

# John E. Opfer

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**Address:** Department of Psychology  
The Ohio State University  
Psychology Building 245  
Columbus, OH 43210  
U.S.A.

**Telephone (w):** (614) 292-9547  
**Telephone (h):** (412) 296-2324  
**Fax:** (614) 292-4537  
**E-mail:** [opfer.7@osu.edu](mailto:opfer.7@osu.edu)  
**Internet:** [faculty.psy.ohio-state.edu/opfer](http://faculty.psy.ohio-state.edu/opfer)

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## **POSITIONS HELD:**

2009 – Associate Professor (with tenure)  
Developmental & Cognitive Areas  
The Ohio State University

2003 – Faculty affiliate, Center for Cognitive Science

2003 – 2009 Assistant Professor  
Developmental & Cognitive Areas  
The Ohio State University

## **EDUCATION & TRAINING:**

2000 – 2003 Postdoctoral Research Associate  
Carnegie Mellon University  
Robert S. Siegler, supervisor

1995 - 2000 Ph.D., Psychology (Developmental)  
University of Michigan-Ann Arbor  
Susan A. Gelman, advisor

1991 – 1995 B.A., Psychology and Classical Humanities  
The George Washington University, *Magna cum laude*

## **PROFESSIONAL MEMBERSHIPS & ACTIVITIES:**

American Psychological Association (Member; Conference Review Panelist)  
Association for Psychological Science (Member; Fellow)  
Cognitive Development Society (Member)

Cognitive Science Society (Member; Program Committee)  
*Developmental Psychology* (Editorial Board, Consulting Editor)  
Society for Research in Child Development (Member; Conference Review Panelist)  
National Science Foundation (Grant Review Panelist)

Ad hoc reviewer for:

*British Journal of Developmental Psychology, Behavioral and Brain Functions, Child Development, Cognition, Cognitive Psychology, Cortex, Developmental Psychology, Developmental Science, Infant and Child Development, Journal of Cognition and Development, Journal of Cross-Cultural Psychology, Journal of Experimental Child Psychology, Journal of Experimental Psychology: General, Psychological Science, Scandinavian Journal of Psychology, Science*

### **HONORS & FELLOWSHIPS:**

2010 Fellow, Association for Psychological Science  
2000 Carnegie Mellon University Postdoctoral Research Fellowship  
1996 National Science Foundation Graduate Research  
Fellowship Program Honorable Mention  
1995 Phi Beta Kappa

### **INVITED TALKS & COLLOQUIA**

Boston College  
Carnegie Mellon University  
Institute for Educational Sciences, Department of Education  
National Science Foundation  
New Bulgarian University (Bulgaria)  
New York University  
Rutgers University  
San Francisco State University  
St. Andrews University (United Kingdom)  
The Ohio State University  
University of Amsterdam (Netherlands)  
University of Chicago  
University of Connecticut  
University of Pittsburgh  
University of York (United Kingdom)  
Villanova University  
Yale University

### **RESEARCH SUPPORT:**

“Adaptive Experimental Methods for Evaluating Computational Models of Cognition” (R01 MH 093838-01). National Science Foundation, 2011-2015. Jay Myung, Mark Pitt, and John Opfer. Direct Costs: \$ 1,250,000.

“Transforming STEM assessment methodologies: Research on cyber-enabled measurement of cognitive models of natural selection” (DRL-0909999). National Science Foundation, 2009 – 2011. Ross Nehm, Dennis Pearl, John Opfer, and Judith Ridgway. Direct Costs: \$ 998,139.

## **PUBLICATIONS & PRESENTATIONS:**

### ***Publications (\*student author):***

-IN PRESS-

Nehm, R., Beggrow, E. P., Opfer, J. E., & Ha, M. (in press). Diagnosing contextual competency in evolutionary reasoning using the ACORNS instrument. *American Biology Teacher*.

Opfer, J. E., & Siegler, R. S. (in press). Development of quantitative thinking. In K. Holyoak & R. Morrison (Eds.), *Oxford Handbook of Thinking and Reasoning*. Cambridge, UK: Oxford University Press.

Opfer, J. E., Siegler, R. S., & Young, C. J. (in press). The Powers of Noise-Fitting: Reply to Barth and Paladino. *Developmental Science*.

Ratcliff, R., Love, J.\*, Thompson, C. A.\*, & Opfer, J. E. (in press). Children are not like older adults: A diffusion model of developmental changes in speeded responses. *Child Development*.

Thompson, C. A., & Opfer, J. E. (in press). The trouble with transfer: Insights from the study of learning. In N. M. Seel (Ed.), *Encyclopedia of the Sciences of Learning*. Springer.

- 2011-

Opfer, J. E., & Furlong, E. E.\* (2011). How numbers bias preschoolers’ spatial search. *Journal of Cross-Cultural Psychology*, 42, 682 – 695.

Opfer, J. E., & Sloutsky, V. S. (2011). On the design and function of rational arguments. *Behavioral and Brain Sciences*, 34, 85-86.

Thompson, C. A., & Opfer, J. E. (2011). Learning Linear Spatial-Numeric Associations Improves Memory for Numbers. In L. Carlson, C. Hölscher and T. Shipley (Eds.), *Proceedings of the XXXIII Annual Conference of the Cognitive Science Society*. Mahwah, NJ: Erlbaum.

Young, C. J.\*, & Opfer, J. E. (2011). Psychophysics of numerical representation: A unified approach to single- and multi-digit magnitude estimation. *Journal of Psychology*, 28, 1 - 9.

Young, C. J., Marciani, F., Opfer, J. E. (2011). Linear Numerical Magnitude Representations Aid Memory for Single Numbers. In L. Carlson, C. Hölscher and T. Shipley (Eds.), *Proceedings of the XXXIII Annual Conference of the Cognitive Science Society*. Mahwah, NJ: Erlbaum.

-2010-

Kanayet, F., Opfer, J. E., & Cunningham, W. A. (2010). Electrophysiological evidence for multiple representations of number in the human brain. In S. Ohlsson & R. Catrambone (Eds.), *Proceedings of the XXXII Annual Conference of the Cognitive Science Society*. Mahwah, NJ: Erlbaum.

Nehm, R.H., Ha, M., Rector, M., Opfer, J. E., Perrin, L., Ridgway, J., Mollohan, K. (2010). Scoring Guide for the Open Response Instrument (ORI) and Evolutionary Gain and Loss Test (EGALT). *Technical Report of National Science Foundation REESE Project 0909999*. 40 p.

Opfer, J. E., & Gelman, S. A. (2010). Development of the animate-inanimate distinction. In U. Goswami (Ed.), *The Wiley-Blackwell Handbook of Childhood Cognitive Development*. Cambridge, UK: Blackwell.

Opfer, J. E., Thompson, C. A.\*, & Furlong, E. E.\* (2010). Early development of spatial-numeric associations: Evidence from spatial and quantitative performance of preschoolers. *Developmental Science*, 13, 761-771.

Tang, Y., Young, C. J., Myung, J. I., Pitt, M. A., & Opfer, J. E. (2010). Optimal inference and feedback for representational change. In S. Ohlsson & R. Catrambone (Eds.), *Proceedings of the XXXII Annual Conference of the Cognitive Science Society*. Mahwah, NJ: Erlbaum.

Thompson, C. A.\*, & Opfer, J. E. (2010). How 15 hundred is like 15 cherries: Effect of progressive alignment on representational changes in numerical cognition. *Child Development*, 81, 1768-1786.

-2009-

Bulloch, M. J.\* & Opfer, J. E. (2009). What makes relational reasoning smart? Revisiting the perceptual-to-relational shift in development of generalization. *Developmental Science*, 12, 114 - 122.

Furlong, E. E.\*, & Opfer, J. E. (2009). Cognitive constraints on how economic rewards affect cooperation. *Psychological Science*, 20, 11 - 16.

Kanayet, F.\* & Opfer, J. E. (2009). Why Children's Number-line Estimates Follow Fechner's Law. In Niels Taatgen and Hedderik van Rijn (Eds.), *Proceedings of the XXXI Annual Cognitive Science Society*. Mahwah, NJ: Erlbaum.

Opfer, J. E., & Bulloch, M. J.\* (2009). Concept development. In E. Anderman & L. Anderman (Eds.), *Psychology of Classroom Learning: An Encyclopedia*.

Siegler, R. S., Thompson, C. A., & Opfer, J. E. (2009). The logarithmic-to-linear shift: One learning sequence, many tasks, many ages. *Mind, Brain, and Education*, 3, 143 - 150.

-2008-

Opfer, J. E., & DeVries, J. M.\* (2008). Representational change and magnitude estimation: Why young children can make more accurate salary comparisons than adults. *Cognition*, 108, 843 - 849.

Opfer, J. E., & Doumas, L. A. A. (2008). Analogy and conceptual change in childhood. *Behavioral and Brain Sciences*, 31, 723.

Opfer, J. E., & Thompson, C. A.\* (2008). The trouble with transfer: Insights from microgenetic changes in the representation of numerical magnitude. *Child Development*, 79, 790-806.

Thompson, C. A.\* & Opfer, J. E. (2008). Costs and benefits of representational change: Effects of context on age and sex differences in symbolic magnitude estimation. *Journal of Experimental Child Psychology*, 101, 20 - 51.

Thompson, C. A.\* & Opfer, J. E. (2008). Representational change and numerical estimation: Effect of progressive alignment on the breadth of transfer. In V. M. Sloutsky, B. C. Love, & K. McCrae (Eds.), *Proceedings of the XXX Annual Cognitive Science Society*. Mahwah, NJ: Erlbaum.

-2007-

Opfer, J. E., & Bulloch, M. J.\* (2007). Causal relations drive young children's induction, naming, and categorization. *Cognition*, 105, 206 - 217.

Opfer, J. E., & Siegler, R. S. (2007). Representational change and children's numerical estimation. *Cognitive Psychology*, 55, 169 - 195.

Opfer, J. E., Thompson, C. A.\* & DeVries, J. M.\* (2007). Why children make "better" estimates of fractional magnitude than adults. In D. S. McNamara & J. G. Trafton

(Eds.), *Proceedings of the XXIX Annual Cognitive Science Society*. Mahwah, NJ: Erlbaum.

Opfer, J. E., & Thompson, C. A.\* (2007). What is the trouble with transfer? In D. S. McNamara & J. G. Trafton (Eds.), *Proceedings of the XXIX Annual Cognitive Science Society* (pp. 545-550). Mahwah, NJ: Erlbaum.

-2006-

Opfer, J. E., & Devries, J. M.\* (2006). How adults acquire children's representation of numeric quantity. *Proceedings of the Fifth International Conference on Development and Learning*, Bloomington, IN.

Opfer, J. E., & Thompson, C. A.\* (2006). Even early representations of numerical magnitude are spatially organized: Evidence for a directional magnitude bias in pre-reading preschoolers. In Sun, R., & Miyaki, N. (Eds.), *Proceedings of the XXVIII Annual Conference of the Cognitive Science Society*, 639-644. Mahwah, NJ: Erlbaum

-2005-

Thompson, C. A.\*, & Opfer, J. E. (2005). Everyday constraints on learning: Children's and adults' development of the major-minor distinction. In Bara, B. G., Barsalou, L.W., & Bucciarelli, M. (Eds.), *Proceedings of the XXVII Annual Conference of the Cognitive Science Society*, 2184-2189. Mahwah, NJ: Erlbaum.

Opfer, J. E., & Siegler, R. S. (2005). Microgenetic changes in representations of numerical magnitude. In Bara, B. G., Barsalou, L.W., & Bucciarelli, M. (Eds.), *Proceedings of the XXVII Annual Conference of the Cognitive Science Society*, 1684-1689. Mahwah, NJ: Erlbaum.

-2004-

Opfer, J. E., & Siegler, R. S. (2004). Revisiting preschoolers' *living things* concept: A microgenetic analysis of conceptual change in basic biology. *Cognitive Psychology*, 49, 301-332.

-2003-

Opfer, J. E. (2003). Life, liveliness, and living kinds: How young children think about the biological world. *International Journal of Behavioral Development*, 27, 375 - 380.

Siegler, R. S., & Opfer, J. E. (2003). The development of numerical estimation: Evidence for multiple representations of numerical quantity. *Psychological Science*, 14, 237 - 243.

-2002-

Gelman, S. A., & Opfer, J. E. (2002). Development of the animate-inanimate distinction. In U. Goswami (Ed.), *Blackwell Handbook of Childhood Cognitive Development* (pp. 151 - 166). Oxford, UK: Blackwell.

Opfer, J. E. (2002). Identifying living and sentient kinds from dynamic information: The case of goal-directed versus aimless autonomous movement in conceptual change. *Cognition*, 86, 97 - 122.

-2001-

Opfer, J. E., & Gelman, S. A. (2001). Children's and adults' models for predicting teleological action: The development of a biology-based model. *Child Development*, 72, 1367 - 1381.

***Presentations at professional meetings:***

Opfer, J. E. (2011, April). *The seven sins of children's problem-solving*. Paper presented at the Meeting of Experts on Cognitive Development, University of Amsterdam, Amsterdam, Netherlands.

Opfer, J. E., (2011, March). Development of spatial-numeric associations. In K. McCrink (Chair), *Interactions among Space, Number, and Ordering in Infancy and Early Childhood*. Symposium conducted at biennial meeting of the Society for Research in Child Development, Montréal, Quebec.

Opfer, J. E., Nehm, R., Beggrow, E. P., & Ha, M. (2011, March). Applying cognitive science to evolution education assessments. Paper presented at the National Association for Research in Science Teaching, Tampa, FL.

Thompson, C. A., & Opfer, J. E. (2011, March). Analogies boost children's memory for numbers. In K. McCrink (Chair), *Children's Development of Analogical Reasoning*. Symposium conducted at biennial meeting of the Society for Research in Child Development, Montréal, Quebec.

Nehm, R.H., Ridgway, J. Haertig, H., Gee, M., Baronda, S., Opfer, J. E., Pearl, D. (2010, March). *Transforming STEM assessment methodologies: Research on cyber-enabled measurement of cognitive models of natural selection*. National Science Foundation REESE Conference. Arlington, VA.

Opfer, J. E. (2009, July). Relational reasoning and conceptual change. In B. Kokinov, D. Gentner, & K. Holyoak (Chairs), *Development of Analogy*. Symposium conducted

- at the Second International Analogy Conference, New Bulgaria University, Sofia, Bulgaria.
- Opfer, J. E., & Furlong, E. E. (2009, July). Early development of spatial-numeric associations. In S. Göbel & M. Fischer (Chairs), *Cultural Effects on the Mental Number Line*. Symposium conducted at University of York, York, United Kingdom.
- Furlong, E. E., & Opfer, J. E. (2009, April). Development of number cognition and cooperation. In E. E. Furlong & J. E. Opfer (Chairs), *Development of Cooperation: Insights from Cognitive Science and Animal Behavior*. Symposium conducted at the meeting of the Society for Research in Child Development, Denver, CO.
- Thompson, C. A., & Opfer, J. E. (2009, April). Costs and benefits of developing a linear representation of number. In B. Morris & A. Masnick (Chairs), *Counting and Beyond: Number Representations and Development of Mathematical Processing*. Symposium conducted at the meeting of the Society for Research in Child Development, Denver, CO.
- Opfer, J. E., Thompson, C. A., Furlong, E. E., & Bulloch, M. J. (2007, October). What makes relational reasoning so smart? In L. A. A. Dumas (Chair), *Role of Comparison in Development of Relational Representations and Structured Thought*. Symposium conducted at the Fifth Biennial Meeting of the Cognitive Development Society, Santa Fe, NM.
- Furlong, E. E., & Opfer, J. E. (2007, September). Why is the parietal context involved in economic decision-making? Insights from human and non-human primates. Symposium conducted at the Society for Neuroeconomics, Hull, MA.
- Opfer, J. E., & Bulloch, M. J. (2007, April). Development of generalization: Revisiting the relational shift. In L. A. A. Dumas (Chair), *Development of Structured Thought*. Symposium conducted at the meeting of the Society for Research in Child Development, Boston, MA.
- Opfer, J. E. (2006, April). Representations of numeric quantity: The process of change in a core domain. In E. Flynn (Chair), *Microgenetic Insights into Cognitive Development*. Symposium conducted at St. Andrews University, St. Andrews, UK.
- Opfer, J. E., & Bulloch, M. J. (2005, October). *Causality-based induction, naming, and categorization: A mathematical model of essentialist generalization*. Poster presented at the biennial meeting of the Cognitive Development Society, San Diego, CA.
- Opfer, J. E. (2005, May). Using cognitive analyses to improve math and science learning. Colloquium held at U. S. Department of Education, *Cognition and Student Learning Principal Investigators' Conference*, Washington, DC.

- Thompson, C. A., & Opfer, J. E. (2005, May). *Everyday constraints on learning: Development of the major-minor distinction*. Poster presented at the annual meeting of the American Psychological Society, Los Angeles, CA.
- Opfer, J. E. (2005, April). Development of the mental number line: Evidence for adaptive choice in representations of numerical quantity. In M. Le Corre (Chair), *Numerical Cognition: The discrete, the continuous, and the relation between them*. Symposium conducted at the meeting of the Society for Research in Child Development, Atlanta, GA.
- Opfer, J. E. (2005, April). Development of numerical estimation: Evidence for competing representations of number. In R. S. Siegler and J. L. Booth (Chairs), *How does estimation develop? Evidence from computational, numerosity, and number-line estimation*. Symposium conducted at the meeting of the Society for Research in Child Development, Atlanta, GA.
- Opfer, J. E. (2004, May). How do representations change? Evidence from the development of number concepts. Colloquium held at the Center for Cognitive Science, Columbus, OH.
- Goldberg, R. F., & Opfer, J. E. (2003, October). *Foundational Traces in Life Judgments: Re-examining the Development of the Living Things Concept*. Poster presented at the biennial meeting of the Cognitive Development Society, Park City, UT.
- Opfer, J. E. (2003, April). A microgenetic analysis of categorization and conceptual change in naïve biology. In J. E. Opfer (Chair), *Conceptual change in core domains: Insights from microgenetic analyses*. Symposium conducted at the meeting of the Society for Research in Child Development, Tampa Bay, FL.
- Opfer, J. E. (2003, April). *Development of numerical estimation: Evidence for competing representations of numerical quantity*. Poster presented at the biennial Meeting of the Society for Research in Child Development, Tampa Bay, FL.
- Opfer, J. E., & Siegler, R. S. (2001, October). *Teleological action speaks louder than words: A microgenetic analysis of categorization and conceptual change in naive biology*. Poster presented at the biennial meeting of the Cognitive Development Society, Virginia Beach, VA.
- Opfer, J. E. (2001, April). *Using goal-directed action to identify living and sentient kinds*. Poster presented at the Biennial Meeting of the Society for Research in Child Development, Minneapolis, MN.

Opfer, J. E. (1999, October). *Distinguishing living from non-living kinds by goal-directed motion alone*. Poster presented at the biennial meeting of the Cognitive Development Society, Chapel Hill, NC.

Opfer, J. E. (1999, April). *Children's and adults' ontology of psychological capacities*. Poster presented at the biennial meeting of the Society for Research in Child Development, Albuquerque, NM.

Opfer, J. E. (1998). *Using categorical knowledge to guide predictions of teleological action*. In D. Thompson (Chair), *Cognition, causal mechanisms, and goals: Children's understanding of goal-directed behavior*. Symposium conducted at a meeting of the Jean Piaget Society Conference, Chicago IL.

### **UNIVERSITY TEACHING:**

#### ***Graduate:***

*Cognitive Development*. 2005-present. The Ohio State University.

*Research Methods in Developmental Psychology*. 2003-present. The Ohio State University.

*Conceptual Development*. 2004-present. The Ohio State University.

#### ***Undergraduate:***

*Honors Psychology*. 2003-present. The Ohio State University.

*Psychology of Childhood*. 2004-present. The Ohio State University.

*Introduction to Psychology*. 1999. University of Michigan-Ann Arbor.

### REFERENCES

#### **Susan A. Gelman, Ph.D.**

Huetwell Professor of Psychology  
University of Michigan  
525 E. University Avenue  
Ann Arbor, MI 48109-1109  
gelman@umich.edu

#### **Robert S. Siegler, Ph.D.**

Heinz Professor of Psychology  
Carnegie Mellon University  
331A Baker Hall  
Pittsburgh, PA 15213  
rs7k@andrew.cmu.edu

#### **Vladimir Sloutsky, Ph.D.**

Professor, Department of Psychology  
Professor, Department of Education  
The Ohio State University  
1961 Tuttle Park Place  
Columbus, OH 43210  
sloutsky.1@osu.edu

#### **David Rakison, Ph.D.**

Associate Professor of Psychology  
Carnegie Mellon University  
Baker Hall 354N  
Pittsburgh, PA 15213  
rakison@andrew.cmu.edu