions in the development of automaticity. Annual meeting of the Cognitive Neuroscience Society, Montreal, April 20.

Forster, E.A. and Dunbar, K.N. (2009) Creativity Evaluation through Latent Semantic Analysis presented at the 31thAnnual Conference of the Cognitive Science Society. Amsterdam, The Netherlands.

Dunbar, K. N. (2009). The Biology of Physics: What the brain reveals about our understanding of the physical world. *Physics Education Research Conference,* 1179, 15-18.

Green, A.E., Fugelsang, J.A., Gray, J., & Dunbar, K.N. (2009). Frontopolar Cortex and Semantic Distance in Analogical Reasoning. 2nd International Conference on Analogical Reasoning. Sofia, Bulgaria, July 23.

Berens, M.S., Nelson, J.K., Petitto, L.A., & Dunbar, K.N. (2008). Identification of Potentially Influential Genes in Pursuing Expertise in the Performing Arts. 38th annual meeting of the Society for Neuroscience. Washington November 2008

Green, A., Kraemer, D., Fugelsang, J.A., Gray, J. & Dunbar, K.N. (2008). Neural Correlates of creativity in Reasoning. 15th annual meeting of the Cognitive Neuroscience Society. San Franscisco April 2008.

Green, A., Kraemer, D.J.M., Gray, J.R., & Dunbar, K. (2008). Where do good ideas come from? Neural substrates of generating analogical solutions. Poster presented at the Cognitive Neuroscience Society

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Teaching Mentoring, and Advising

I have a passionate commitment to teaching and I regard it as an essential component of the intellectual life and vibrancy of any university. My dedication to teaching is reflected in my teaching evaluations by students, which has been consistently high (at Toronto, Dartmouth and McGill) and in my eagerness to supervise undergraduate research projects. I also strive for cross-disciplinary and cross boundary topics in my courses and in the students who take my courses. I encourage science and arts students to take and participate in my courses, engage in group discussions, class demonstrations and weekly lab meetings and one on one meetings.

Courses Taught

2011- present: University of Maryland

ED414. The Development of the Scientific Mind across the Lifespan.

EDHD 780Advanced Methods in Human Development

2007-2011: University of Toronto

PSY C84: Psychology and the Scientific Mind. Fall 2008, 2009, 2010.

PSY D56: Creativity, Reasoning & Problem Solving. Winter 2009, 2010, 2011
PSY D57: Cognition, Health, Culture and Decision Making. Winter 2008, 2009, 2010, 2011.

*University Toronto:*2010-2011:

Sample theses supervised

Robin Gong Conceptual Judgment and Decision Techniques in Scientific Problem Solving, (now at Harvard Graduate School):

Timour Al-Khindi Investigating the Relationship between Working Memory and Causal Reasoning, (now at Johns Hopkins Medical School)

Xiaomei Liu: Training Automaticity in Short-Term Period: The Learning and Memory Process in Modified Shape Stroop Task, (now a graduate student at the University of Illinois, Urrbana Champaign

Amritpal Sandhu: Semantic Association and Processing Level: Evidence of an Interactive Effect on Analogical Reasoning, (one more year of undergraduate)

Faryaal Khattak: Behavioral Evidence for the Integrating Effects of Causal Perception and Causal Inference, Undergraduate research project

Sharif Alkatib: How Analogical Inferences Influence Mental Models of Drugs. Undergraduate research project

SUMMARY OF RESEARCH INTERESTS

Overview of My Research Program

The overall focus of my research is to discover and foster the psychologically and educationally important mental processes underlying Thinking, Reasoning, Problem Solving, and Creativity. I use controlled laboratory experiments, real-world educational settings, genetic analyses, and neuroimaging techniques (fNIRs & fMRI) to investigate these issues. As well as providing new models of higher level cognition, this work has many important practical implications involving insights into the ways that science is conducted, scientists are taught in schools and universities, and how industrial and academic laboratories are best structured to ensure success. The hallmark of my research is that I investigate the reasoning processes underlying from multiple perspectives and use many different methodologies. The use of different converging methodologies makes it possible to propose models that are applicable across a wide variety of contexts and provide insights into the nature of what it means to be a sentient human being.

1. Conceptual Change in Science and he effects of learning science on the brain (fNIRS and fMRI studies). Using Physics, Chemistry, and Biology students, we have been able to find key sites that are activated by learning scientific concepts. Currently we are using physics, chemistry and biology domains to discover what cognitive processes (and concomitant brain mechanisms) are common to reasoning in these different domains and whether they suggest novel learning paradigms that can be used to overcome difficulties that students encounter when the learn many scientific concepts.

2. Causal reasoning is a central component of both science education and everyday thought..

3. Analogical and relational reasoning (neuroimaging and behavioral studies).

Recent Newspaper & Magazine articles about my research

New Yorker Magazine. Why people don't believe in Science. By Jonah Lehrer, June 7 2012

GEO Magazine Germany. Article on my Research March 2012.

Time Magazine Ideas, Coverage of my research on science education by Annie Murphy Hall. "The bigger Ball drops faster and other Myths of physics" January 18 2012

The Scientist: Innovations 'R' Us by Sarah Greene December 01, 2010

The Huffington Post: How Not to Save the World by Harry Roman October 22, 2010

July, 2010. Superinteressante Magazine Brazil. "O cientista que estuda cientistas." Eduardo Szklarz. Appeared August 22 2010

January 2010. Wired Magazine. "The Neuroscience of Screwing up". Page 80-85.