

# David Danks

## *Curriculum Vitae*

### Contact Information

Department of Philosophy  
135 Baker Hall  
Carnegie Mellon University  
Pittsburgh, PA 15213  
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*Country of citizenship:* United States

### Academic Career

Carnegie Mellon University	
Associate Professor of Philosophy & Psychology	2008-present
Assistant Professor of Philosophy	2003-2008
Florida Institute for Human & Machine Cognition (UARI with Univ. of Florida system)	
Research Scientist	2001-present
Center for Philosophy of Science, University of Pittsburgh	
Associate fellow	2005-present
Center for Advanced Study of Language, University of Maryland	
Adjunct member	2008-present
Philosophy Dept., Colorado College	
Visiting Assistant Professor (2 courses)	2002-2003

### Education

University of California, San Diego (La Jolla, Calif.)	
Philosophy Department (Ph.D., 6/2001; M.A., 12/1999)	1996-2001
Carnegie Mellon University (Pittsburgh, Pa.)	
Logic, Computation, and Methodology (visiting graduate student)	1998-1999
Princeton University (Princeton, N.J.)	
Major: Philosophy (A.B. <i>cum laude</i> , 5/1996)	1992-1996

### Publications

#### Journal articles and book chapters:

Danks, David. (in press). Learning. In K. Frankish & W. Ramsey (Eds.), *Cambridge handbook to artificial intelligence*. Cambridge: Cambridge University Press.

Danks, David. (in press). The psychology of causal perception and reasoning. In H. Beebe, C. Hitchcock, & P. Menzies (Eds.), *Oxford handbook of causation*. Oxford: Oxford University

Press.

- Danks, David, & Eberhardt, Frederick. (in press). Conceptual problems in statistics, testing and experimentation. In J. Symons & F. Calvo (Eds.), *Routledge companion to the philosophy of psychology*. Routledge.
- Glymour, Clark, Danks, David, Glymour, Bruce, Eberhardt, Frederick, Ramsey, Joseph, Scheines, Richard, Spirtes, Peter, Teng, Choh Man, & Zhang, Jiji. (in press). Actual causation: A stone soup essay. *Synthese*.
- Danks, David, & Eberhardt, Frederick. (2009). Explaining norms and norms explained [Commentary]. *Behavioral and Brain Sciences*, 32 (1): 86-87.
- Ramapriyan, H., Isaac, David, Yang, Wenli, Bonnlander, Brian, & Danks, David. (in press). An intelligent archive testbed incorporating data mining. In L. Di, H. K. Ramapriyan, & Y. Bai (Eds.), *Standards-based data and information systems for earth observations*. Springer.
- Wimberly, Frank, Danks, David, Glymour, Clark, & Chu, Tianjiao. (in press). Problems for structure learning: Aggregation and computational complexity. In S. Das, S. M. Welch, D. Caragea, & W. H. Hsu (Eds.), *Computational methodologies in gene regulatory networks*. Hershey, PA: IGI Global Publishing.
- Danks, David. (2008). Rational analyses, instrumentalism, and implementations. In N. Chater & M. Oaksford (Eds.), *The probabilistic mind: Prospects for Bayesian cognitive science* (pp. 59-75). Oxford: Oxford University Press.
- Jantzen, Benjamin, & Danks, David. (2008). Biological codes and topological causation. *Philosophy of Science*, 75, 259-277.
- Townsend, Kelly A., Wollstein, Gadi, Danks, David, Sung, Kyung Rim, Ishikawa, Hiroshi, Kagemann, Larry, Gabriele, Michelle L., & Schuman, Joel S. (2008). Heidelberg Retina Tomography III machine learning classifiers for glaucoma detection. *British Journal of Ophthalmology*, 92, 814-818.
- Danks, David. (2007). Causal learning from observations and manipulations. In M. C. Lovett & P. Shah (Eds.), *Thinking with data* (pp. 359-388). New York: Lawrence Erlbaum Associates.
- Danks, David. (2007). Theory unification and graphical models in human categorization. In A. Gopnik & L. Schulz (Eds.), *Causal learning: Psychology, philosophy, and computation* (pp. 173-189). Oxford: Oxford University Press.
- Glymour, Clark, & Danks, David. (2007). Reasons as causes in Bayesian epistemology. *Journal of Philosophy*, 104(9), 464-474.
- Scheines, Richard, Easterday, Matt, & Danks, David. (2007). Teaching the normative theory of causal reasoning. In A. Gopnik & L. Schulz (Eds.), *Causal learning: Psychology, philosophy, and computation* (pp. 119-138). Oxford: Oxford University Press.
- Danks, David. (2005). Scientific coherence and the fusion of experimental results. *The British Journal for the Philosophy of Science*, 56, 791-807.
- Danks, David. (2005). The supposed competition between theories of human causal inference. *Philosophical Psychology*, 18 (2), 259-272.
- Gopnik, Alison, Glymour, Clark, Sobel, David M., Schulz, Laura E., Kushnir, Tamar, & Danks, David. (2004). A theory of causal learning in children: Causal maps and Bayes nets. *Psychological Review*, 111 (1), 3-32.

Danks, David. (2003). Equilibria of the Rescorla-Wagner model. *Journal of Mathematical Psychology*, 47, 109-121.

Peer-reviewed conference proceedings:

Tillman, Robert E., Danks, David, & Glymour, Clark. (2009). Integrating locally learned causal structures with overlapping variables. In D. Koller, D. Schuurmans, Y. Bengio, & L. Bottou (Eds.), *Advances in neural information processing systems 21* (pp. 1665-1672). La Jolla, CA: The NIPS Foundation.

Nichols, William, & Danks, David. (2007). Decision making using learned causal structures. In D. S. McNamara & J. G. Trafton (Eds.), *Proceedings of the 29th annual meeting of the cognitive science society* (pp. 1343-1348). Austin, TX: Cognitive Science Society.

Townsend, Kelly A., Wollstein, Gadi, Danks, David, Sung, K., Ishikawa H., Kagemann, L., Gabriele, M. L., & Schuman, Joel S. (2007). Heidelberg Retina Tomography 3 machine learning classifiers for glaucoma detection. *Association for Research in Vision and Ophthalmology (ARVO) 2007*.

Zhu, Huichun, & Danks, David. (2007). Task influences on category learning. In D. S. McNamara & J. G. Trafton (Eds.), *Proceedings of the 29th annual meeting of the cognitive science society* (pp. 1677-1682). Austin, TX: Cognitive Science Society.

Danks, David. (2006). (Not) learning a complex (but learnable) category. In R. Sun & N. Miyake (Eds.), *Proceedings of the 28<sup>th</sup> annual meeting of the cognitive science society* (pp. 1186-1191). Mahwah, NJ: Lawrence Erlbaum Associates.

Danks, David, & Schwartz, Samantha. (2006). Effects of causal strength on learning from biased sequences. In R. Sun & N. Miyake (Eds.), *Proceedings of the 28<sup>th</sup> annual meeting of the cognitive science society* (pp. 1180-1185). Mahwah, NJ: Lawrence Erlbaum Associates.

Ramapriyan, H. K., Isaac, David, Yang, Wenli, Bonnlander, Brian, & Danks, David. (2006). An intelligent archive testbed incorporating data mining lessons and observations. In *Proceedings of the IEEE geoscience and remote sensing symposium* (pp. 3482-3485).

Danks, David, & Schwartz, Samantha. (2005). Causal learning from biased sequences. In B. G. Bara, L. Barsalou, & M. Bucciarelli (Eds.), *Proceedings of the 27<sup>th</sup> annual meeting of the cognitive science society* (pp. 542-547). Mahwah, NJ: Lawrence Erlbaum Associates.

Bunch, Larry, Breedy, Maggie, Bradshaw, Jeffrey M., Carvalho, Marco, Danks, David, & Suri, Niranjan. (2004). Flexible automated monitoring and notification for complex processes. In F.-Y. Wang (Ed.), *Proceedings of the IEEE international conference on networking, sensing, and control* (pp. 443-448). Tucson, AZ.

Danks, David. (2004). Constraint-based human causal learning. In M. Lovett, C. Schunn, C. Lebiere, & P. Munro (Eds.), *Proceedings of the 6<sup>th</sup> international conference on cognitive modeling (ICCM-2004)* (pp. 342-343). Mahwah, NJ: Lawrence Erlbaum Associates.

Danks, David, Glymour, Clark, & Spirtes, Peter. (2003). The computational and experimental complexity of gene perturbations for regulatory network search. In W. H. Hsu, R. Joehanes, and C. D. Page (Eds.), *Proceedings of IJCAI-2003 workshop on learning graphical models for computational genomics* (pp. 22-31).

Danks, David, Griffiths, Thomas L., & Tenenbaum, Joshua B. (2003). Dynamical causal learning. In S. Becker, S. Thrun, & K. Obermayer (Eds.), *Advances in neural information processing systems 15* (pp. 67-74). Cambridge, MA: MIT Press.

- Hewett, Rattikorn & Danks, David. (2003). Integration of learning with probabilistic and compact relational models. In *Proceedings of the 3rd predictive methods conference*. Newport Beach, CA.
- Kushnir, Tamar, Gopnik, Alison, Schulz, Laura E., & Danks, David. (2003). Inferring hidden causes. In R. Alterman & D. Kirsh (Eds.), *Proceedings of the 25<sup>th</sup> annual meeting of the cognitive science society* (pp. 699-703). Boston: Cognitive Science Society.
- Danks, David. (2002). Learning the causal structure of overlapping variable sets. In S. Lange, K. Satoh, & C. H. Smith (Eds.), *Discovery science: Proceedings of the 5<sup>th</sup> international conference* (pp. 178-191). Berlin: Springer-Verlag.
- Danks, David, & Glymour, Clark. (2001). Linearity properties of Bayes nets with binary variables. In J. Breese & D. Koller (Eds.), *Uncertainty in artificial intelligence: Proceedings of the 17<sup>th</sup> conference (UAI-2001)* (pp. 98-104). San Francisco: Morgan Kaufmann.
- Wheeler, Willie, Danks, David, Ramsey, Joseph, Scheines, Richard, Smith, Joel, & Thompson, Andrew. (2001). Developing and deploying online courses with Jcourse. In *Proceedings of the association of the advancement of computing in education (AACE)*.

#### Book reviews and technical reports:

- Chu, Tianjiao, Danks, David, & Glymour, Clark. (2005). Data-driven methods for nonlinear Granger causality: Climate teleconnection mechanisms. Technical report CMU-PHIL-171. June 7, 2005.
- Danks, David. (2005). Review of *Natural-born cyborgs: Minds, technologies, and the future of human intelligence*. *Philosophical Psychology*, 18 (3), 383-387.
- Danks, David. (2004). Psychological theories of categorization as probabilistic models. Technical report CMU-PHIL-157. July 15, 2004.
- Danks, David. (2003). Learning integrated structure from distributed databases with overlapping variables. Technical report CMU-PHIL-149. October 28, 2003.
- Danks, David. (2002). Review of *Graphical models: Foundations of neural computation*. *Pattern Analysis and Applications*, 5 (4), 401-402.

#### **Submitted manuscripts**

- Danks, David, & Harrell, Maralee. (under review). Local coevolution and constraints. Submitted to *Synthese*.
- Eberhardt, Frederick, & Danks, David. (under review). “Rational” in what sense? Bayesian models in cognitive science. Submitted to *Journal of Philosophy*.

#### **Works in progress**

- Danks, David. (in prep). A Bayesian network unification of three categorization theories. Revise-and-resubmit at *Journal of Mathematical Psychology*
- Danks, David. (in prep). Explanatory power, input-output approximation, and the case of rational analysis. Revise-and-resubmit at *Philosophy of Science*.
- Danks, David. (in prep). Representing higher-order features in categorization using graphical models. Revise-and-resubmit at *Journal of Mathematical Psychology*
- Danks, David, & Walker, Adam. (in prep). Particle filter models of psychological causal

learning.

Danks, David, & McKenzie, Craig R. M. (in prep). Learning complex causal structures.

## **Fellowships, Awards and Grants**

### External:

- Integrating Causal Cognition, Concepts, and Decision-making* 2008-14  
James S. McDonnell Foundation Scholar Award  
\$600,000 (direct costs) for six years [sole P.I.]
- Causal learning: Computational Learning Mechanisms and Cognitive Development* 2005-09  
James S. McDonnell Foundation Collaborative Initiative  
\$2.25 million (direct costs) for five years [one of 12 core members (Lead: A. Gopnik)]
- The Bayesian Network Lens* 2002-03  
James S. McDonnell Foundation grant  
\$49,615 (direct costs) for one year [sole P.I.]

### Internal:

- Wimmer Faculty Fellow (one of four) 2007
- Travel grant from Berkman Faculty Development Fund to attend 2004  
2004 International Congress of Psychology – \$2,511 (direct costs)
- “Building Webs of Causal Knowledge” – Carnegie Mellon Falk fellowship 2003-05  
\$3,840 (direct costs) – sole P.I.
- UCSD Philosophy Department Dissertation Fellowship 2000-01
- UCSD Humanities Research Fellowship 1996-97

## **Professional Presentations**

- “Modeling (Partially) Integrated Cognition” 2009  
*Carnegie Mellon University (Psychology Dept.)*
- “Putting the Pieces Together: Modeling Integrated Cognition” 2008  
*California Institute of Technology (Humanities & Social Sciences)*
- “What Bayesian Models Can (And Can’t) Tell Us About Cognition” 2008  
*Society for Philosophy & Psychology Annual Conference*
- “Conceptual and Causal Knowledge: Steps Towards an Integration” 2008  
*Eastern Psychological Association*
- “Integrating Causal Knowledge: Challenges and Some Responses” 2007  
*Agrifood Nanotechnology group (Michigan State University)*
- “Introduction to Data-driven Methods for Causal Inference” 2007  
*Five-day course for the National Security Agency (taught twice during 2007)*
- “Actual Causation: A Stone Soup Essay” (co-author with 8 others) 2007  
*Formal Epistemology Workshop*
- “Rational Analyses and Approximation in Cognitive Science” 2006  
*Center for the Philosophy of Science (University of Pittsburgh)*
- “Applications of Recent Research in Causal and Statistical Reasoning” 2006  
*Five-day course for the National Security Agency*

“Introduction to Learning, Reasoning, & Knowing” <i>Three-day course for the National Security Agency</i>	2006
“Causal Quilting: Integrating Overlapping Causal Structures” <i>25<sup>th</sup> Biennial Meeting of the Society for Multivariate Analysis in the Behavioural Sciences</i>	2006
“Rational Models and Heuristic Approximations” <i>The Probabilistic Mind: Prospects for Rational Models of Cognition</i>	2006
“Machine Learning, or How to (Sometimes) Use a Computer to Understand the World’s Structure” <i>Strategic Studies Group (Chief of Naval Operations)</i>	2005
“Data-driven Causal Inference” <i>Five-day course for the National Security Agency</i>	2005
“Learning, Reasoning, & Knowing” <i>Three-day course for the National Security Agency</i>	2005
“Graphical Models for Psychological Categorization” <i>IPAM Program: Probabilistic Models of Cognition: The Mathematics of Mind</i>	2005
“Chain Graph Models of Psychological Categorization” <i>NIPS Workshop: Structured Data and Representations in Prob. Models for Categorization</i>	2004
“Constraint-Based Human Causal (Bayes Net) Learning” <i>28<sup>th</sup> International Congress of Psychology</i>	2004
“Causal Learning from Observations and Manipulations” <i>33<sup>rd</sup> Carnegie Symposium on Cognition – “Thinking with Data”</i>	2004
“The Usefulness of Causal Beliefs” <i>Workshop on the Origins and Functions of Causal Thinking (Centre for Time, U. of Sydney)</i>	2004
“Critical Experiments in Causal Categorization” <i>Workshop on Causation and Categorization (Center for Adv. Study in Behavioral Sci.)</i>	2004
“Wildfire Occurrence and Size Prediction (A Work-in-Progress)” <i>NASA Ames Ecosystem Science and Technology Branch</i>	2003
“The Computational and Experimental Complexity of Gene Perturbations for Regulatory Network Search” <i>Learning Graphical Models for Computational Genomics (IJCAI-03)</i>	2003
“Theories of Human Causal Learning” <i>Carnegie-Mellon University (Philosophy Dept.)</i>	2003
“Methodological Problems in Cognitive Psychology” <i>McDonnell Workshop: Viewing the World Through a Bayes Net Lens</i>	2003
“Learning the Causal Structure of Overlapping Variable Sets” <i>Discovery Science 2002</i>	2002
“Causal Learning, or How We’re Smarter than Pavlov’s Dogs” <i>Colorado College (Psychology Dept.)</i>	2002
“Causal Learning with Bayesian Networks” <i>Colorado College (Mathematics Dept.)</i>	2002
“What the Philosophy of Causation Can Learn from the Psychology of Causation” <i>International Congress on Causation &amp; Explanation in Natural &amp; Social Sciences</i>	2002

“Mathematical Philosophy meets Cognitive Psychology” (with C. Glymour) <i>Philosophy of Science Association Biennial Meeting</i>	2002
“Human Learning of Causal Structures with Hidden Variables” <i>NIPS-2001 Workshop</i>	2001
“Learning Causes” <i>University of Colorado-Boulder (Psychology Dept.)</i>	2000

### Professional Service

CMU Institutional Review Board	Member: 2004-present Acting chair: 2009-present
Director, Laboratory for Empirical Approaches to Philosophy (LEAP)	2006-present
CMU Summer School in Logic and Formal Epistemology	Instructor: 2006-2008 Co-director: 2008-present
Director of Graduate Admissions, CMU Philosophy Department	2006-present
CMU Faculty Senate	Senator from Philosophy: 2008-present Member-at-large of Executive Committee: 2008-present
Nominating Editor, <i>The Philosopher’s Annual</i>	2008-present
Member, Organizing committee for CMU Humanities Lecture Series	2007-08
Commentator, 9 <sup>th</sup> Pitt-CMU Graduate Student Philosophy Conference	2007

### Workshop & Symposium organization:

- Organizer of Symposium at 2009 Eastern Psychological Association Annual Meeting on “Causal Reasoning and Decision-Making” (March 5-8, 2009)
- Organizer of Workshop for McDonnell Causal Learning Collaborative on “Problems of Variable Definition and Selection” (Nov. 5-6, 2008)
- Organizer and Moderator for Symposium at 2007 James S. McDonnell Foundation Annual Program Meeting on “Worth a thousand words? The ups and downs of using photos, film, and the outputs from imaging tools as primary data” (June 4– 6, 2007)
- Co-organizer of Workshop at NIPS-2004 on “Structured Data and Representations in Probabilistic Models for Categorization” (Dec. 18, 2004)
- Organizer of workshop on “Would the World Look Different if We Viewed It through a Bayes Net Lens” on behalf of the James S. McDonnell Foundation (Jan. 9– 11, 2003)

### Journal reviewing (multiple times for most):

*American Philosophical Quarterly; Applied Artificial Intelligence; Behavioural Processes; Canadian Journal of Experimental Psychology; Cognition; Cognitive Science; European Review of Philosophy; International Journal of Intelligent Systems; Journal of Educational and Behavioral Statistics; Journal of Experimental Psychology: Learning, Memory, Cognition; Journal of Machine Learning Research; Journal of Mathematical Psychology; Memory & Cognition; Philosophy of Science; Psychological Reports; Psychological Review; Psychological Science; Psychonomic Bulletin and Review; Studies in History and Philosophy of Science; Synthese; Trends in Cognitive Science*

### Conference reviewing:

Annual Conference of the Cognitive Science Society (2003-09)  
Neural Information Processing Systems (2005-08)  
Society for Philosophy & Psychology Conference (2009)  
Conference on Uncertainty in Artificial Intelligence (2003; Program Committee: 2004-06)  
Conference on Computing and Philosophy (2005; 07)  
Pacific Symposium on Biocomputing (2004-05)  
AAAI National Conference on Artificial Intelligence (2004)

### **Professional Organizations**

Cognitive Science Society  
Philosophy of Science Association  
Society for Philosophy & Psychology  
American Philosophical Association  
Association for Psychological Science

### **Dissertation**

*The Epistemology of Causal Judgment*

Committee: Clark Glymour (chair; Philosophy, UCSD & CMU), Patricia Churchland (Philosophy, UCSD), Paul Churchland (Philosophy, UCSD), Craig McKenzie (Psychology, UCSD), Sandra Mitchell (History and Philosophy of Science, Univ. of Pittsburgh), Terrence Sejnowski (Biology, UCSD; The Salk Institute)

### **Teaching Experience**

#### **Carnegie Mellon University**

*Current Topics in Philosophy of Science (Graduate seminar)* [F-07]  
*Graphical Models in Cognitive Science (Graduate seminar)* [S-06]  
*Philosophical Foundations (Core graduate seminar)* [S-08]  
*The Nature of Reason* [F-04; F-08]  
*Nietzsche* [S-05; S-07]  
*Normativity in Cognitive Psychology (Graduate seminar)* [S-04]  
*Philosophy and Psychology* [S-04; S-06; S-07; F-08]  
*Philosophy of Biology* [S-05; S-08]  
*Philosophy of Mind* [F-03; F-04; F-05]  
*Probability and Artificial Intelligence* [F-07]

#### **Colorado College**

*Philosophy of Biology* [S-03]  
*Philosophy of Mind* [F-02]

### **Thesis Advising and Committee Participation**

#### **Primary Advisor**

Joanna Tamburino (M.S., Logic & Computation, 2004)  
Thesis: “Emotional Learning: How We Implicitly Learn to Feel”  
First position: Philosophy Ph.D. program at U. Pennsylvania  
Benjamin Jantzen (M.A., Philosophy, 2006)  
Thesis: “Biological Codes: An Explication via a Formal Extension of

Classical Coding Theory”

First position: Logic, Computation, & Methodology Ph.D. program at CMU  
Kevin Jarrett (M.S., Logic & Computation, 2006)

Thesis: “Fine-Grained Selection Communication and the Hippocampus”

First position: Computational Biology & Center for Neural Science  
joint Ph.D. program at NYU

Huichun Zhu (M.S., Logic & Computation, 2006)

Thesis: “Effects of Category Application on Category Learning”

First position: Psychology Ph.D. program at Lehigh

William Nichols (M.S., Logic, Computation, & Methodology, 2007)

Thesis: “Causal Learning and Decision Making: An Empirical Approach”

First position: Analysis practice consultant, Management Concepts Inc.

Ari Klein (Undergraduate honors thesis, Philosophy, 2008)

Thesis: “Locke and Nietzsche: God as the Distinction between  
Two Epistemological Perspectives”

Rob Tillman (Ph.D., Logic, Computation, & Methodology, in progress)

Daniel Malkiel (M.S., Logic, Computation, & Methodology, in progress)

**Committee member / Second reader**

Umit Guvenc (Ph.D., Engineering & Public Policy, 2005)

James Soto (M.S., Logic & Computation, 2005)

Stephen Fancsali (Ph.D., Logic, Computation, & Methodology, in progress)

Conor Mayo-Wilson (Ph.D., Logic, Computation, & Methodology, in progress)

Jonah Schupbach (Ph.D., History & Philosophy of Science (Pitt), in progress)

Michael Frenor (M.S., Logic, Computation, & Methodology, in progress)