

## Larry Birnbaum

Northwestern University  
Computer Science Division /  
EECS Department  
2133 Sheridan Road, 3-337  
Evanston, IL 60208

*home:*  
2328 Hartzell Street  
Evanston, IL 60201

(847) 491-3640

[l-birnbaum@northwestern.edu](mailto:l-birnbaum@northwestern.edu)

<http://infolab.northwestern.edu>

### Education

B.S. 1977, M.S. 1980, Ph.D. (Computer Science) 1986, Yale University

### Employment

Northwestern University:

- Computer Science Division, Dept. of Electrical Engineering and Computer Science: *Professor of Computer Science*, 2013-present. *Associate Professor*, 1995-2013. *Assistant Professor*, 1989-1995. *Head*, Computer Science Division, 2014-present. *Chair*, Computer Science, 1998-2002.
- Medill School of Journalism, Media, Integrated Marketing Communications: *Professor of Journalism (by courtesy)*, 2013-2017. *Associate Professor*, 2009-2013.
- School of Education and Social Policy: *Associate Professor of Learning Sciences (by courtesy)*, 1995-2010. *Assistant Professor*, 1992-1995.
- Intelligent Information Laboratory (InfoLab): *Co-Director*, 2005-present.
- Program in Technology and Social Behavior: *Member*, 2007-present.
- Farley Center for Entrepreneurship and Innovation, McCormick School of Engineering and Applied Science: *Faculty Fellow*, 2013-present.
- Northwestern Data Science Initiative: *Steering Committee*, 2015-present.
- Medill-McCormick Center for Innovation in Technology, Media and Journalism: *Management Committee*, 2009-2016; *Director*, 2011-2014.
- Knight Lab: *PI / co-PI*, 2010-2016; *Interim Executive Director*, 2011.
- Shepard Residential College: *Fellow*, 2010-2016. *Associate Master*, 2012-2015.
- The Garage, Northwestern University, Innovation and New Ventures Office: *Program Committee*, 2014-2015.
- Information Technology Development Laboratory (DevLab): *Director IP Management*, 2001-2004.
- The Institute for the Learning Sciences: *Faculty Fellow*, 1989-2000.

Yale University:

- Dept. of Computer Science: *Assistant Professor*, 1987-1989. *Lecturer*, 1983-1987. *Research Assistant*, 1979-1982. *Teaching Assistant*, 1979-1980. *Developer*, 1977-1978.

Narrative Science Inc., Chicago, IL:

- *Co-Founder* and *Chief Scientific Advisor*, 2010-present.

Coda Media Inc.:

- *Member*, Board of Advisors, 2014-present.

Allvoices, Inc., San Francisco, CA:

- *Co-Founder* and *Scientific Advisor*, 2007-2011.

Asset Learning, Inc., Troy, MI:

- *Scientific Advisor*, 2004-2009.

MediaRiver (formerly Intellect), Inc., Chicago, IL:

- *Co-Founder* and *Scientific Advisor*, 2002-2008.

### **Professional activities**

Editorial board, *Journal of Pragmatics*, 1984-87.

Organizing committee, 1988 AAAI Workshop on Plan Recognition, St. Paul, MN, August, 1988.

Review committee, "Development and Change in Planning Skills Throughout the Life Span," National Institute of Child Health and Human Development, NIH, Bethesda, MD, October, 1988.

Program committee, 1989 Workshop on Case-Based Reasoning, Pensacola, FL, May, 1989.

Editorial board, *Journal of the Learning Sciences*, 1990-92.

Program co-chair, Eighth International Workshop on Machine Learning, Evanston, IL, June, 1991.

Program committee, 1991 AAAI Conference, Anaheim, CA, August, 1991.

Program committee, Ninth International Conference on Machine Learning, Aberdeen, Scotland, U.K., June, 1992.

Program committee, Tenth International Conference on Machine Learning, Amherst, MA, June, 1993.

Program committee, 1993 AAAI Conference, Washington, DC, July, 1993.

Organizing committee, 1993 IJCAI Workshop on “Models of Teaching and Models of Learning,” Chamberry, France, August, 1993.

Program committee, Tenth IEEE Conference on Artificial Intelligence for Applications, San Antonio, TX, March, 1994.

Program committee, Second International Conference on the Learning Sciences, Evanston, IL, July, 1996.

Senior member, program committee, 1996 AAAI Conference, Portland, OR, August, 1996.

Program committee, Fourth International Conference on Artificial Intelligence Planning Systems (AIPS-98), Pittsburgh, PA, June, 1998.

Program committee, 1998 AAAI Conference, Madison, WI, August, 1998.

Program committee, 1999 International Conference on Intelligent User Interfaces, Redondo Beach, CA, January, 1999.

Program co-chair, 1999 AAAI Workshop on Intelligent Information Systems, Orlando, FL, August, 1999.

Program committee, 2000 International Conference on Intelligent User Interfaces, New Orleans, LA, January, 2000.

Program committee, 2002 International Conference on Intelligent User Interfaces, San Francisco, CA, January, 2002.

Program committee, 2002 AAAI Conference, Edmonton, Alberta, Canada, July, 2002.

Program committee, 2003 International Conference on Intelligent User Interfaces, Miami Beach, FL, January, 2003.

Program committee, 2003 Cognitive Science Conference, Boston, MA, June, 2003.

Program committee, 2003 International Conference on Knowledge Capture, Sanibel Island, Florida, October, 2003.

Program co-chair (short papers track), 2004 International Conference on Intelligent User Interfaces, Madeira, Portugal, January, 2004.

Program committee, 2004 International Conference on Computer-Aided Design of User Interfaces, Madeira, Portugal, January, 2004.

Program committee, Special Track on “AI and the Web,” 2004 FLAIRS Conference, Miami Beach, FL, May, 2004.

Program committee, 2005 International Conference on Intelligent User Interfaces, San Diego, CA, January, 2005.

Program committee, 2005 International Conference on Knowledge Capture, Banff, Alberta, Canada, October, 2005.

Program committee, 2006 International Conference on Intelligent User Interfaces, Sydney, Australia, January, 2006.

Program committee, 2006 AAAI Conference, Boston, MA, July, 2006.

Program committee, 2007 International Conference on Intelligent User Interfaces, Hawaii, January, 2007.

Program committee, 2007 AAAI Conference, Vancouver, Canada, July, 2007.

Program committee, 2008 International Conference on Intelligent User Interfaces, Maspalomas, Canary Islands, January, 2008.

Program committee, 2009 IUI Workshop on Story Understanding, Common Sense, and Intelligent User Interfaces, Sanibel Island, FL, January, 2009.

Senior program committee, 2013 International Conference on Intelligent User Interfaces, January, 2013.

Senior program committee, 2014 International Conference on Intelligent User Interfaces, Haifa, Israel, January, 2014.

Program committee, 2014 Computation + Journalism Symposium, Columbia University, New York, NY, October, 2014.

Organizing committee and program committee, 2015 Computation + Journalism Symposium, Columbia University, New York, NY, October, 2015.

Program committee, 2016 International Conference on Intelligent User Interfaces, Sonoma, CA, March, 2016.

Organizing committee, 2016 IJCAI Workshop, “Natural Language Processing Meets Journalism,” New York, NY, July, 2016.

Organizing committee and program committee, 2016 Computation + Journalism Symposium, Stanford University, Stanford, CA, September, 2016.

Program and organizing co-Chair, 2017 Computation + Journalism Symposium, Northwestern University, Evanston, IL, October, 2017.

Senior program committee, 2018 IJCAI, Stockholm, Sweden, July, 2018 (upcoming).

### **Consulting**

Past and present clients include: Abbott Laboratories; Accenture; Allvoices; Ameritech (now AT&T); Asset Learning; Beyond Broadcast; Buzz Labs; Chemical Abstracts Service; Cognitive Arts; Diamond Technology Partners (now PwC Diamond Advisory Services); Elucidate; Inciscent Technologies; General Motors; Honeywell; MediaRiver (formerly Intellect); Mitre; Narrative Science; Northern Trust; Pacific Northwest National Laboratory.

### **Courses taught**

- Innovation in Technology, Media, and Journalism
- Natural Language Processing
- Practicum in Intelligent Information Systems
- Building AI Applications with IBM Watson
- Human-Computer Interaction
- Educational Software Design
- Memory and Learning
- Introduction to Artificial Intelligence
- Methodology of AI and Cognitive Science
- Problem Solving by Computer
- Introduction to Computer Science for Majors (I and II)
- Introduction to Cognitive Science
- Data Structures
- Introduction to Computer Programming

### **Publications**

#### **Journals**

1. Schank, R., Lebowitz, M., and **Birnbaum, L.** An integrated understander. *American Journal of Computational Linguistics*, vol. 6, 1980, pp. 13-30.
2. Stefik, M., Aikens, J., Balzer, R., Benoit, J., **Birnbaum, L.**, Hayes-Roth, F., and Sacerdoti, E. The organization of expert systems: A tutorial. *Artificial Intelligence*, vol. 18, 1982, pp. 135-173.

3. Schank, R., **Birnbaum, L.**, and Mey, J. Integrating semantics and pragmatics. *Quaderni di Semantica*, vol. 6, 1985, pp. 313-325.
4. **Birnbaum, L.** Inferential memory and linguistic creativity. *Metaphor and Symbolic Activity*, vol. 5, 1990, pp. 175-193.
5. **Birnbaum, L.** Rigor mortis: A response to Nilsson's 'Logic and artificial intelligence.' *Artificial Intelligence*, vol. 47, 1991, pp. 57-77.
6. Ferguson, W., Bareiss, R., **Birnbaum, L.**, and Osgood, R. ASK systems: An approach to the realization of story-based teachers. *Journal of the Learning Sciences*, vol. 2, 1992, pp. 95-134.
7. Stefik, M., Aikens, J., Balzer, R., Benoit, J., **Birnbaum, L.**, Hayes-Roth, F., and Sacerdoti, E. Retrospective on 'The organization of expert systems: A tutorial.' *Artificial Intelligence*, vol. 59, 1993, pp. 221-224.
8. Cooper, P., **Birnbaum, L.**, and Brand, M. Causal scene understanding. *Computer Vision and Image Understanding*, vol. 62, 1995, pp. 215-231.
9. Leake, D., **Birnbaum, L.**, Hammond, K., Marlow, C., and Yang, H. Integrating diverse information resources in a case-based design environment. *Engineering Applications of Artificial Intelligence*, vol. 12, 1999, pp. 705-716.
10. Medin, D., Schwartz, H., Blok, S., and **Birnbaum, L.** The semantic side of decision-making. *Psychonomic Bulletin and Review*, vol. 6, 1999, pp. 562-569.
11. Johnson, C., **Birnbaum, L.**, Bareiss, R., and Hinrichs, T. War stories: Harnessing organizational memories to support task performance. *ACM Intelligence*, vol. 11, 2000, pp. 16-31.
12. Budzik, J., Hammond, K., and **Birnbaum, L.** Information access in context. *Knowledge-Based Systems*, vol. 14, 2001, pp. 37-53.

#### Stringently refereed conferences

13. Schank, R., Lebowitz, M., and **Birnbaum, L.** Parsing directly into knowledge structures. *Proceedings of the Sixth International Joint Conference on Artificial Intelligence*, Tokyo, Japan, 1979, pp. 772-777.
14. **Birnbaum, L.**, Flowers, M., and McGuire, R. Towards an AI model of argumentation. *Proceedings of the First National Conference on Artificial Intelligence*, Stanford, CA, 1980, pp. 313-315.
15. McGuire, R., **Birnbaum, L.**, and Flowers, M. Opportunistic processing in arguments. *Proceedings of the Seventh International Joint Conference on Artificial Intelligence*, Vancouver, B.C., 1981, pp. 58-60.

16. **Birnbaum, L.** Argument molecules: A functional representation of argument structure. *Proceedings of the Second National Conference on Artificial Intelligence*, Pittsburgh, PA, 1982, pp. 63-65.
17. **Birnbaum, L.**, and Collins, G. Opportunistic planning and Freudian slips. In *Proceedings of the Sixth Cognitive Science Conference*, Boulder, CO, 1984, pp. 124-127.
18. **Birnbaum, L.** Lexical ambiguity as a touchstone for theories of language analysis. *Proceedings of the Ninth International Joint Conference on Artificial Intelligence*, Los Angeles, CA, 1985, pp. 815-820.
19. **Birnbaum, L.** A short note on opportunistic planning and memory in arguments. *Proceedings of the Ninth International Joint Conference on Artificial Intelligence*, Los Angeles, CA, 1985, pp. 281-283.
20. Collins, G., **Birnbaum, L.**, and Krulwich, B. An adaptive model of decision-making in planning. *Proceedings of the Eleventh International Joint Conference on Artificial Intelligence*, Detroit, MI, 1989, pp. 511-516.
21. **Birnbaum, L.** A critical look at the foundations of autonomous syntactic analysis. *Proceedings of the Eleventh Cognitive Science Conference*, Ann Arbor, MI, 1989, pp. 99-106.
22. Krulwich, B., Collins, G., and **Birnbaum, L.** Cross-domain transfer of planning strategies: Alternative approaches. *Proceedings of the Twelfth Cognitive Science Conference*, Cambridge, MA, 1990, pp. 954-961.
23. **Birnbaum, L.**, Collins, G., Freed, M., and Krulwich, B. Model-based diagnosis of planning failures. *Proceedings of the Eighth National Conference on Artificial Intelligence*, Boston, MA, 1990, pp. 318-323.
24. Brand, M., and **Birnbaum, L.** Noticing opportunities in a rich environment. *Proceedings of the Twelfth Cognitive Science Conference*, Cambridge, MA, 1990, pp. 245-252.
25. Schank, R., Ferguson, W., **Birnbaum, L.**, Barger, J., and Greising, M. ASK Tom: An experimental interface for video case libraries. *Proceedings of the Thirteenth Cognitive Science Conference*, Chicago, IL, 1991, pp. 570-575.
26. Jona, M., Bell, B., and **Birnbaum, L.** Button Theory: A taxonomy of student-teacher communication for interface design in computer-based learning environments. *Proceedings of the Thirteenth Cognitive Science Conference*, Chicago, IL, 1991, pp. 765-769.
27. Collins, G., **Birnbaum, L.**, Krulwich, B., and Freed, M. Plan debugging in an intentional system. *Proceedings of the Twelfth International Joint Conference on Artificial Intelligence*, Sydney, Australia, 1991, pp. 353-358.

28. Krulwich, B., **Birnbaum, L.**, and Collins, G. Learning several lessons from one experience. *Proceedings of the Fourteenth Cognitive Science Conference*, Bloomington, IN, 1992, pp. 242-247.
29. Shafto, E., Bareiss, R., and **Birnbaum, L.** A memory architecture for case-based argumentation. *Proceedings of the Fourteenth Cognitive Science Conference*, Bloomington, IN, 1992, pp. 307-312.
30. Freed, M., Krulwich, B., **Birnbaum, L.**, and Collins, G. Reasoning about performance intentions. *Proceedings of the Fourteenth Cognitive Science Conference*, Bloomington, IN, 1992, pp. 7-12.
31. Brand, M., **Birnbaum, L.**, and Cooper, P. Seeing is believing: Why vision needs semantics. *Proceedings of the Fourteenth Cognitive Science Conference*, Bloomington, IN, 1992, pp. 720-725.
32. **Birnbaum, L.**, Brand, M., and Cooper, P. Looking for trouble: Using causal semantics to direct focus of attention. *Proceedings of the Fourth International Conference on Computer Vision*, Berlin, 1993, pp. 49-56.
33. Brand, M., **Birnbaum, L.**, and Cooper, P. Sensible scenes: Visual understanding of complex structures through causal analysis. *Proceedings of the Eleventh National Conference on Artificial Intelligence*, Washington, DC, 1993, pp. 588-593.
34. Cooper, P., **Birnbaum, L.**, Halabe, D., Brand, M., and Prokopowicz, P. Divided we fall: Causal reasoning about scenes with occlusion. *Proceedings of the 1994 European Conference on Computer Vision*, Stockholm, Sweden, 1994.
35. Krulwich, B., **Birnbaum, L.**, and Collins, G. Determining what to learn through component-task modeling. *Proceedings of the Fourteenth International Joint Conference on Artificial Intelligence*, Montreal, Canada, 1995, pp. 439-445.
36. Hinrichs, T., Bareiss, R., **Birnbaum, L.**, and Collins, G. An interface design tool based on explicit task models. *Human Factors in Computing Systems—CHI 96 Conference Companion*, Vancouver, Canada, 1996, pp. 269-270.
37. **Birnbaum, L.**, Bareiss, R., Hinrichs, T., and Johnson, C. Interface design based on standardized task models. *Proceedings of the 1998 International Conference on Intelligent User Interfaces*, San Francisco, CA, 1998, pp. 65-72.
38. Johnson, C., **Birnbaum, L.**, Bareiss, R., and Hinrichs, T. Integrating organizational memory and performance support. *Proceedings of the 1999 International Conference on Intelligent User Interfaces*, Redondo Beach, CA, 1999, pp. 127-134.
39. Leake, D., **Birnbaum, L.**, Hammond, K., Marlow, C., and Yang, H. Integrating information resources: A case study of engineering design support. In *Proceedings of the Third International Conference on Case-Based Reasoning (ICCBR-99)*,



Munich, Germany, July, 1999, pp. 482-496. (“Outstanding Applications Paper” award.)

40. Crossen, A., Budzik, J., Warner, M., **Birnbaum, L.**, and Hammond, K. XLibris: An automated library research assistant. *Proceedings of the 2001 International Conference on Intelligent User Interfaces*, Santa Fe, NM, 2001, pp. 49-52.
41. Leake, D., **Birnbaum, L.**, Hammond, K., Marlow, C., and Yang, H. An integrated interface for proactive, experience-based design support. *Proceedings of the 2001 International Conference on Intelligent User Interfaces*, Santa Fe, NM, 2001, pp. 101-108.
42. Johnson, C., **Birnbaum, L.**, Bareiss, R., and Hinrichs, T. Improved performance support through an integrated task-based video case library. *Proceedings of the Fifth International Conference on Case-Based Reasoning (ICCBR-01)*, Vancouver, Canada, 2001.
43. Krema, M., **Birnbaum, L.**, Budzik, J., and Hammond, K. *Themometers and thermostats*: Characterizing and controlling thematic attributes of information. *Proceedings of the 2002 International Conference on Intelligent User Interfaces*, San Francisco, CA, 2002, pp. 196-197.
44. Livingston, K., Dredze, M., Hammond, K., and **Birnbaum, L.** Beyond broadcast. *Proceedings of the 2003 International Conference on Intelligent User Interfaces*, Miami, FL, 2003, pp. 260-262.
45. Sood, S., Hammond, K., and **Birnbaum, L.** Low-fidelity location-based information systems. *Proceedings of the 2004 International Conference on Intelligent User Interfaces*, Funchal, Madeira, Portugal, 2004, pp. 325-327.
46. **Birnbaum, L.**, Hopp, W., Iravani, S., Livingston, K., Shou, B., and Tirpak, T. Task aware information access for diagnosis of manufacturing problems. *Proceedings of the 2005 International Conference on Intelligent User Interfaces*, San Diego, CA, 2005, pp. 308-310.
47. Forbus, K., **Birnbaum, L.**, Wagner, E., Baker, J., and Witbrock, M. Combining analogy, intelligent information retrieval, and knowledge integration for analysis: A preliminary report. *Proceedings of the 2005 International Conference on Intelligence Analysis*, McLean, VA, 2005.
48. Forbus, K., Riesbeck, C., **Birnbaum, L.**, Livingston, K., Sharma, A., and Ureel, L. Integrating NL, KRR, and analogical processing to learn by reading. *Proceedings of the 22<sup>nd</sup> AAAI Conference on Artificial Intelligence*, Vancouver, Canada, 2007, pp. 1542-1547.
49. Liu, J., Wagner, E., and **Birnbaum, L.** Compare&Contrast: Using the web to discover comparable cases for news stories. *Proceedings of the 16<sup>th</sup> International World Wide Web Conference*, Banff, Canada, 2007, pp. 541-550.

50. Liu, J., and **Birnbaum, L.** Measuring semantic similarity between named entities by searching the web directory. *Proceedings of the 2007 International Conference on Web Intelligence*, Fremont, CA, 2007.
51. Nichols, N., Liu, J., Pardo, B., Hammond, K., and **Birnbaum, L.** Learning to gesture: Applying appropriate animations to spoken text. *Proceedings of the 15<sup>th</sup> ACM International Conference on Multimedia*, Augsburg, Germany, 2007.
52. Sood, S., Owsley, S., Hammond, K., and **Birnbaum, L.** TagAssist: Automatic tag suggestions for blog posts. *Proceedings of the First International Conference on Weblogs and Social Media*, Boulder, CO, 2007, pp. 177-183. (Best paper award.)
53. Liu, J., **Birnbaum, L.**, and Pardo, B. Categorizing bloggers' interests based on short snippets of blog posts. *Proceedings of the 17<sup>th</sup> ACM Conference on Information and Knowledge Management*, Napa, CA, 2008.
54. Liu, J., and **Birnbaum, L.** What do they think? Aggregating local views about news events and topics. *Proceedings of the 17<sup>th</sup> International World Wide Web Conference*, Beijing, China, 2008.
55. Nichols, N., Hammond, K., **Birnbaum, L.**, and Gandy, L. Pivot: Automatically offering information and services to real-world shoppers. *Proceedings of the 2<sup>nd</sup> International Conference and Exhibition on Next Generation Mobile Applications and Technologies*, Cardiff, Wales, UK, 2008.
56. Iacobelli, F., Hammond, K., and **Birnbaum, L.** Social media meets automatic content generation. *Proceedings of the Third International Conference on Weblogs and Social Media*, San Jose, CA, 2009.
57. Liu, J., **Birnbaum, L.**, and Pardo, B. Spectrum: Retrieving different points of view from the blogosphere. *Proceedings of the Third International Conference on Weblogs and Social Media*, San Jose, CA, 2009.
58. Wagner, E., Liu, J., **Birnbaum, L.**, and Forbus, K. Rich interfaces for reading news on the web. *Proceedings of the 2009 International Conference on Intelligent User Interfaces*, Sanibel Island, FL, 2009.
59. Wagner, E., **Birnbaum, L.**, and Forbus, K. Modeling multiple-event situations across news articles. *Proceedings of the Fifth International Conference on Knowledge Capture*, Redondo Beach, CA, 2009, pp. 207-8.
60. Iacobelli, F., **Birnbaum, L.**, and Hammond, K. Tell me more, not just "More of the same". *Proceedings of the 2010 International Conference on Intelligent User Interfaces*, Hong Kong, China, 2010.

61. O'Banion, S., **Birnbaum, L.**, and Bradley, S. Finding the local angle in national news. *Proceedings of the 2013 International Conference on Intelligent User Interfaces*, Santa Monica, CA, 2013.
62. O'Banion, S., and **Birnbaum, L.** Using explicit linguistic expressions of preference in social media to predict voting behavior. *Proceedings of the 2013 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining*, Niagara Falls, Canada, 2013. (Best paper award.)
63. **Birnbaum, L.**, Boon, M., Bradley, S., and Wilson, J. The news context project. *Proceedings of the 2015 International Conference on Intelligent User Interfaces*, Atlanta, GA, 2015.
64. Cohn, J., Kuntz, A, and **Birnbaum, L.** AttitudeBuzz: Using social media data to localize complex attitudes. *Proceedings of the 2015 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining*, Paris, France, 2015.
65. Noraset, T., Liang, C., **Birnbaum, L.**, and Downey, D. Definition modeling: Learning to define word embeddings in natural language. *Proceedings of the 31<sup>st</sup> AAAI Conference on Artificial Intelligence*, San Francisco, CA, 2017.
66. Cohn, J., Muthukumar, S., and **Birnbaum, L.** Ranking content on semantic dimensions: A multi-objective approach. *Proceedings of the 2017 IEEE/ACM Conference on Advances in Social Networks Analysis and Mining*, Sydney, Australia, 2017.

#### **Book chapters and proceedings edited**

67. **Birnbaum, L.**, and Selfridge, M. Conceptual analysis of natural language. In R. Schank and C. Riesbeck, eds., *Inside Computer Understanding*, Lawrence Erlbaum, Hillsdale, NJ, 1981, pp. 318-353.
68. Flowers, M., McGuire, R., and **Birnbaum, L.** Adversary arguments and the logic of personal attacks. In W. Lehnert and M. Ringle, eds., *Strategies for Natural Language Processing*, Lawrence Erlbaum, Hillsdale, NJ, 1982, pp. 275-294.
69. Stefik, M., Aikens, J., Balzer, R., Benoit, J., **Birnbaum, L.**, Hayes-Roth, F., and Sacerdoti, E. The architecture of expert systems. In F. Hayes-Roth, D. Waterman, and D. Lenat, eds., *Building Expert Systems*, Addison-Wesley, Reading, MA, 1983, pp. 89-126.
70. Stefik, M., Aikens, J., Balzer, R., Benoit, J., **Birnbaum, L.**, Hayes-Roth, F., and Sacerdoti, E. Basic concepts for building expert systems. In F. Hayes-Roth, D. Waterman, and D. Lenat, eds., *Building Expert Systems*, Addison-Wesley, Reading, MA, 1983, pp. 59-86.

71. Schank, R., and **Birnbaum, L.** Memory, meaning, and syntax. In T. Bever, J. Carroll, and L. Miller, eds., *Talking Minds: The Study of Language in Cognitive Science*, MIT Press, Cambridge, MA, 1984, pp. 209-251.
72. **Birnbaum, L.** Let's put the AI back in NLP. In Y. Wilks, ed., *Theoretical Issues in Natural Language Processing*, Lawrence Erlbaum, Hillsdale, NJ, 1989, pp. 118-121.
73. **Birnbaum, L.** Complex features in planning and understanding: Problems and opportunities for connectionism. In J. Barnden and J. Pollack, eds., *Advances in Connectionist and Neurally Oriented Computation, Volume 1: High-Level Connectionist Models*, Ablex, Norwood, NJ, 1991, pp. 340-350.
74. **Birnbaum, L.** (Editor). *The International Conference on the Learning Sciences: Proceedings of the 1991 Conference*. Association for the Advancement of Computing in Education, Charlottesville, VA, 1991.
75. **Birnbaum, L.**, and Collins, G. (Editors). *Machine Learning: Proceedings of the Eighth International Workshop*. Morgan Kaufmann, San Mateo, CA, 1991.
76. Collins, G., and **Birnbaum, L.** Learning strategic concepts in competitive planning: An explanation-based approach to the transfer of knowledge across domains. In R. Spencer-Smith and S. Torrance, eds., *Machinations: Computational Studies of Logic, Language, and Cognition*, Ablex, Norwood, NJ, 1992, pp. 155-189.
77. **Birnbaum, L.**, and Collins, G. Opportunistic planning and Freudian slips. In B. Baars, ed., *Experimental Slips and Human Error: Exploring the Architecture of Volition*, Plenum, New York, 1992, pp. 121-125.
78. **Birnbaum, L.** Rigor mortis: A response to Nilsson's 'Logic and artificial intelligence.' In D. Kirsh, ed., *Foundations of Artificial Intelligence*, MIT Press, Cambridge, MA, 1992, pp. 57-77.
79. Collins, G., **Birnbaum, L.**, Krulwich, B., and Freed, M. The role of self-models in learning to plan. In A. Meyrowitz and S. Chipman, eds., *Foundations of Knowledge Acquisition: Machine Learning*. Kluwer, Boston, 1993, pp. 117-143.
80. **Birnbaum, L.**, Ferguson, W., and Jona, M. Using content-based AI to structure human-computer interaction. In A. Ortony, J. Slack, and O. Stock, eds., *Communication from an Artificial Intelligence Perspective: Theoretical and Applied Issues*, Springer, Heidelberg, 1993, pp. 191-204.
81. Schank, R., and **Birnbaum, L.** Enhancing intelligence. In J. Khalfa, ed., *What Is Intelligence?* Cambridge University Press, Cambridge, England, 1994, pp. 72-106.
82. Hammond, K., and **Birnbaum, L.** (Editors). *Intelligent Information Systems: Papers from the AAAI Workshop*, Orlando, FL, 1999.

83. Iacobelli, F., Nichols, N., **Birnbaum, L.**, and Hammond, K. Information finding with robust entity detection: The case of an online news reader. In M. Zacarias and J. Valente de Oliveira, eds., *Human-Computer Interaction: The Agency Perspective*, Springer, Heidelberg, Germany, 2012.

#### Other conferences and workshops

84. Reinhardt, V., Peters, H., and **Birnbaum, L.** Field operable hydrogen maser design. In *Proceedings of the Eighth Annual PTTI (Precise Time and Time Interval) Meeting*, Washington, DC, 1976.
85. Schank, R., **Birnbaum, L.**, and Mey, J. Integrating semantics and pragmatics. In *Proceedings of the Thirteenth International Congress of Linguists*, Tokyo, Japan, 1983, pp. 149-162.
86. **Birnbaum, L.** Let's put the AI back in NLP. In *Proceedings of the Third Conference on Theoretical Issues in Natural Language Processing*, Las Cruces, NM, 1987, pp. 120-123.
87. **Birnbaum, L.**, and Collins, G. An explanation-based approach to the transfer of planning knowledge across domains. *Explanation-Based Learning: Papers from the 1988 AAAI Spring Symposium*, Stanford, CA, pp. 107-111, 1988.
88. **Birnbaum, L.**, and Collins, G. The transfer of experience across planning domains through the acquisition of abstract strategies. In J. Kolodner, ed., *Proceedings of the 1988 Workshop on Case-Based Reasoning*, Morgan Kaufmann, San Mateo, CA, 1988, pp. 61-79.
89. Collins, G., and **Birnbaum, L.** Failure-driven acquisition of strategic planning knowledge: A progress report. *Proceedings of the ONR Workshop on Knowledge Acquisition*, Arlington, VA, 1989.
90. Krulwich, B., Collins, G., and **Birnbaum, L.** Improving decision-making on the basis of experience. *Proceedings of the Sixth International Workshop on Machine Learning*, Ithaca, NY, 1989, pp. 55-57.
91. **Birnbaum, L.**, Collins, G., and Krulwich, B. Issues in the justification-based diagnosis of planning failures. *Proceedings of the Sixth International Workshop on Machine Learning*, Ithaca, NY, 1989, pp. 194-196.
92. **Birnbaum, L.** Panel on "Indexing Vocabulary." In K. Hammond, ed., *Proceedings of the 1989 Workshop on Case-Based Reasoning*, Morgan Kaufmann, San Mateo, CA, 1989, p. 46.
93. **Birnbaum, L.**, and Collins, G. Reminders and engineering design themes: A case study in indexing vocabulary. In K. Hammond, ed., *Proceedings of the 1989*

*Workshop on Case-Based Reasoning*, Morgan Kaufmann, San Mateo, CA, 1989, pp. 47-51.

94. Krulwich, B., **Birnbaum, L.**, and Collins, G. Goal-directed diagnosis of expectation failures. *Automated Abduction: Papers from the 1990 AAAI Spring Symposium*, Stanford, CA, 1990, pp. 116-119.
95. Collins, G., and **Birnbaum, L.** Problem-solver state descriptions as abstract indices for case retrieval. *Case-Based Reasoning: Papers from the 1990 AAAI Spring Symposium*, Stanford, CA, 1990, pp. 32-35.
96. Ferguson, W., Bareiss, R., **Birnbaum, L.**, and Osgood, R. ASK Systems: An approach to story-based teaching. *Proceedings of the 1991 International Conference on the Learning Sciences*, Evanston, IL, 1991, pp. 158-164.
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132. Schank, R., and **Birnbaum, L.** Memory, meaning, and syntax. Research report no. 189, Yale University, Dept. of Computer Science, New Haven, CT, 1980.
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136. Schank, R., Ferguson, W., **Birnbaum, L.**, Barger, J., and Greising, M. ASK Tom: An experimental interface for video case libraries. Technical report no. 10, Northwestern University, The Institute for the Learning Sciences, Evanston, IL, 1991.
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### **Patents and patents pending**

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2. Filtering context-sensitive search results. U.S. Patent 7,610,279. J. Budzik, S. Sood, **L. Birnbaum**, K. Hammond, and A. Crossen. October 27, 2009.
3. Characterizing context-sensitive search results as non-spam. U.S. Patent 7,617,199. J. Budzik, S. Sood, **L. Birnbaum**, K. Hammond, and A. Crossen. November 10, 2009.
4. Displaying context-sensitive ranked search results. U.S. Patent 7,617,200. J. Budzik, S. Sood, **L. Birnbaum**, K. Hammond, and A. Crossen. November 10, 2009.
5. Organizing context-sensitive search results. U.S. Patent 7,627,565. J. Budzik, S. Sood, **L. Birnbaum**, K. Hammond, and A. Crossen. December 1, 2009.
6. Generating a ranked list of search results via result modeling. U.S. Patent 7,644,072. J. Budzik, S. Sood, **L. Birnbaum**, K. Hammond, and A. Crossen. January 5, 2010.
7. Chaining context-sensitive search results. U.S. Patent 7,657,518. J. Budzik, S. Sood, **L. Birnbaum**, K. Hammond, and A. Crossen. February 2, 2010.
8. Method and system for assessing relevant properties of work contexts for use by information services. U.S. Patent 7,836,010. K. Hammond, J. Budzik, and **L. Birnbaum**. November 16, 2010.
9. Interactive task-sensitive assistant. U.S. Patent 7,890,336. **L. Birnbaum**, K. Hammond, and L. Chen. February 15, 2011.
10. Automatic method and system for formulating and transforming representations of context used by information services. U.S. Patent 7,895,595. K. Hammond, J. Budzik, and **L. Birnbaum**. February 22, 2011.
11. Method and system for assessing relevant properties of work contexts for use by information services. U.S. Patent 7,933,906. K. Hammond, J. Budzik, and **L. Birnbaum**. April 26, 2011.
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13. Processing a content item with regard to an event and a location. U.S. Patent 8,352,455. A. Tareen, S. Sood, **L. Birnbaum**, K. Hammond, and E. Sundelof. January 8, 2013.
14. System and method for using data and angles to automatically generate a narrative story. U.S. Patent 8,355,903. **L. Birnbaum**, K. Hammond, N. Allen, and J. Templon. January 15, 2013.

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16. Ranking content items related to an event. U.S. Patent 8,548,996. A. Tareen, E. Sundelof, **L. Birnbaum**, K. Hammond, and S. Sood. October 1, 2013.
17. Configurable and portable method, apparatus, and computer program product for generating narratives using content blocks, angles and blueprint sets. U.S. Patent 8,630,844. N. Nichols, **L. Birnbaum**, and K. Hammond. January 14, 2014.
18. System and method for using data to automatically generate a narrative story. U.S. Patent 8,688,434. **L. Birnbaum**, K. Hammond, N. Allen, and J. Templon. April 1, 2014.
19. Method and system for assessing relevant properties of work contexts for use by information services. U.S. Patent 8,725,725. K. Hammond, J. Budzik, and **L. Birnbaum**. May 13, 2014.
20. Method and apparatus for triggering the automatic generation of narratives. U.S. Patent 8,775,161. N. Nichols, M. Smathers, **L. Birnbaum**, K. Hammond, and L. Adams. July 8, 2014.
21. System and method for using data and derived features to automatically generate a narrative story. U.S. Patent 8,843,363. **L. Birnbaum**, K. Hammond, N. Allen, and J. Templon. September 23, 2014.
22. Method and apparatus for triggering the automatic generation of narratives. U.S. Patent 8,886,520. N. Nichols, M. Smathers, **L. Birnbaum**, K. Hammond, and L. Adams. November 11, 2014.
23. Method and apparatus for triggering the automatic generation of narratives. U.S. Patent 8,892,417. N. Nichols, M. Smathers, **L. Birnbaum**, K. Hammond, and L. Adams. November 18, 2014.
24. Automatic method and system for formulating and transforming representations of context used by information services. U.S. Patent 8,978,033. K. Hammond, J. Budzik, and **L. Birnbaum**. March 10, 2015.
25. Processing a content item with regard to an event and a location. U.S. Patent 9,201,880. A. Tareen, S. Sood, **L. Birnbaum**, K. Hammond, and E. Sundelof. December 1, 2015.
26. Method and apparatus for triggering the automatic generation of narratives. U.S. Patent 9,208,147. N. Nichols, M. Smathers, **L. Birnbaum**, K. Hammond, and L. Adams. December 8, 2015.

27. System and method for using data and angles to automatically generate a narrative story. U.S. Patent 9,251,134. **L. Birnbaum**, K. Hammond, N. Allen, and J. Templon. February 2, 2016.
28. Method and system for assessing relevant properties of work contexts for use by information services. U.S. Patent 9,348,871. K. Hammond, J. Budzik, and **L. Birnbaum**. May 24, 2016.
29. Method and system for assessing relevant properties of work contexts for use by information services. U.S. Patent 9,348,872. K. Hammond, J. Budzik, and **L. Birnbaum**. May 24, 2016.
30. Method and system for assessing relevant properties of work contexts for use by information services. U.S. Patent 9,367,588. K. Hammond, J. Budzik, and **L. Birnbaum**. June 14, 2016.
31. Method and system for assessing relevant properties of work contexts for use by information services. U.S. Patent 9,384,245. K. Hammond, J. Budzik, and **L. Birnbaum**. July 5, 2016.
32. System and method for using data and angles to automatically generate a narrative story. U.S. Patent 9,396,168. **L. Birnbaum**, K. Hammond, N. Allen, and J. Templon. July 19, 2016.
33. Processing a content item with regard to an event. U.S. Patent 9,535,911. A. Tareen, S. Sood, **L. Birnbaum**, K. Hammond, and E. Sundelof. January 3, 2017.
34. Automatic generation of narratives from data using communication goals and narrative analytics. U.S. Patent 9,576,009. K. Hammond, **L. Birnbaum**, N. Nichols, A. Paley, S. Murata, and P. Oplencia. February 21, 2017.
35. Use of tools and abstraction in a configurable and portable system for generating narratives. U.S. Patent 9,697,178. N. Nichols, **L. Birnbaum**, and K. Hammond. July 4, 2017.
36. Automatic generation of narratives from data using communication goals and narrative analytics. U.S. Patent 9,697,197. **L. Birnbaum**, K. Hammond, N. Nichols, A. Paley, S. Murata, and P. Oplencia. July 4, 2017.
37. Automatic generation of narratives from data using communication goals and narrative analytics. U.S. Patent 9,697,492. **L. Birnbaum**, K. Hammond, N. Nichols, A. Paley, S. Murata, and P. Oplencia. July 4, 2017.
38. System and method for using data and angles to automatically generate a narrative story. U.S. Patent 9,720,884. **L. Birnbaum**, K. Hammond, N. Allen, and J. Templon. August 1, 2017.

39. Automatic generation of narratives from data using communication goals and narrative analytics. U.S. Patent 9,720,899. **L. Birnbaum**, K. Hammond, N. Nichols, A. Paley, S. Murata, and P. Opulencia. August 1, 2017.

### **Talks, panels, and paper presentations**

1. Syntax and semantics in language processing. Yale University, Dept. of Linguistics, New Haven, CT, February, 1981.
2. Opportunistic processing in arguments. Seventh IJCAI, Vancouver, B.C., Canada, August, 1981.
3. Problems and prospects in computer intelligence. Yale University, Dept. of Physics, New Haven, CT, December, 1981.
4. Argument molecules: A functional representation of argument structure. 1982 AAAI Conference, Pittsburgh, PA, August, 1982.
5. Integrating semantics and pragmatics. Invited address, 13th International Congress of Linguists, Tokyo, Japan, August, 1982.
6. Thematic memory structures in language processing. 13th International Congress of Linguists, Tokyo, Japan, August, 1982.
7. Opportunistic planning and Freudian slips. Sixth Cognitive Science Conference, Boulder, CO, June, 1984.
8. The role of opportunistic planning in arguments. State University of New York at Buffalo, Dept. of Computer Science, Buffalo, NY, February, 1985.
9. Lexical ambiguity as a touchstone for theories of language analysis. Ninth IJCAI, Los Angeles, CA, August, 1985.
10. A short note on opportunistic planning and memory in arguments. Ninth IJCAI, Los Angeles, CA, August, 1985.
11. Why robots will make Freudian slips: Opportunistic planning and its implications. Cognitive Science Colloquium, Princeton University, Princeton, NJ, February, 1986.
12. Integrated models of explanatory inference in story understanding. New York University, Dept. of Computer Science, New York, NY, November, 1986.
13. Lexical disambiguation in natural language understanding. Second Annual Meeting of the Yale Computer Science Liaison Program, New Haven, CT, November, 1986.
14. Let's put the AI back in NLP. Panelist, Third Conference on Theoretical Issues in Natural Language Processing, Las Cruces, NM, January, 1987.

15. Artificial intelligence and the functional view of the mind. Killeen Chair lecture, St. Norbert College, De Pere, WI, February, 1987.
16. A gentle attack on the role of logic in AI. Commentator, MIT Workshop on the Foundations of Artificial Intelligence, Dedham, MA, June, 1987.
17. An explanation-based approach to the transfer of knowledge across domains. Invited address, Conference on Philosophy and Computation, King's College, London, England, October, 1987.
18. An explanation-based approach to the transfer of knowledge across domains. Third Annual Meeting of the Yale Computer Science Liaison Program, New Haven, CT, November, 1987.
19. Complex features in planning and understanding: Problems and opportunities for connectionism. Workshop on High-Level Connectionist Models, New Mexico State University, Computing Research Laboratory, Las Cruces, NM, April, 1988.
20. Explanatory inference in language comprehension. Computational Linguistics Colloquium Series, Yale University, Dept. of Linguistics, New Haven, CT, April, 1988.
21. Learning and “learnability”: An assessment of recent complexity-theoretic research on induction from an artificial intelligence perspective. Panelist, Workshop on Computational Learning Theory, Massachusetts Institute of Technology, Cambridge, MA, August, 1988.
22. Computational aspects of plan recognition. Keynote address, AAAI Workshop on Plan Recognition, St. Paul, MN, August, 1988.
23. The acquisition of abstract features for cross-contextual reasoning. Fourth Annual Meeting of the Yale Computer Science Liaison Program, New Haven, CT, October, 1988.
24. Computational aspects of plan recognition. Fourth Annual Meeting of the Yale Computer Science Liaison Program, New Haven, CT, October, 1988.
25. Complex features in planning and understanding: Problems and opportunities for connectionism. Neural networks seminar, Yale University, Dept. of Computer Science, New Haven, CT, February, 1989.
26. The transfer of knowledge across planning domains through the acquisition of abstract strategies. International Computer Science Institute, Berkeley, CA, March, 1989.

27. The transfer of knowledge across planning domains through the acquisition of abstract strategies. University of Southern California, Dept. of Computer Science, Los Angeles, CA, March, 1989.
28. The transfer of knowledge across planning domains through the acquisition of abstract strategies. New York University, Dept. of Computer Science, New York, NY, March, 1989.
29. The transfer of knowledge across planning domains through the acquisition of abstract strategies. Massachusetts Institute of Technology, Laboratory for Computer Science, Cambridge, MA, April, 1989.
30. The transfer of knowledge across planning domains through the acquisition of abstract strategies. University of Washington, Dept. of Computer Science, Seattle, WA, April, 1989.
31. The transfer of knowledge across planning domains through the acquisition of abstract strategies. University of Wisconsin, Computer Sciences Dept., Madison, WI, April, 1989.
32. Integrated models of explanatory inference. Johns Hopkins University, Dept. of Computer Science, Baltimore, MD, May, 1989.
33. The transfer of knowledge across planning domains through the acquisition of abstract strategies. Carnegie-Mellon University, School of Computer Science, Pittsburgh, PA, May, 1989.
34. Reminders and engineering design themes: A case study in indexing vocabulary. Panelist and Chair, Panel on "Indexing Vocabulary," 1989 Workshop on Case-Based Reasoning, Pensacola, FL, May, 1989.
35. Integrated models of explanatory inference. Northwestern University, Dept. of Electrical Engineering and Computer Science, Evanston, IL, June, 1989.
36. Issues in the justification-based diagnosis of planning failures. Sixth International Workshop on Machine Learning, Ithaca, NY, July, 1989.
37. A critical look at the foundations of autonomous syntactic analysis. Eleventh Cognitive Science Conference, Ann Arbor, MI, August, 1989.
38. Panel on "Planning and Learning," DARPA Workshop on Planning in the Real World, Clearwater, FL, December, 1989.
39. Problem-solver state descriptions as abstract indices for case retrieval. 1990 AAAI Spring Symposium on Case-Based Reasoning, Stanford, CA, March, 1990.



40. Models of teaching and models of learning. Faculty-to-Faculty Seminar Series, Northwestern University, McCormick School of Engineering and Applied Science, Evanston, IL, May, 1990.
41. Model-based diagnosis of planning failures. 1990 AAAI Conference, Boston, MA, August, 1990.
42. "Extension 720" with Dr. Milton Rosenberg. WGN Radio, Chicago, IL, August, 1990.
43. Using content-based AI to structure human-computer interaction. NATO Advanced Research Workshop on Computational Theories of Communication and Their Applications: Problems and Prospects, Castel Ivano, Trentino, Italy, November, 1990.
44. Case-based reasoning at Northwestern University. Panel on "Case-Based Reasoning," American Express AI Information Exchange, New York, NY, November, 1990.
45. Cross-contextual reminders and memory organization. Odesta Corporation, Evanston, IL, March, 1991.
46. What is semantics for? Northwestern University, Language and Cognition Program, Evanston, IL, May, 1991.
47. Using content-based AI to structure human-computer interaction. Panel on "Conversation and Interaction," First Annual Meeting of the Society for Text and Discourse, Chicago, IL, August, 1991.
48. Every picture tells a story. University of Chicago, Dept. of Computer Science, Chicago, IL, May, 1992.
49. Using content-based AI to structure human-computer interaction. Metropolitan Chicago Chapter, Human Factors Society, Rosemont, IL, June, 1992.
50. Learning and self-models. Fourteenth Cognitive Science Conference, Bloomington, IN, July, 1992.
51. Every picture tells a story. Georgia Institute of Technology, Cognitive Science Colloquium, Atlanta, GA, February, 1993.
52. ASK Systems: Hypermedia case libraries for organizational memory. Panel on "Enhancing Organizational Memory," Ninth IEEE Conference on Artificial Intelligence for Applications, Orlando, FL, March, 1993.
53. Every picture tells a story: Visual understanding as causal analysis. Northwestern University, Integrated Science Program, Evanston, IL, October, 1993.

54. AI as a science of semantics. DePaul University, Dept. of Computer Science, Chicago, IL, November, 1993.
55. "Extension 720" with Dr. Milton Rosenberg. WGN Radio, Chicago, IL, December, 1993.
56. Every picture tells a story: Visual understanding as causal analysis. University of Illinois, Beckman Institute, Urbana, IL, January, 1994.
57. Knowledge organization in the small and in the large. Users Council Meeting, OCLC Online Computer Library Center, Inc., Dublin, OH, May, 1994.
58. Seeing reasons. Workshop on Reasons, Northwestern University, Dept. of Psychology, Evanston, IL, June, 1994.
59. A little semantics goes a long way. Northwestern University, Dept. of Electrical Engineering and Computer Science, Evanston, IL, November, 1994.
60. The "mentor in a box": Apprenticeship training for the next century. International Association of Machinists / Boeing "Quality Through Training" Program, Tukwila, WA, January, 1995.
61. It's the content, silly! Panel on "Compelling Intelligent User Interfaces: How Much AI?", 1997 International Conference on Intelligent User Interfaces, Orlando, FL, January, 1997.
62. A little semantics goes a long way: The night watchman and other stories. Massachusetts Institute of Technology, Media Laboratory, Cambridge, MA, March, 1997.
63. A little semantics goes a long way: The night watchman and other stories. University of Chicago, Dept. of Computer Science, Chicago, IL, June, 1997.
64. A little semantics goes a long way: The night watchman and other stories. Andersen Consulting, Center for Strategic Technology Research (CSTaR), Northbrook, IL, June, 1997.
65. A little semantics goes a long way: The night watchman and other stories. AI Seminar, University of Michigan, Dept. of Electrical Engineering and Computer Science, October, 1997.
66. A little semantics goes a long way: The night watchman and other stories. Cognitive and CPEP Forum, University of Michigan, Dept. of Psychology, October, 1997.
67. Integrating organizational memory and performance support. Technology Reviews: New Tools and Technology for Training and Education, Northwestern University, Tech Corporate Partners, Evanston, IL, November, 1997.

68. Integrating organizational memory and performance support. Center for LifeLong Learning and Design, University of Colorado, Dept. of Computer Science and Institute of Cognitive Science, Boulder, CO, November, 1997.
69. A little semantics goes a long way: The night watchman and other stories. University of Colorado, Dept. of Computer Science, Boulder, CO, November, 1997.
70. Interface design based on standardized task models. 1998 International Conference on Intelligent User Interfaces, San Francisco, CA, January, 1998.
71. Computers as semantic machines. University of Chicago, Dept. of Computer Science, Chicago, IL, March, 1998.
72. Breaking the syntax barrier. Panel on “Advancing human effectiveness with new technologies: The sky’s the limit,” 42nd Annual Meeting of the Human Factors and Ergonomics Society, Chicago, IL, October, 1998.
73. A little semantics goes a long way: The night watchman and other stories. Carnegie-Mellon University, HCI Institute, Pittsburgh, PA, October, 1998.
74. Don’t build bridges. Panel on “Bridging science and applications,” 1999 International Conference on Intelligent User Interfaces, Redondo Beach, CA, January, 1999.
75. Across the great functional-technical divide. Commentator, 1999 AAAI Workshop on Intelligent Information Systems, Orlando, FL, July, 1999.
76. Go with the task flow. Panel on “Lessons Learned and Suggested Directions on KM/CBR Synergies,” 1999 AAAI Workshop on Exploring Synergies of Knowledge Management and Case-Based Reasoning, Orlando, FL, July, 1999.
77. Discussant, Panel on “Intelligent User Interfaces for Correspondence Domains: Moving IUIs ‘Off the Desktop’,” 2000 International Conference on Intelligent User Interfaces, New Orleans, LA, January, 2000.
78. Journalism and Computer Science: A match made in heaven or a shotgun wedding? Panel on “On the Cutting Edge: The Future of Computer-Assisted Reporting and New Media,” 2000 National Conference on Computer-Assisted Reporting, Lexington, KY, September, 2000.
79. Participant, Symposium on Common Sense Reasoning, St. Thomas, VI, April, 2002.
80. Panelist, Illinois Annual Technology Conference 2002, Chicago, IL, April, 2002.
81. Frictionless information systems. Motorola Homeland Security Technology Summit, Arlington Heights, IL, August, 2002.

82. Watson: A proactive information system for business intelligence. Motorola Corporate Business Intelligence Forum, Schaumburg, IL, September, 2002.
83. “A Life without Friction: Tales from the InfoLab,” Panel co-Chair, 2003 International Conference on Intelligent User Interfaces, Miami, FL, January, 2003.
84. Watson. (With J. Budzik.) Solutions Fair Demo, 2003 Sun Worldwide Education and Research Conference, San Francisco, CA, February, 2003.
85. Meet IChef and Pocket Classmate. (With K. Hammond.) A Day with Northwestern, Northwestern Alumni Association, Evanston, IL, April, 2003.
86. Pinpoint: A decision tree-based knowledge retrieval system. Motorola Advanced Technology Center, Schaumburg, IL, February, 2004.
87. Taskmaster: Automated interactive task guides. Invited presentation, DARPA / IPTO Grand Challenge Workshop, Arlington, VA, January, 2005.
88. Analogy, intelligent IR, and knowledge integration for intelligence analysis. 2005 AAAI Spring Symposium on AI Technologies for Homeland Security, Stanford, CA, March, 2005.
89. Panelist, “Grand Challenges Regarding Using AI for Homeland Security,” AAAI Spring Symposium on AI Technologies for Homeland Security, Stanford, CA, March, 2005.
90. What—if anything—can a semanticist do for you? Semantics in the large and in the small. Invited presentation, ARDA Complex Document Information Processing Grand Challenge Workshop, Chicago, IL, March, 2005.
91. Engaging, connected, emotional: An information avatar for the car. (With A. Shaw.) Ford Motor Company Research and Innovation Center, Dearborn, MI, September 2006.
92. Relational vocabularies and event tracking. (With M. Witbrock.) 2006 Knowledge Discovery and Dissemination Conference, McLean, VA, October 2006.
93. Beyond broadcast. (With S. Sood and K. Hammond.) Motorola Research, Schaumburg, IL, October 2006.
94. Building task-directed case-based reasoning on a robust and scalable substrate. DARPA / IPTO Workshop on Experience-Based Narrative Memory, Arlington, VA, February, 2009.
95. There and back again: Building web-scale CBR. Workshop on WebCBR: Reasoning from Experiences on the Web, Eighth International Conference on Case-Based Reasoning, Seattle, WA, July, 2009.

96. From contextual search to automatic content generation: Scaling human editorial judgment. Thomson Reuters Research, Eagan, MN, September, 2010.
97. From contextual search to automatic content generation: Scaling human editorial judgment. Illinois Institute of Technology, Dept. of Computer Science, Chicago, IL, February, 2011.
98. The Knight News Innovation Laboratory: What does it mean for journalism, for Chicago, and for Northwestern? (With R. Gordon and O. Youngman.) Northwestern University, Medill School of Journalism Faculty Colloquium, Evanston, IL, February, 2011.
99. Beyond question answering. USC Information Sciences Institute, Marina del Rey, CA, February, 2011.
100. Building a memory by telling stories. Workshop on Reasoning with Text, USC Institute for Creative Technologies, Los Angeles, CA, February, 2011.
101. From contextual search to automatic content generation: Scaling human editorial judgment. Northwestern University IEEE Student Branch, Evanston, IL, February, 2011.
102. Crossing the chasm: The process and problems of moving technology into the marketplace. (With K. Hammond.) Dean's Seminar Series, McCormick School of Engineering and Applied Science, Northwestern University, Evanston, IL, April, 2011.
103. Building a memory by telling stories. Cognitive Systems Brown Bag, Northwestern University, Dept. of Electrical Engineering and Computer Science, Evanston, IL, April, 2011.
104. From contextual search to automatic content generation: Scaling human editorial judgment. MIT Media Lab, Cambridge, MA, May, 2011.
105. News innovation at Northwestern. Innovation and New Ventures Office (INVO) Advisory Board Meeting, Northwestern University, Chicago, IL, June, 2011.
106. From contextual search to automatic content generation: Scaling human editorial judgment. Yale University, Dept. of Computer Science, New Haven, CT, October, 2011.
107. From contextual search to automatic content generation: Scaling human editorial judgment. Microsoft Research, Redmond, WA, November, 2011.
108. From contextual search to automatic content generation: Scaling human editorial judgment. Carnegie-Mellon University, Language Technology Institute, Pittsburgh, PA, December, 2011.

109. Panelist, “An Innovator’s Story.” Conference on Creating Jobs through Innovation, Northwestern University, Office of Government Relations, Evanston, IL, December, 2011.
110. Why half of what you read will be written by machine in ten years. Shepard Residential College, Northwestern University, Evanston, IL, February, 2012.
111. Transforming data into stories and insight: Scaling human editorial judgment. Joint seminar, Chicago Chapter ACM and Loyola University Computer Science Department, Chicago, IL, February, 2012.
112. Participant, Active Data Workshop. Pacific Northwest National Laboratory. Held at Mitre Corp., Vienna, VA, February, 2012.
113. From contextual search to automatic content generation: Scaling human editorial judgment. University of Michigan, Computer Science and Engineering AI Colloquium, Ann Arbor, MI, April, 2012.
114. Technology drives transformation: Partnerships for change. A Day with Northwestern, Northwestern Alumni Association, Evanston, IL, April, 2012.
115. From contextual search to automatic content generation: Scaling human editorial judgment. Northwestern University, Science of Networks in Communities (SONIC) Research Group, Evanston, IL, May, 2012.
116. Panelist, “Creating a Startup Based on University Research.” entrepreneur@nu Conference, Northwestern University, Evanston, IL, May, 2012.
117. Meta-stories: Telling stories at scale. Panel, “And Now for Something Completely Different,” MIT-Knight Civic Media Conference, Cambridge, MA, June, 2012.
118. Participant, Pivot Point: Reinventing Community Information for a Participatory Culture. Reynolds Journalism Institute, University of Missouri, held in Chicago, IL, June, 2012.
119. INVO Fellows Lunch Seminar, Innovation and New Ventures Office (INVO), Northwestern University, Evanston, IL, July, 2012.
120. Editorial judgment and artificial intelligence. LitFlow: For the Literature of Tomorrow, German Federal Cultural Foundation, Berlin, Germany, September, 2012.
121. Panelist, “Discussions on the Literature of Tomorrow.” (With K. Goldsmith.) LitFlow: For the Literature of Tomorrow, German Federal Cultural Foundation, Berlin, Germany, September, 2012.

122. Guest lecturer, “Uncreative Writing,” English 111.301 (Prof. K. Goldsmith), University of Pennsylvania, Center for Programs in Contemporary Writing, Dept. of English, Philadelphia, PA, November, 2012.
123. A little AI goes a long way: Building smart, dynamic, and scalable journalism and media systems. (With S. Bradley and S. O’Banion.) Fireside Presentation, Mozilla Festival 2012, London, UK, November, 2012.
124. The future of artificial intelligence in journalism. Panel on “The Future of ‘X,’” Computation + Journalism Symposium 2013, Georgia Institute of Technology, Atlanta, GA, February, 2013.
125. Automated narrative generation. Invited talk, 2013 Annual Conference of the National Federation of Advanced Information Services, Philadelphia, PA, February, 2013.
126. Helping your technology self-actualize. Panel on “How Can We Get the Widest Impact Out of Technology Projects?”, 2013 Conference on Computer-Assisted Reporting, Louisville, KY, March, 2013.
127. From contextual search to automatic content generation: Scaling human editorial judgment. Toyota Technological Institute at Chicago, Chicago, IL, April, 2013.
128. Big data and compelling stories. McCormick Corporate Forum, Northwestern University, Evanston, IL, May, 2013.
129. From data to insight: Telling stories at scale. Keynote address, OCLC / Northwestern University Library Workshop on Collective Insight: Driven by Shared Data, Evanston, IL, May, 2013.
130. From data to insight: Telling stories at scale. Northwestern University Analytics Exchange, Evanston, IL, June, 2013.
131. Telling stories at Internet scale. Joint AAAI-13/IAAI-13 Invited Talk, 27<sup>th</sup> AAAI Conference on Artificial Intelligence and 25<sup>th</sup> Annual Conference on Innovative Applications of Artificial Intelligence, Bellevue, WA, July, 2013.
132. Participant, CENDI Data Jam, White House Office of Science and Technology, Washington, DC, July, 2013.
133. Panelist, “Future of Technologies and Innovation,” 46<sup>th</sup> HOBY World Leadership Congress, Chicago, IL, July, 2013.
134. From contextual search to automatic content generation: Scaling human editorial judgment. Google, Mountain View, CA, July, 2013.
135. Semantics and its vicissitudes: The night watchman and other stories. Google, Mountain View, CA, July, 2013.

136. Panelist, “Jump! NU Knight Lab’s New Tools for Social Journalism and You,” Social Media Week Chicago, Tribeca Flashpoint Media Arts Academy, Chicago, IL, September, 2013.
137. From contextual search to news apps and automatic story generation. NETT Day Conference, Northeastern Illinois University, Chicago, IL, October, 2013.
138. News editors as attentional engineers. Ignite talk, News Foo Camp 2013, Phoenix, AZ, November, 2013.
139. Scaling human editorial judgment. Qatar Computing Research Institute, Doha, Qatar, November, 2013.
140. Telling stories at Internet scale. Panel on “Driving Media Innovation with Big Data,” Symposium on “Big Data, Smart Media? Connecting Content, Audience and Information,” Northwestern University in Qatar, Doha, Qatar, November, 2013.
141. Panelist, Big Data Workshop: Connections, Competencies, and Content, Northwestern University, Evanston, IL, January, 2014.
142. Farley Fellows Seminar, Farley Center for Entrepreneurship and Innovation, Northeastern University, Evanston, IL, February, 2014.
143. Collaborative projects in technology and journalism. Tow Tea, Tow Center for Digital Journalism, Columbia University Graduate School of Journalism, New York, NY, March, 2014.
144. Panelist, Panel on “Computational Storytelling,” Columbia University Series on Computational Journalism, Tow Center for Digital Journalism, Columbia University Graduate School of Journalism, New York, NY, March, 2014.
145. Panelist, Panel on Entrepreneurship, 2014 Academic Career Workshop for Underrepresented Junior Faculty and Senior Graduate Students, Center for Minorities and People with Disabilities in Information Technology, held at Northwestern University, Evanston, IL, March, 2014.
146. Panelist, Panel on “Bots, Drones, Sensors, Wearables, Etc.: The New Tools for Journalists,” 15<sup>th</sup> International Symposium on Online Journalism, Knight Center, University of Texas, Austin, TX, April, 2014.
147. Scaling human editorial judgment. Data Science Seminar, Illinois Institute of Technology, Chicago, IL, April, 2014.
148. Telling stories at Internet scale. GEN Summit 2014, Global Editors Network, Barcelona, Spain, June, 2014.



149. Panelist, Panel on “Death of the Journalist: Can the Human Touch Be Replaced by a Machine?” GEN Summit 2014, Global Editors Network, Barcelona, Spain, June, 2014.
150. Telling stories at Internet scale. Panel on “Robot Reporters,” 2014 Convention of the National Association of Black Journalists, Boston, MA, August, 2014.
151. From contextual search to automatic content generation: Scaling human editorial judgment. Yahoo! Research, Sunnyvale, CA, September, 2014.
152. Telling stories at Internet scale. AMPLab, University of California, Computer Science Division / Dept. of EECS, Berkeley, CA, September, 2014.
153. Panelist, Panel on “Technologies in a Changing Media Landscape,” The New Reality: Exploring the Intersection of New Documentary Forms and Digital Journalism, MIT Open Documentary Lab, Cambridge, MA, October, 2014.
154. Summary remarks, Computation + Journalism Symposium 2014, Brown Center for Media Studies, Columbia University, New York, NY, October 2014.
155. Finding and telling stories at Internet scale. Northwestern University, Learning for Life Lectures on “Big Data: Impact on our Lives,” Chicago, IL, October, 2014.
156. Panelist, Panel on “The Future of Work,” Chicago Council on Science and Technology, Chicago, IL, October, 2014.
157. What we can tell about you from Twitter. ResTalk, Northwestern University, Residential College Board, Evanston, IL, November, 2014.
158. Finding and telling stories at Internet scale. Big Data for Media Conference, International News Media Association (INMA), London, UK, March, 2015.
159. Finding—and telling—stories at Internet scale. Stanford University, Brown Institute for Media Innovation, Stanford, CA, April, 2015.
160. Participant, From Paper to Persona to Payment: Considering a New(s) Ecosystem for News, Information and Privacy. Reynolds Journalism Institute, University of Missouri, held in Chicago, IL, May, 2015.
161. Participant, NSF Workshop on Future Technology to Preserve College Student Health and Foster Wellbeing. Northwestern University, Chicago, IL, July, 2015.
162. Finding—and Telling—Stories at Internet Scale. Crazy Futures III: Media Meaning for Horizon Scanning—Promise and Limits of Natural Language Processing. Government of Romania, Executive Agency for Higher Education, Research, Development and Innovation Funding, held at Green Village, Delta Dunarii, Romania, August, 2015.

163. Narrative Science: Telling stories at Internet scale. Master's Tea, Berkeley College, Yale University, New Haven, CT, October, 2015.
164. Putting news in context, automatically. With M. Boon. 2015 Computation + Journalism Symposium, Brown Institute for Media Innovation, Columbia University, New York, NY, October, 2015.
165. Panel moderator, Internet of Things: Productivity. The Garage, Northwestern University, Evanston, IL, November, 2015.
166. Finding (and telling) stories at Internet scale. Northwestern University Institute on Complex Systems (NICO), Evanston, IL, November, 2015.
167. Participant, Closing Roundtable, *Personalizationpalooza*, NYC Media Lab, held at Hearst Corporation, New York, NY, February, 2016.
168. Finding – and telling! – stories at Internet scale. PRSA Strategic Collaboration Conference, Public Relations Society of America, held at Loyola University, Chicago, IL, May, 2016.
169. Telling stories at Internet scale (or, how I learned to stop worrying and love big data). Keynote talk, 2016 Students of Cognitive Systems Workshop, Conference on Advances in Cognitive Systems, Evanston, IL, June, 2016.
170. The Intelligent Information Lab. Chicago Biomedical Informatics and Data Science Jam, Feinberg School of Medicine, Northwestern University, Chicago, IL, September, 2016.
171. From contextual search to automatic content generation: Scaling human editorial judgment. University of Buenos Aires, Dept. of Computer Science, Buenos Aires, Argentina, November, 2016.
172. Finding and telling stories at Internet scale. Neo Media Lab 9, UNTREF, Teatro Margarita Xirgu, Buenos Aires, Argentina, November, 2016.
173. Panelist, Panel on “Watson – Come Here!”, UBS Global Technology Conference, San Francisco, November, 2016.
174. Finding—and telling—stories at Internet scale. Federal University of Rio de Janeiro, Dept. of Computer Science, Rio de Janeiro, Brazil, November, 2016.
175. The rise of AI and the future of (culture) work. Keynote talk, ArTecnologia III—International Symposium on Technology and Contemporary Culture, Museo de Arte do Rio, Rio de Janeiro, Brazil, November, 2016.
176. Web & Elections: Tweetcast Your Vote. WebScience@10, Web Science Trust 10<sup>th</sup> Anniversary Celebration, Northwestern University, Evanston, IL, November, 2016.

177. Finding—and telling—stories at Internet scale. Accenture Labs, San Jose, CA, January, 2017.
178. Finding—and telling—stories at Internet scale. Northwestern University Machine Learning Meetup, Integrated Data-Driven Discovery in Earth and Astrophysical Sciences / Center for Interdisciplinary Exploration and Research in Astrophysics, Evanston, IL, February, 2017.
179. Panelist, “Get ready for the future: 6 big tech changes in 6 minutes.” Yale Class of 1977 40<sup>th</sup> Reunion, Yale University, New Haven, CT, June, 2017.
180. AI and journalism—Where, what, how, and what does it mean? Lightning talk, Technology panel, Artificial Intelligence: Practice and Implications for Journalism. Tow Center for Digital Journalism and Brown Institute for Media Innovation, Columbia University, New York, NY, June, 2017.
181. Finding—and telling—stories at Internet scale. Tencent AI Lab Rhino-bird Frontier Lecture Series, Tencent, Shenzhen, China, July, 2017.
182. Automating journalism—and augmenting journalists. Workshop on “Robot reporters: What you need to know,” 2017 Convention of the National Association of Black Journalists, New Orleans, LA, August, 2017.
183. Innovation, interface, intelligence throughout the enterprise. Strategic Innovation Summit, Inovo Group LLC, Chicago, IL, September, 2017.
184. Panelist, “Artificial Intelligence and New Technologies.” Managing Disruption Conference, Moody’s Analytics, New York, NY, September, 2017.
185. Panelist, “Innovation in the Data Economy.” IIT Institute of Design, Chicago, IL, October, 2017.
186. From contextual search to automatic content generation: A conversation about applied AI. Dubai University, Dubai, UAE, November, 2017.
187. Panelist, “The Digital Revolution and Its Role in Traditional and Social Media,” Knowledge Summit 2017, MBRF, Dubai, UAE, November, 2017.
188. AI and Machine Learning at Northwestern University. “Artificial Intelligence: The Human-Machine Partnership,” Argonne National Laboratory, Systems Science Center / Global Security Sciences Division, Argonne, IL, November, 2017.

### **Grants and gifts**

1. Learning Strategic Concepts in Competitive Planning. PI/Co-PI with G. Collins. Office of Naval Research, contract no. N00014-89-J-3217, 7/1/89—12/31/90, \$90,366.

2. Case-Based Reasoning. PI/Co-PI with G. Collins. Defense Advanced Research Projects Agency, monitored by the Air Force Office of Scientific Research under contract no. F49620-88-C-0058 (subcontract through Cognitive Systems, Inc.), 7/1/89—7/31/91, \$604,691.
3. Eighth International Workshop on Machine Learning. PI/Co-PI with G. Collins. Office of Naval Research, contract no. N00014-91-J-1756, 5/1/91—10/31/91, \$5,000.
4. Learning in an Intentional System. PI/Co-PI with G. Collins. Air Force Office of Scientific Research, contract no. AFOSR-91-0341-DEF, 8/1/91—7/31/94, \$257,304.
5. Model-Based Human-Computer Interaction. PI/Co-PI with R. Bareiss and G. Collins. Defense Advanced Research Projects Agency, monitored by Rome Laboratory under contract no. F30602-94-C-0219, 7/1/94—8/31/97, \$954,870.
6. Model-Based Mixed Initiative Planning. PI/Co-PI with R. Bareiss and G. Collins. Defense Advanced Research Projects Agency and Rome Laboratory, monitored by Rome Laboratory under contract no. F30602-95-1-0019, 6/1/95—5/31/98, \$598,914.
7. *The Stamping Advisor: A Case-Based Approach*. PI/Co-PI with K. Hammond and D. Leake. Ford Motor Company, 8/15/98—1/15/99, \$39,162.
8. Proactive, Task-Configurable Information Systems. PI/Co-PI with K. Hammond. Ford Motor Company, 6/15/99—7/31/01, \$350,000.
9. Task-Based Observer Systems. PI/Co-PI with K. Hammond. Lockheed-Martin Advanced Technology Laboratory, 7/1/99—12/31/99, \$30,000.
10. Extracting Location-Related Information from On-Line Data Sources. PI/Co-PI with K. Hammond. NEC Laboratories, 10/1/00—4/31/01, \$50,000.
11. GOALI: Principle-Based Knowledge Management System for Cellular Manufacturing. PI/Co-PI with W. Hopp and S. Irvani. National Science Foundation, 10/01/01—9/30/04, \$240,000.
12. Watson Development. PI/Co-PI with K. Hammond. MediaRiver (Intellect), Inc., 2/1/2002—5/31/2005, \$1,275,000.
13. Development of an Intelligent Information System for StarOffice: Exploratory Phase. PI/Co-PI with K. Hammond. Sun Microsystems, 9/1/02—3/31/03, \$48,871.
14. ITR: Analogy, Knowledge Integration, and Task Modeling Tools for Intelligence Analysts. PI/Co-PI with K. Forbus and D. Lenat. National Science Foundation, grant no. IIS-0325315, 9/01/03—8/31/07, \$439,854.

15. Learning by Reading. PI/Co-PI with K. Forbus and C. Riesbeck. Defense Advanced Research Projects Agency, contract no. HROD11-04-1-0051, 9/21/04—9/30/05, \$650,000.
16. Mobius Pilot Project. PI/Co-PI with K. Forbus and C. Riesbeck. Defense Advanced Research Projects Agency (sub-contract through SRI International), 9/1/2005—5/31/2006, \$119,747.
17. Evocative Information Systems for Automotive Applications. PI/Co-PI with K. Hammond. Ford Motor Company (through Ford-Boeing-NU Alliance), 6/1/2006—8/31/2006, \$64,336.
18. Beyond Broadcast. PI/Co-PI with K. Hammond. Motorola, 6/15/2006—9/30/2006, \$46,769.
19. Beyond Broadcast. PI/Co-PI with K. Hammond. Motorola-NU Center for Seamless Communications, 9/1/2006—8/31/2008, \$120,000.
20. Computational Creativity: Building a Model of Machine-Generated Humor. PI/Co-PI with K. Hammond. National Science Foundation, 6/1/2009—5/31/2013, \$712,883.
21. An Architecture and Platform for Frictionless Information Systems. PI/Co-PI with K. Hammond. National Science Foundation, 8/15/2009—8/14/2014, \$500,000.
22. Knight News Innovation Lab. PI/Co-PI with K. Hammond, O. Youngman, and R. Gordon. John S. and James L. Knight Foundation, 2/1/2011—6/30/2016, \$4,220,000.
23. REU Supplement for “An Architecture and Platform for Frictionless Information Systems.” PI/Co-PI with K. Hammond. National Science Foundation, 7/1/2013—8/31/2013, \$4,400.
24. Thematic Characterization of News Stories: A Research and Teaching Proposal. Google, Focused Research Program in Computational Journalism, 12/1/2013—11/31/2015, \$58,100, plus \$20,000 in-kind contribution of Google Cloud services.
25. Google Glass for Dynamically Constructed Theatrical Experiences Using Online Content. PI/Co-PI with K. Hammond. Google, Faculty Research Award, \$5000.
26. The History and Future of the Book: Jump-Starting the Digital Humanities at Northwestern. PI/Co-PI with M. Mueller and D. Downey. Murphy Society, McCormick School of Engineering, Northwestern University, 11/1/2014—8/31/2015, \$15,000.
27. *First Aid*: Task-Focused Conversational Interaction Based on Existing Online Content. Google, Faculty Research Award, 3/1/2017—2/28/2018, \$60,000.

28. Semantic constraints in conversational text generation. PI/Co-PI with D. Downey. Tencent, AI Lab Rhino-Bird Gift Fund, 9/7/2017—9/6/2018, \$30,000.

### **Doctoral students**

1. Bruce Krulwich. Ph.D. awarded December 1993. Dissertation title: *Flexible Learning in a Multi-Component Planning System*. Current positions: Principle Lead, E-Tabs, UK & Israel; Chief Analyst, Grizzly Analytics, Israel; CTO, Cognilyze, Israel.
2. Matthew Brand. Ph.D. awarded December 1994. Dissertation title: *Explanation-Mediated Vision: Making Sense of the World through Causal Analysis*. Current position: MERL Fellow, Mitsubishi Electric Research Laboratories, Cambridge, MA.
3. Michael Freed. Ph.D. awarded June 1998. Dissertation title: *Simulating Human Performance in Complex, Dynamic Environments*. Current position: Program Director, SRI International, Artificial Intelligence Center, Menlo Park, CA.
4. Christopher Johnson. Ph.D. awarded June 1999. Dissertation title: *Integrating Organizational Memory with Performance Support: A Task Model-Based Approach*. Current position: Lead AI Engineer, Mitre Corp., Arlington, VA.
5. Sanjay Sood. (Co-advised with K. Hammond). Ph.D. awarded June 2007. Dissertation title: *The Role of Relevance in Frictionless Information Systems: Building Systems that Delight and Inform*. Current position: VP Highly Automated Driving, HERE, Chicago, IL.
6. Earl Wagner. Ph.D. awarded December 2009. Dissertation title: *Extracting and Aggregating Information about Situations over Time to Present the Context of News*. Current Position: Software Engineer, Google, Inc., Mountain View, CA.
7. Jiahui Liu. Ph.D. awarded December 2009. Dissertation title: *Information Diversity in Web Search*. Current position: Software Engineer, Google, Inc., Mountain View, CA.
8. Francisco Iacobelli. Ph.D. awarded March 2011. Dissertation title: *Augmenting News Stories with Distinct Information*. Current position: Assistant Professor, Northeastern Illinois University, Dept. of Computer Science, Chicago, IL.
9. Patrick McNally. (Co-advised with K. Hammond). Ph.D. awarded December 2013. Dissertation title: *Narrative Constraint Systems: How the Networked Computer can Tell Stories*. Current position: Director of R&D, Guidebook, Inc., Sunnyvale, CA.
10. Shawn O'Banion. Ph.D. awarded June 2014. Dissertation title: *Using Explicit Expressions of Preference and Choice in Social Media for Prediction and Recommendation*. Current position: Software Engineer, Google, Inc., Seattle, WA.

- 11.** Miriam Boon. Current student. Research area: Technology, media, and journalism.
- 12.** Jason Cohn. Current student. Research area: Technology, media, and journalism.
- 13.** Victor Bursztyn. Current student. Research area: Technology, media, and journalism.