

**Assistant Professor**

Department of Brain & Psychological Sciences  
Psychology Building  
1101 E. 10<sup>th</sup> St.  
Indiana University  
Bloomington, Indiana, USA 47405-7007  
804-287-6663; dlandy@indiana.edu; dhlandy@gmail.com

**EDUCATION AND EMPLOYMENT**

**Indiana University, Department of Brain and Psychological Sciences**  
Assistant Professor, 2013-Present

**University of Richmond, Psychology Department**  
Assistant Professor, 2009-2013; Cognitive Science Program Coordinator, 2012-2013

**University of Illinois at Urbana-Champaign, Psychology Department**  
Post-doctoral Research Scientist, 2007-2009

**Indiana University, Bloomington**  
Ph.D. Joint degree in Computer Science and Cognitive Science, 2001-2007

**Alma College**  
B.S., B.A. Physics, Mathematics and Computer Science, 1995-1999, *Cum Laude*  
Minors: Cognitive Science, English Literature

**GRANT SUPPORT**

"Teaching the visual structure of algebra through dynamic interactions with notation", Department of Education, Institute of Education Science, David Landy (PI) and Robert L. Goldstone, #R305A110060 \$1,120,000, May 2011-May 2014.

"The perception of distance in mathematical notation", University of Richmond, Faculty Research Council, \$975, January 2011.

"Spatial strategies in equation understanding", University of Richmond, Faculty Research Council, \$6,000, January 2010.

"Processes of equation understanding", University of Richmond, Faculty Research Council, \$2,000, December, 2009.

## JOURNAL PUBLICATIONS

**Landy, D.**, Brookes, D., & Smout, R. (in press). The form of formalism: Modeling abstract numeric relations as mapping into a visual algebraic notation.

**Landy, D.**, Silbert, N., Goldin, A. (2013). Estimating Large Numbers. *Cognitive Science*, 37(5), 775-799.

Taylor, E. T., **Landy, D.**, & Ross, B. (2012). The effect of explanation in simple binary decision tasks. *Quarterly Journal of Experimental Psychology* Online Publication: April 12, 2012.

Goldstone, R. L., **Landy, D.**, & Brunel, L. (2011). Improving perception to make distant connections closer. *Frontiers in Perception Science*, 2(385). doi: 10.3389/fpsyg.2011.00385

**Landy, D.**, Allen, C., Anderson, M. L. (2011). Conceptual discontinuity through recycling old processes in new domains. *Behavioral and Brain Sciences*, 34(3), 136-137.

**Landy, D.**, & Goldstone, R. L. (2010). Proximity and precedence in arithmetic. *Quarterly Journal of Experimental Psychology*, 63(10), 1953-1968.

Goldstone, R.L., **Landy, D.**, & Son, J. Y. (2010). The Education of Perception. *Topics in Cognitive Science*, 2(2), 265-284.

Goldstone, R.L. & **Landy, D.** (2010). Domain-creating Constraints. *Cognitive Science*, 34(7), 1357-1377.

**Landy, D.**, & Goldstone, R. L. (2007). Formal notations are diagrams: Evidence from a production task. *Memory and Cognition*, 35(8).

**Landy, D.**, & Goldstone, R. L. (2007). How abstract is symbolic thought? *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 33(4), 720-733.

**Landy, D.** (2005). Inside Doubt: On the non-identity of the theory of mind and propositional attitude psychology. *Minds and Machines*, 15(3-4), 399-414.

**Landy, D.**, & Goldstone, R. L. (2005). How we learn about things we don't already understand. *Journal of Experimental and Theoretical Artificial Intelligence*, 17, 343-369.

Reed, B. C., Carmody, P. M., & **Landy D. H.** (1998). BVR Photometry of Northern Galactic Plane Luminous Stars, *Publications of the Astronomical Society of the Pacific*, 110(743), 27-30.

## PUBLICATIONS UNDER REVIEW

Guay, B., Davis, Z, DeLaunay, M., Charlesworth, A., **Landy, D.** (under review). Number Comprehension Impacts Political Judgment.  
Ottmar, E., & **Landy, D.** (in revision). Pushing Symbols: Manipulatives and Motion.

#### PUBLICATIONS IN PREPARATION

**Landy, D.**, Ottmar, E., & Goldstone, R. L. (in revision). Algebra Touch Research: A New Technology.

**Landy, D.**, & Charlesworth, A. (in preparation). Comparison of large and small symbolic magnitudes.

**Landy, D.**, Goldstone, R. L., & Van der Maas, H. (in preparation). Factors influencing the organization of arithmetic expressions over development.

#### BOOK CHAPTERS

Goldstone, R. L., Gerganov, A., **Landy, D.**, & Roberts, M. E. (2008). Learning to see and conceive. In L. Tommasi, M. Peterson, & L. Nadel (Eds.) *The New Cognitive Sciences* (part of the Vienna Series in Theoretical Biology). Cambridge, MA: MIT Press. (pp. 163-188).

Goldstone, R. L., **Landy, D.**, & Son, J. (2008). A well-grounded education: The role of perception in science and mathematics. In A. Glenberg, M. DeVega, & A. Graesser (Eds.) *Symbols, Embodiment and Meaning*, Universidad de La Laguna, Tenerife. (pp. 327-355).

#### CONFERENCE PROCEEDINGS

**Landy, D.**, Ottmar, E. (2013). Algebra as a game played with symbols. Poster presented at *Games, Learning, and Society*. Madison, Wisconsin.

Ottmar, E. Hulse, T., Pierce, J., & **Landy, D.**, (2013). Pushing Symbols: An Intervention to Increase Understanding of Algebraic Notation. Talk given at *National Council of Teachers of Mathematics Research Pre-session*. Denver, Colorado.

**Landy, D.**, Silbert, N., & Goldin, A. G. (2012). Getting of at the end of the line: the estimation of large numbers. Poster presented at *The 34<sup>th</sup> Annual Conference of the Cognitive Science Society*, Sapporo Japan.

Ottmar, E., **Landy, D.**, & Goldstone, R. L. (2012). Teaching the Perceptual Structure of Algebraic Expressions: Preliminary Findings from the Pushing Symbols Intervention. Poster presented at *The 34<sup>th</sup> Annual Conference of the Cognitive Science Society*, Sapporo Japan.

Sears, K., **Landy, D.**, & Lesky, J. (2012). Interactions between abstract actions and apparent distance. Poster presented at *The 34<sup>th</sup> Annual Conference of the Cognitive Science Society*, Sapporo Japan.

**Landy, D.**, Brookes, D., Smout, R. (2011). Modeling Abstract Numeric Relations Using Concrete Notations. Paper presented at *The 33<sup>rd</sup> Annual Conference of the Cognitive Science Society*, Boston, Massachusetts.

**Landy, D.** & Hummel, J. E. (2010). Explanatory reasoning for inductive confidence. Paper presented at *The 32<sup>nd</sup> Annual Conference of the Cognitive Science Society*, Portland, Oregon.

**Landy, D.** & Linkenauger, S. (2010). Arithmetic notation—now in 3d! Poster presented at *The 32<sup>nd</sup> Annual Conference of the Cognitive Science Society*, Portland, Oregon.

**Landy, D.** (August, 2010). Toward a physics of equations. In *Diagrammatic Representation and Inference*. In R. Goebel, J. Siekmann, and W. Wahlster, eds., *Lecture notes in Computer Science* Volume 6170/2010, pages 160-166. Springer.

**Landy, D.** & Hummel, J. E. (2009). Explanatory reasoning for inductive confidence. Paper presented at *New Frontiers in Analogy Research*, Sofia, Bulgaria.

**Landy, D.** & Taylor, E. G. (2009). Variation among individuals in how structure affects similarity. Paper presented at *New Frontiers in Analogy Research*, Sofia, Bulgaria.

Hummel, J. E. & **Landy, D.** (2009). Relaxing the 1:1 mapping constraint....Very carefully. Paper presented at *New Frontiers in Analogy Research*, Sofia, Bulgaria.

Taylor, E. G., **Landy, D.**, & Ross, B. (2009). Explanation effects in very simple tasks. Paper presented at *The 31<sup>st</sup> Annual Conference of the Cognitive Science Society*, Amsterdam.

**Landy, D.**, & Goldstone, R. L. (2009). Pushing Symbols. Paper presented at *The 31<sup>st</sup> Annual Conference of the Cognitive Science Society*, Amsterdam.

**Landy, D.**, Jones, M. N., & Goldstone, R. L. (2008). How the appearance of an operator affects its mathematical precedence. Poster presented at *The 30<sup>th</sup> Annual Conference of the Cognitive Science Society*. Washington, D.C.

**Landy, D.**, Jones, E., & Hummel, J. E. (2008). Why spatial-numeric associations aren't evidence for a mental number line. Paper presented at *The 30<sup>th</sup> Annual Conference of the Cognitive Science Society*. Washington, D.C.

Hummel, J.E., **Landy, D. H.**, Devnich, D. (2008). Toward a Process Model of Explanation with Implications for the Type-Token Problem. Paper presented at *The Association for the Advancement of Artificial Intelligence (AAAI) Fall Symposium*, Arlington, VA.

**Landy, D.**, & Goldstone, R. L. (2007). Grounding Symbol Structures in Space: Formal Notations as Diagrams. *The 29<sup>th</sup> Annual Conference of the Cognitive Science Society*. Nashville, TN. (winner of the Marr Prize for best student submission)

**Landy, D.**, & Goldstone, R. L. (2007). How Space Guides Interpretation of a Novel Mathematical System. *The 29<sup>th</sup> Annual Conference of the Cognitive Science Society*. Nashville, TN.

**Landy, D.**, & Goldstone, R. L. (2007). The Alignment of Ordering and Space in Arithmetic Computation. *The 29<sup>th</sup> Annual Conference of the Cognitive Science Society*. Nashville, TN.

**Landy, D.**, Allen, C. A., Zednik, C. (2007) A perceptual account of notational reasoning. Poster presented at *The Society for Philosophy and Psychology*. Toronto, CA.

**Landy, D.**, & Goldstone, R.L. (2006, August). A perceptually-driven process model of algebraic validity judgments. Paper presented at *The Annual Conference of the Society for Mathematical Psychology*, Vancouver, Canada.

**Landy, D.**, & Goldstone, R. L. (2006, October). Perceptual grouping in mathematical reasoning. Paper presented at *The Annual Conference of the Psychonomic Society*, Houston, Texas.

**Landy, D.**, & Goldstone, R.L. (2005, December). The Role of Perceptual Grouping in Building Abstract Concepts. Poster presented at *The Garachico Workshop: Symbols, Embodiment, and Meaning*. Garachico, Spain.

**Landy, D.** (2005, June). Capturing High-Order Regularities in SRNs by Clustering Dynamic Maps. Poster presented at *Connectionist and Dynamic Systems Approaches to Development: On the Cusp of a Grand New Theory, or Still Too Distributed?*, Iowa City, IA.

**Landy, D.** (2004). Recurrent Representation Reinterpreted. *The Association for the Advancement of Artificial Intelligence (AAAI) Fall Symposium on Connectionism and Compositionality*, Arlington, VA.

## CONFERENCE PRESENTATIONS

**Landy, D.**. Uncertain analogies and inference. Talk given at *Analogies 3*. Dijon, France.

Guay, B. & **Landy, D.**, (2013). Voter interpretation of large numbers in politics: A comparison of data collected from in-person solicited surveys and Mechanical Turk. Poster presented at *The Annual Conference of the American Association for Public Opinion Research*. Boston, Massachusetts.

Hulse, T. & **Landy, D.**, (2013). Written Algebraic Expressions Reflect the Structure of Text. Poster presented at *Association for Psychological Science*. Washington, D.C.

Ottmar, E. & **Landy, D.** (November, 2012). Pushing Symbols: Teaching the Structure of Algebraic Expressions. Talk given at *Psychology Of Mathematics Education, North American Chapter*. Kalamazoo, Michigan.

**Landy, D.**, Davis, Z., Guay, B., DeLaunay, M., Charlesworth, A. C., Silbert, N. H. (Fall, 2012). Moving on down the (mental number) line. Talk given at *The Annual Conference of the Psychonomic Society*, Minneapolis, Minnesota.

Szurkowski, C., & **Landy, D.** (2012). Why do people prefer simple explanations? Poster presented at *The 34<sup>th</sup> Annual Conference of the Cognitive Science Society*, Sapporo Japan.

**Landy, D.** (2012). Chairs, Beer Mugs, and Proof: Turning formal proving into exploring objects in space. Talk given at *Games, Learning, and Society 8.0*. University of Wisconsin, Madison.

**Landy, D.**, Silbert, N., & Goldin, A.,(2011). Magnitude estimation on a very large number line. *MathPsych 2011*, Boston, MA.

Penner-Wilger, M., Landy, D. H., Zhang, X., Weitzer, A. (2011). Going through the Motions: Skill Differences in the Representation of Arithmetic Operations. *The 33<sup>rd</sup> Annual Conference of the Cognitive Science Society*. Boston, MA.

Brookes, D., **Landy, D.**, & Mestre, J. (2010). How students' conceptual understanding is influenced by the grammatical structure of physics equations. Poster presented at the *Physics Education Research Conference, 2010*. Portland, Oregon

Brookes, D., **Landy, D.**, & Mestre, J. (2010). How students' conceptual understanding is influenced by the grammatical structure of physics equations. Poster presented at the *American Association of Physics Teachers, 2010*. Portland, Oregon.

Goldstone, R. L. & **Landy, D.** (May, 2010). Learning mathematics by learning how to look at, and act on, notation. Presentation delivered at *American Education Research Association*, Denver, Colorado.

**Landy, D.** (2008). A perceptual-motor account of formal notational reasoning. Talk given at *New Perspectives on Human Problem Solving*. West Lafayette, IN.

Goldstone, R. L., & **Landy, D.** (2008). Real Physical Symbol Systems for Mathematical Reasoning. Talk given at *The 20<sup>th</sup> Annual convention of the Association for Psychological Science*. Chicago.

Taylor, E., **Landy, D.**, Ross, B., & Hummel, J. (2008). Generating Explanations. Poster presented at *The Annual Conference of the Psychonomic Society*, Chicago, Illinois.

**Landy, D.** (2008). A model of analogical correspondence via electrical resistance. Poster presented at *The Annual Meeting of the Society for Mathematical Psychology*. Washington, D.C.

**Landy, D.,** & Goldstone, R.L. (2005, July). The Perceptual Constituents of Abstract Knowledge. Poster presented at *The Annual Conference of the Psychonomic Society*, Toronto, Canada.

Ekbia, H., Goldberg, J. & **Landy, D.** (2003, April) What about the Children? Connectionism and Language Learning. Talk given at *BOOT-LA (Bootstrapping in Language Acquisition)*, Bloomington, IN.

Howe, R., Komm, R., **Landy, D.,** & Hill, F. (2001, July) The Effect of Magnetic Flux Distribution on Individual-m Frequencies. Paper presented at *Helio- and Asteroseismology at the Dawn of the Millenium*, Noordwijk, The Netherlands.

**Landy, D. H.,** Howe, R., Komm, R., & Hill, F. (2001, April). Asymmetric Line Profiles Applied to GONG Helioseismic Data. Poster presented at *The American Geophysical Union Spring Meeting*. Abstract #SP21C-04, Boston, MA.

Toner, C.G., & **Landy, D.H.** (2001, April). On the Possibility of Merging GONG+ and GONG Classic Time Series. Poster presented at *The American Geophysical Union Spring Meeting*. Abstract #SP31A-10.

## TEACHING EXPERIENCE

**Course Instructor**, University of Richmond

- Psychology 100: Introduction to Psychology
- Psychology 333: Cognitive Science
- Psychology 449: Seminar on Embodied Cognition
- Psychology 449: Seminar on Cognition and Student Learning
- First-year Seminar: The Elements of Thought

**Course Instructor**, Indiana University, Computer Science Department

- Artificial Intelligence, Fall 2003

**Assistant Instructor**, Indiana University, Mathematics Department

- Introduction to Modal Logic, Fall 2004

**Assistant Instructor**, Indiana University, Computer Science Department

- Using the World Wide Web, Fall 2004
- Data Structures, Summer 2003, Summer 2004
- Discrete Mathematics, Spring 2003, Spring 2004
- Artificial Intelligence, Fall 2002

**Undergraduate Assistant**, Alma College, Physics Department

- Laboratory Assistant for Introductory Physics, 1997-1999

#### **AWARDS AND FELLOWSHIPS**

**New Investigator Award**, *American Psychological Association, Division 3*, 2008

**Student Research Achievement Award** *Indiana University Cognitive Science Program*, 2008

**Marr Prize for Best Student Paper** *Annual Conference of the Cognitive Science Society*, 2007

**Cognitive Science Summer Research Fellowship** *Indiana University*, 2005, 2006

**Student Travel Award** *Connectionism & Dynamic Systems Approaches to Development Conference*, 2005

**GAANN fellowship** *Indiana University, Computer Science Department*, 2001-2002

**Distinguished Scholar Award (full tuition scholarship)** *Alma College*, 1995-1999

#### **INVITED TALKS**

University of North Carolina, Wilmington, August, 2012.

The AppFest, Madrid, Spain. May, 2012.

University of Wisconsin, Madison. March, 2012.

Associated Colleges of the South, Annual Conference for Presidents and Deans. June, 2011.

Franklin and Marshall College. October, 2010.

University of Virginia. October, 2009.

University of Richmond. November, 2008.

University of Chicago. October, 2008.

Vanderbilt University. February, 2008.

University of Illinois at Urbana Champaign. September, 2007.

University of Texas, Austin. March, 2007.

Stanford University. August, 2001.

#### **SERVICE**

Ad-hoc reviewer: *Canadian Journal of Experimental Psychology, Cognition, Cognitive Science, Cognitive Psychology, Journal of Experimental Psychology: Learning, Memory, and Cognition, Memory & Cognition, Topics in Cognitive Science, Psychonomic Bulletin and Review, Behavioral Research Methods, Mind Brain and Education*, Conference of the Cognitive Science Society, European Cognitive Science Society Conference, International Conference on Development and Learning,



Program Committee Member, Conference of the Cognitive Science Society, 2010-Present.

Member of the Review Board for Division C, Mathematics of AERA (2009, 2010, 2012)

Member, Henrico County Public Schools math advisory committee, 2012-present.

#### **AFFILIATIONS**

Member, Cognitive Science Society. 2002-Present.

Member, Association for Psychological Science, 2009-Present.

Member, Psychonomic Society, 2011-Present.

#### **OTHER EXPERIENCE**

Attendee, 12th International Summer School in Cognitive Science. New Bulgarian University, Sofia, Bulgaria, Summer, 2005

Data Reduction Operator, Global Oscillation Network Group, National Solar Observatory, Tucson, AZ, USA, 1999-2001

Visiting Astronomer, National Undergraduate Research Observatory, Lowell Observatory, Flagstaff, Arizona, USA, Summer, 1998