Ronald Brachman
VP, Chief Scientist, and Head, Yahoo Labs
Yahoo Labs
Yahoo, Inc.

Awards and honors and year received (list--no more than *five* items):
- ACM Fellow – 1999
- Office of the Secretary of Defense Medal for Exceptional Public Service – 2005
- IEEE Fellow – 2008
- AAAI Distinguished Service Award – 2008
- Yahoo Super Star Leader Award - 2013

Have you previously been involved in any CRA activities? If so, describe.
I have been a member of the CRA Board of Directors since 2010. I am currently serving as the CRA's Treasurer. I organized and chaired an Industry/University Relations panel at Snowbird 2012. Prior to 2010 I had served on the industry program committee for a Snowbird Conference and attended multiple others. While at DARPA I participated on a Snowbird Funding Agency panel and worked directly with CRA leadership.

List any other relevant experience and year(s) it occurred (list--no more than *five* items).
- I served for 9 years as Secretary-Treasurer of the International Joint Conferences on Artificial Intelligence (IJCAI) (1993-2002).
- I served as President of the Association for the Advancement of Artificial Intelligence (then: American Association for Artificial Intelligence) (AAAI) from 2003-2005.
- I was the Director of the Information Processing Technology Office at DARPA from 2002-2005.
- Throughout my career I have served on numerous advisory committees, panels, and task forces for university Computer Science Departments and government agencies, including Princeton, Columbia, Carnegie Mellon, Penn, Johns Hopkins, NSF, NSA, and the Defense Science Board.
- I serve as an advisor for Segovia Technology, which works to provide enterprise technology to help relieve extreme poverty in emerging economies and provide rapid and seamless humanitarian relief through secure, reliable cash transfers.

Research interests: (list only)
- Artificial Intelligence (esp. Knowledge Representation, Machine Learning, and Integrated Intelligent Systems)
- Cognitive Systems

Personal Statement
I have always strived to facilitate my colleagues' and the broader CS community's research success. My research background helps me understand what it takes to produce and communicate top-quality research, and I have always tried to use that understanding to help create supportive environments and exciting programs for others. Through my work at DARPA and my leadership in top industry research labs, I have worked hard to support and grow computing research across many institutions as well as mentor and support career growth in our emerging talent pool. I have also enjoyed helping CRA as Treasurer.

Brief Biography or CV
(Attached)

RONALD J. BRACHMAN

Yahoo Labs
229 W. 43rd St
New York, NY 10036
rjb@yahoo-inc.com

854 Nancy Way
Westfield, New Jersey 07090
ronbrachman@yahoo.com

Education:

Ph.D. (Applied Mathematics), Harvard University, 1977. Thesis entitled, "A Structural Paradigm for Representing Knowledge." Thesis Advisor: W. A. Woods.

S.M. (Applied Mathematics), Harvard University, 1972.

B.S.E. *summa cum laude* (Electrical Engineering), Princeton University, 1971.

AT&T Advanced Management Program, December, 1996; highly selective two-week course in leadership.

Honors and Awards:

Yahoo Super Star Leader Award, October, 2013 (Yahoo's highest internal honor).

Distinguished Service Award, Association for the Advancement of Artificial Intelligence, July, 2008.

IEEE Fellow, January 2008.

Donald E. Walker Distinguished Service Award, International Joint Conferences on Artificial Intelligence, IJCAI-07, Hyderabad, India, January, 2007.

Office of the Secretary of Defense Medal for Exceptional Public Service, 2005.

2004 AAAI Classic Paper Award, Honorable Mention, "For…seminal contributions to understanding the relationship between formal knowledge representations and computational tractability." Awarded to most influential paper from the National Conference on Artificial Intelligence twenty years before the award.

IEEE Senior Member, elected 2002.

Fellow of the Association for Computing Machinery (ACM), elected 1999.

Founding Fellow of the American Association for Artificial Intelligence (AAAI), elected 1990.

Associate, Canadian Institute for Advanced Research, 1988–1993.

Winner (with H. J. Levesque) of Publisher's Prize (award for best paper at the conference), AAAI-84, the Fourth National Conference on Artificial Intelligence, for "The Tractability of Subsumption in Frame-Based Description Languages" — August, 1984.

Fairchild Key Technologist — elected April, 1984.

Phi Beta Kappa, *Tau Beta Pi* — elected 1971.

Eta Kappa Nu — elected 1970.

Winner, Princeton University Class of 1916 Cup (senior varsity letterman with highest academic average) and Lyman Biddle Medal (varsity Crew sportsmanship award) — 1971.

Varsity Captain, Princeton Heavyweight Crew — 1970–71.

Professional Experience:

Yahoo! Inc. (Sunnyvale, CA) – Chief Scientist and Head, Yahoo Labs, April, 2012- .

- Head all of Yahoo Labs worldwide (8 locations, approx. 220 people) and serve as company's Chief Scientist.
- Report directly to the CEO.
- Led significant turnaround in the organization after a sizable layoff/attrition in 2012 – grew from 145 to 235 in less than two years, including more than 100 new PhD's hired.
- Lead and facilitate strong partnerships across all of Yahoo's lines of business, with Labs consistently delivering technology and leadership and contributing materially to products in the hands of hundreds of millions of users. Subject matter supervised includes, but is not limited to machine learning, information retrieval, economics and computational advertising, image and video processing, natural language processing, data science/analytics, theoretical computer science/algorithms, optimization, mobile platforms, human-computer interaction, and systems (including cloud computing, Hadoop, and data management).
- Led the creation and funding of a 5-year $10M partnership with Carnegie Mellon University for joint research in mobile personalized systems (launched in February, 2014).

Yahoo Labs, Yahoo! Inc. (Santa Clara, CA; New York, NY) – Associate Head and Vice President, June, 2011-2012; Vice President, Yahoo! Labs and Research Operations, 2008-2011. Head, Yahoo Academic Relations, 2007-2012.

- Organizational executive sponsor and mentor, Accelerated Development Program for Top Women in Technology, 2011-2012.
- In 2011, expanded role to Associate Head of Yahoo Labs, with general broader responsibility for integrating business thinking and execution into science and research mission, broad representation of Labs across company, Labs strategy, and a global view of all Labs operations.
- In 2008, expanded role from head of all operations for Yahoo! Research to head of all operations for Yahoo Labs (reporting directly to head of Yahoo Labs), which covers Research and several Applied Sciences organizations (organization grew from ~120 to ~350). Expanded processes, website coverage, and other operations to include broader organization. Responsible for most of organizational design and Labs concept, approved and executed in late 2008.
- Secured significant budget and headcount for Yahoo Academic Relations and continued to lead university outreach and collaboration across the entire company.
- Led development of company-wide disciplined process for expediting external deployment of research experiments and beta products, working closely with Legal, Privacy Policy, Paranoids (security), Brand, and Customer Care organizations. Formal first-of-its-kind (for Yahoo!) process established, documented, and used regularly (2010).
- Developed and led new innovation process ("Leonardo") for Yahoo Labs, allowing anyone in the Labs to propose a novel project and work outside of their day-to-day responsibilities (with engineering support) on an exceptionally forward-looking product or technology idea (2010).
- Created and chaired internal company-wide technology conference ("Tech Pulse") in 2008, 2009, 2010, and 2011. Conference typically has 50 lecture-style presentations, 150 posters, and 600-700 attendees; in 2011 more than 800 papers were submitted to the review process. Managed cross-organizational team, delivering unique high-quality conference, always within budget ($725-850K).
- Helped create laboratories in Haifa, Israel, and Beijing, China.
- Continued overall budget discipline, regularly holding yearly Labs expenditures to within .5-1% of $65-70M budget.

Yahoo Research, Yahoo! Inc. (Santa Clara, CA; New York, NY) – Vice President, Worldwide Research Operations, 2005-2008. Head, Yahoo! Academic Relations, 2007- .

- Worked as chief operating officer of new and rapidly growing research organization within Yahoo!; responsible for budget, all research infrastructure, and creation of new programs to facilitate research operations. Supervised Research Engineering team, tasked with implementation of prototypes, concept demonstrations, early beta products, and platforms developed jointly with corporate engineering and product units. Dotted-line responsibility for Research Engineering team in Bangalore, India.

- Created and grew new laboratory in NYC, dealing with all aspects of new lab creation.
- Helped create laboratories in Barcelona, Spain, and Santiago, Chile.
- Developed corporate-wide program for Academic Relations, growing staff to critical mass and starting multiple significant academic outreach programs.
- Repeatedly brought organization's expenditures in within 1% of $25M budget.

U.S. Defense Advanced Research Projects Agency (Arlington, VA) — Director, Information Processing Technology Office, 2002–2005. (Flag Officer equivalent rank)

- Created major new research thrust for DARPA in Cognitive Systems and developed new programs that received substantial funding for novel work in areas of national scope and importance.
- Developed the vision for the office and communicated it nationally.
- Developed first major program within the new vision (Personalized Assistant that Learns) and personally "sold" the program to the agency Director; funded at more than $30M/year. This program ended up lasting at least 6 years, with more than $200M funding, and led to multiple technology transitions; program led to technology in Apple's "Siri."
- Grew annual office budget by more than $100M (more than 60%) over 2-1/2 years.
- Managed office budgets totaling over $275M/year, totaling more than $1B over four years.

AT&T Labs (Florham Park, NJ) — Communications Services Research Vice President (formerly Information Systems and Services Research VP), 1996-2002.

- Led an 85-person research laboratory spanning three locations, covering knowledge representation, natural language processing, machine learning, information retrieval and Web search, human-computer interface technology, IP communication services, online platforms, broadband applications, secure systems, and customer research. Managed annual budgets as high as $17M.
- Established overall vision and technical directions for laboratory (around unified, universal, agent-mediated communications with natural user interfaces). Member of executive leadership team that established AT&T Labs-Research, creating vision and culture for new research organization after AT&T "trivestiture" (spin-off of Lucent Technologies and NCR) in 1995.
- Served as Chief Scientist (2001) for large-scale universal communications ASP product team (AT&T Monogram Network), leading determination of 2nd- and 3rd-generation product features and capabilities.
- Served as Chief Technical Officer for AT&T Music Initiative (1999-2000). Spearheaded joint venture arrangement on secure electronic media distribution linking AT&T, Universal Music, BMG Entertainment and Matsushita; served on Board of Directors. Involved extensive business, contractual, and intellectual property negotiations.
- Served as Chief Technical Officer for AT&T Personal Online Services (1995-96), leading technology development and deployment for online services business.
- Represented organization in numerous high-profile public forums, including *ABC Nightline*, *New York Times*, national satellite TV tours, among others.
- Ran an organization-wide Intellectual Property Review Team that assessed, prioritized, advocated and expanded substantial patent portfolio.

AT&T Bell Laboratories (Murray Hill, NJ) — Director, Software and Systems Research Center, 1994–1996; Head, Artificial Intelligence Principles Research Department, 1985–1994.

- Led a 100-person research laboratory across two locations focused on large-scale software systems, artificial intelligence, human-computer interaction, programming languages, software engineering, database management, and related topics.
- Led the development of an AI-based configuration system used for multiple products, based on my work on knowledge representation; system processed more than $6B worth of AT&T/Lucent products and is still in use a decade later.

Schlumberger Palo Alto Research — CAS AI Laboratory (originally Fairchild Laboratory for Artificial Intelligence Research; Palo Alto, CA) — Senior Computer Scientist, 1981–1985; Manager, Knowledge Representation and Reasoning Group, 1981–1983; Acting Manager, Cognition Group, 1983–1985.

Bolt Beranek and Newman Inc. (Cambridge, MA) — Computer Scientist, 1972–81 (full-time, 1977–1981).

Formation, Inc. (Cherry Hill, NJ) — Simulation Programmer, Summer 1972.

Princeton Student Data Service (Princeton University, Princeton, NJ) — Manager, 1969–71.

RCA — Summer Internships: EASD (Van Nuys, CA), 1968; DCSD (Camden, NJ), 1969; MSRD (Moorestown, NJ), 1971.

Academic and Teaching Experience:

University of Toronto:

- Co-instructor, CS2502, "Introduction to Knowledge Representation,"
  Fall, 1992; Fall, 1993; Fall, 1994; Fall, 1996; Fall, 1998; Fall, 1999; Fall, 2000.
- Adjunct Professor, University of Toronto, June, 1987–June, 1988.
- Instructor, CS2532S, "Introduction to Knowledge Representation"
  Spring, 1987.
- Visiting Associate Professor, University of Toronto, January, 1987–June, 1987.

Ecole d'Ete d'Informatique, Electricite de France:

- Taught one-week (10 hour) course on Knowledge Representation,
  June, 1989; June, 1990.

University of Pennsylvania:

- Taught one-day course on Knowledge Bases and Knowledge Representation, Course on Databases and Knowledge Bases, given for the Army Research Office
  June, 1986; June, 1987; May, 1988; May, 1989; May, 1990.

Stanford University:

- Taught classes in CS227, "Knowledge Representation and Reasoning," 2010, 2011.
- Instructor, CS276, "Computational Approaches to the Semantics of Natural Language," Winter Quarter, 1983.

International Joint Conferences on Artificial Intelligence:

- *Tutorial on Knowledge Representation*, Karlsruhe, West Germany, August 7, 1983 (with H. Levesque).

Thesis committees and student supervision:

- Mentor and supervisor, Charles Isbell (Ph.D., Georgia Institute of Technology), AT&T Cooperative Research Fellowship Program.
- Supported numerous undergraduates through AT&T's Undergraduate Research Program.
- Member, Ph.D. thesis committee, Mark Derthick, Carnegie-Mellon University, 1988.
- Superviser, MSAI Practicum, Victoria Pigman, Stanford University, 1983–4.
- Member, Ph.D. thesis committee, Jos de Bruin, U. of Twente (Netherlands), 1982.
- External appraiser, Ph.D. thesis committee, Hector Levesque, University of Toronto, 1981.
- Member, Ph.D. thesis committee, Henry Leitner, Harvard University, 1980–1981.

Taught individual classes at Stanford University, Syracuse University, Rutgers University. Teaching Fellow for one year at Harvard.

Professional and Academic Service and Advisory Activities:

Segovia Technology Co., Executive Advisor, 2015- .

Princeton University Department of Computer Science, Advisory Council, 2011- .

Defense Science Board Task Force on Cyber Security and Reliability in a Digital Cloud, 2011-2012.

Board of Directors, Computing Research Association (CRA), 2010- . (elected for a second term); Treasurer, 2011- .

Human Language Technology Center of Excellence, Scientific Advisory Committee, Johns Hopkins University, 2010- .

Department of Homeland Security Command, Control and Interoperability Center for Advanced Data Analysis (CCICADA), Advisory Committee, 2009- .

Association for the Advancement of Artificial Intelligence, Government Relations Liaison, 2009-2010.

National Science Foundation, Division of Information and Intelligent Systems: Committee of Visitors, 2009.

Computing Research Association (CRA): Distinguished Service Award Committee, 2009.

Free University of Bozen-Bolzano, Italy, KRDB Research Center: Scientific Advisory Board, 2009- .

National Security Agency, NSA Advisory Board Panel on Computer Science, 2008- .

Columbia University, Department of Computer Science: Scientific Advisory Board, 2008- .

Carnegie Mellon University President's Advisory Board for the Machine Learning Department, 2007- .

National Security Agency, NSA Advisory Board Panel on Knowledge Discovery/Analytics, 2006–2011.

National Research Council: Member, Committee on Network Science for Future Army Applications, 2004.

American Association for Artificial Intelligence (AAAI)
- Past President, 2005-2007 (Chair of Awards, Fellows committees)
- President, 2003-2005
- President-Elect, 2001-2003
- Member, Conference Committee, 1984-1988
- Member, Executive Council, 1984-1987

International Joint Conferences on Artificial Intelligence (IJCAI)
- Secretary-Treasurer, 1993–2002
- Deputy Secretary-Treasurer, 1991–1993

Computing Research Association (CRA): Industry Committee, 2001–2002

Institute for Research in Cognitive Science, University of Pennsylvania: Advisory Board, 1995–2000

Association for Computing Machinery (ACM)
- SIGART Vice-Chair 1981–1987

IntelliCorp, Inc.: Scientific Advisory Board, 1984–1985.

Professional Society Memberships: Association for Computing Machinery, SIGART, AAAI, IEEE

Editorial, Conference, and Workshop Activities:

Editorial Positions:
- Editor, Synthesis Artificial Intelligence and Machine Learning Series, Morgan-Claypool Publishers, 2005- .
- Series Editor, Series in Representation and Reasoning, Morgan Kaufmann Publishers, Inc., 1988-.
- Associate Editor, *Journal of Applied Artificial Intelligence*, 1985–1999.
- Senior Advisory Editor, *Princeton Engineer,* 1970–71.

Editorial Boards:
- *Data Mining and Knowledge Discovery*, 1997– .
- *International Journal of Intelligent Information Systems*, 1991– .
- *Artificial Intelligence*, 1986–2001.
- *Journal of Intelligent Systems*, 1985–1995.
- *Journal of Automated Reasoning*, 1983–1991.
- Comtex Scientific Corporation, 1982–1983.
- *American Journal of Computational Linguistics*, 1980–82.

International Conferences on Principles of Knowledge Representation and Reasoning

- Co-Founder, 1989.
- Program Co-Chair, KR'89: The First International Conference on Principles of Knowledge Representation and Reasoning, 1989.
- Member, Steering Committee, 1989-1996.
- Member, Program Committee, 1991, 1992, 1994, 1996.

National Conference on Artificial Intelligence:

- Program Chair, 1984.
- Member, Program Committee, 1990, 1986, 1983, 1982, 1981.

International Conference on Knowledge Discovery in Databases:

- Member, Steering Committee, 1995-1999.
- Member, Program Committee, 1996, 1995.

Other Committee and Workshop Activity:

- Program Committee, Innovative Applications of Artificial Intelligence Conference, 2011, 2010.
- Chaired panel, "Inflection Points," AAAI Fellows Symposium, Cambridge, MA, July, 2006.
- Conceived, organized, and chaired panel, "Meaning on the Web: Evolution or Intelligent Design", WWW2006, Edinburgh, Scotland, May, 2006.
- Steering Committee, First International Conference on Intelligence Analysis Methods and Tools, May, 2005
- Sponsored and participated in numerous technical workshops as part of DARPA leadership; includes creation of new Cognitive Systems conference and series of workshops on Grand Challenges in Cognitive Systems
- Program Committee, CRA Snowbird Conference, 2002
- Participant, CRA Grand Challenges in Computer Science conference, 2002
- Program Committee and Invited Participant, ACM Strategic Directions in Computing Research Workshop, 1996
- Program Committee, SIGMOD Workshop on Data Mining, 1996
- Program Committee, IEEE Conferences on Artificial Intelligence for Applications: 1994, 1992, 1991
- Organizing Committee, AAAI Spring Symposium on Implemented Knowledge Representation and Reasoning Systems, 1991
- Program Committee, International Conference on Fifth Generation Computer Systems, Tokyo, Japan, 1992
- Invited Participant, DARPA/NSF Workshop on AI Methodology, Northampton, MA, June, 1991
- Invited Participant and Keynote Speaker, Second International Workshop on Terminological Logics, Dagstuhl, Germany, May, 1991
- Program Committee, International Symposium on Methodologies for Intelligent Systems, 1990
- Invited Participant, DARPA/NSF Workshop on Knowledge Representation Standards, Santa Barbara, March, 1990
- Co-chair, Symposium on Knowledge-based Natural Language Understanding, Eighth European Meeting on Cybernetics and Systems Research, Vienna, Austria, 1986
- Program Committee, First International Conference on Expert Database Systems, 1986
- Invited Participant, Timberline Workshop on Planning and Reasoning about Action, Timberline, OR, June, 1986
- Program Committee and Invited Participant, Workshop on the Foundations of Artificial Intelligence (sponsored by AAAI and CRL/New Mexico State Univ.), Las Cruces, NM, February 6–8, 1986
- Member of the Advisory Committee and invited participant, Islamorada Workshop on Large Scale Knowledge Base and Reasoning Systems, Islamorada, FL, February, 1985
- Program Committee, CSCSI-84: Fifth National Conference of the Canadian Society for Computational Studies of Intelligence, 1984
- Invited Participant, Santa Barbara Workshop on Knowledge Representation, Santa Barbara, 1983
- Invited Participant, Task Force Meeting on Future and Impacts of Artificial Intelligence, 1983

- Organizer and Chair, *Panel on Knowledge Representation*, AAAI-82, Pittsburgh, PA, August, 1982.
- Invited Participant, and Group Leader, Expert Systems Workshop, San Diego, CA, August, 1980
- Organizer and Host, First KL-One Workshop, Jackson, N.H., 1980
- Invited Participant, Workshop on Formal Methods in Artificial Intelligence, Moss Landing, CA, 1980
- Invited Participant, Workshop on Knowledge Representation and Natural Language Understanding, Brown University, June, 1980 (sponsored by Sloan Foundation).

Books, Edited Collection, and Invited Articles:

"(AA)AI: More Than the Sum of its Parts," *The AI Magazine*, Vol. 27, No. 4, Winter, 2006, 19–34.

"Getting Back to 'The Very Idea'," *The AI Magazine*, Vol. 26, No. 4, Winter, 2005, 48–50.

Knowledge Representation and Reasoning (with H. J. Levesque), Morgan Kaufmann, 2004. (First-year graduate textbook, 381 pp.)

Artificial Intelligence, Special Issue on Knowledge Representation (with H. J. Levesque and R. Reiter), Volume 49, Number 1, May, 1991. Also published by MIT Press as *Knowledge Representation*.

Proceedings of KR'89, The First International Conference on Principles of Knowledge Representation and Reasoning (with H. J. Levesque and R. Reiter), San Mateo, CA: Morgan Kaufmann Publishers, Inc., May, 1989.

AT&T Technical Journal (with F. H. Henig). Special Issue on Artificial Intelligence. Volume 67, Number 1, January/February, 1988.

Readings in Knowledge Representation (with H. J. Levesque). Los Altos, CA: Morgan Kaufmann Publishers, Inc., 1985.

SIGART Newsletter (No. 70), Special Issue on Knowledge Representation (with B. C. Smith), New York: ACM, February 1980.

Refereed Publications

Journal Articles:

"Systems that Know What They're Doing," *IEEE Intelligent Systems*, November, 2002, pp. 67–71.

"'Reducing' CLASSIC to Practice: Knowledge Representation Theory Meets Reality" (with D. L. McGuinness, P. F. Patel-Schneider, and A. Borgida), *Artificial Intelligence*, Vol. 114, Nos. 1-2, October, 1999, pp. 203–237.

"Visual Data Mining: Recognizing Telephone Calling Fraud" (with K. C. Cox, S. G. Eick, and G. J. Wills), *Data Mining and Knowledge Discovery*, Vol. 1, No. 2, 1997, pp. 225–231.

"Mining Business Databases" (with T. Khabaza, W. Kloesgen, G. Piatetsky-Shapiro, and E. Simoudis), *Communications of the ACM*, Vol. 39, No. 11, November, 1996, pp. 42–48.

"Undirected Behavior Without Unbounded Search" (with H. J. Levesque), *Computing Surveys*, Vol. 27, No. 3, September, 1995, pp. 314–316.

"Integrated Support for Data Archaeology" (with P. G. Selfridge, L. G. Terveen, B. Altman, A. Borgida, F. Halper, T. Kirk, A. Lazar, and L. A. Resnick), *International Journal of Intelligent and Cooperative Information Systems*, Vol. 2, No. 2 (1993), 159–185.

"LaSSIE: A Knowledge-Based Software Information System" (with P. Devanbu, P. G. Selfridge, and B. Ballard), *Communications of the ACM*, Volume 34, Number 5, May, 1991, pp. 34–49.

"Toward a Software Information System" (with D. G. Belanger, Y-F. Chen, P. T. Devanbu, and P. G. Selfridge), *AT&T Technical Journal*, Volume 69, Number 2, March/April, 1990, pp. 22–41.

"The Basics of Knowledge Representation and Reasoning," *AT&T Technical Journal*, Vol. 67, No. 1, January/February, 1988, 7–24.

"The Emergence of Artificial Intelligence Technology" (with F. H. Henig), *AT&T Technical Journal*, Vol. 67, No. 1, January/February, 1988, 3–6.

"The Myth of the One True Logic," *Computational Intelligence*, Vol. 3, No. 3, 1987.

"Knowledge Representation: A Shaky Keystone?" *AI Expert*, August, 1987, 7–8.

"Expressiveness and Tractability in Knowledge Representation" (with H. J. Levesque), *Computational Intelligence*, Vol. 3, No. 2, May, 1987, 78–93.

" 'I Lied About the Trees' (or, Defaults and Definitions in Knowledge Representation)," *The AI Magazine*, Vol. 6, No. 3, Fall, 1985, 80–92.

"An Overview of the KL-One Knowledge Representation System" (with J. G. Schmolze), *Cognitive Science*, Vol. 9, No. 2, Apr.–June, 1985, 171–216.

"What 'IS-A' Is and Isn't: An Analysis of Taxonomic Links in Semantic Networks," *IEEE Computer*, Special Issue on Knowledge Representation, Vol. 16, No. 10, October, 1983, 30–36.

"Krypton: A Functional Approach to Knowledge Representation" (with R. E. Fikes and H. J. Levesque), *IEEE Computer*, Special Issue on Knowledge Representation, Vol. 16, No. 10, October, 1983, 67–73.

"What's in a Concept: Structural Foundations for Semantic Networks," *International Journal of Man-Machine Studies*, Vol. 9, 126–152, March 1976. Also, BBN Report No. 3433, October 1976.

Conference Papers:

"Viewing Databases Through a Knowledge Representation Lens," in K. Fuchi and T. Yokoi (eds.) *Knowledge Building and Knowledge Sharing*, Proc. KB&KS'93 Conference, Tokyo: Ohmsha, Ltd., 1994, pp. 121–124.

"The Process of Knowledge Discovery in Databases: A First Sketch," (with T. Anand), Proc. KDD-94: AAAI-94 Workshop on *Knowledge Discovery in Databases*. Seattle, WA, 1994, pp. 1–11.

"Loading Data into Description Reasoners" (with A. Borgida), *Proc. 1993 ACM SIGMOD International Conference on Management of Data (SIGMOD-93)*, Washington, DC, June, 1993, pp. 217–226.

"Customizable Classification Inference in the ProtoDL Description Management System" (with A. Borgida), *Proc. First International Conference on Information and Knowledge Management (CIKM-92),*Baltimore, MD, November, 1992, pp. 482–490.

"Knowledge Representation Support for Data Archaeology" (with P. G. Selfridge, L. G. Terveen, B. Altman, A. Borgida, F. Halper, T. Kirk, A. Lazar, and L. A. Resnick, *Proc. First International Conference on Information and Knowledge Management (CIKM-92)*, Baltimore, MD, November, 1992, pp. 457–464.

" 'Reducing' CLASSIC to Practice: Knowledge Representation Theory Meets Reality," *Principles of Knowledge Representation and Reasoning: Proceedings of the Third International Conference (KR'92),*Cambridge, MA, October, 1992, pp. 247–258.

"The CLASSIC Knowledge Representation System, or KL-One: The Next Generation" (with A. Borgida, D. L. McGuinness, P. F. Patel-Schneider, and L. A. Resnick), *Proc. FGCS`92: International Conference on Fifth Generation Computer Systems*, Tokyo, June, 1992.

"Metric Constraints for Maintaining Appointments: Dates and Repeated Activities" (with M. Poesio), *Proc. AAAI-91*, Anaheim, CA, July, 1991.

"The Future of Knowledge Representation," *Proc. AAAI-90*, Boston, MA, July–August, 1990, pp. 1082–1092.

"Supporting a Knowledge-Based Software Information System with a Large Code Database" (with P. G. Selfridge), *AAAI Workshop on Knowledge Base Management Systems*, Boston, MA, July, 1990.

"A Knowledge-Based Software Information System" (with P. Devanbu, P. G. Selfridge, and B. Ballard), *Proc. 12th International Conference on Software Engineering*, Nice, France, 1990.

"Vivid Knowledge and Tractable Reasoning" (with D. W. Etherington, A. Borgida, and H. Kautz), *Proc. 11th International Joint Conference on Artificial Intelligence*, Detroit, Michigan, August, 1989.

"Steps Towards a Knowledge-Based Software Information System" (with P. T. Devanbu, P. G. Selfridge, and B. W. Ballard), *Proc. 11th International Joint Conference on Artificial Intelligence*, Detroit, Michigan, August, 1989.

"CLASSIC: A Structural Data Model for Objects" (with A. Borgida, D. L. McGuinness, and L. A. Resnick), *Proc. 1989 ACM SIGMOD International Conference on Management of Data*, Portland, Oregon, May, 1989, 58–67.

"Knowledge Representation, Connectionism, and Conceptual Retrieval" (with D. L. McGuinness), *Proc. 11th International Conference on Research and Development in Information Retrieval,* Grenoble, France, June, 1988.

"Tales from the Far Side of KRYPTON," in *Expert Database Systems: Proc. from the First International Conference*. L. Kerschberg (*ed*.). Menlo Park, CA: The Benjamin/Cummings Publishing Co., 1987, 3–43.

"An Essential Hybrid Reasoning System: Knowledge and Symbol Level Accounts of KRYPTON" (with V. P. Gilbert and H. J. Levesque), *Proc. IJCAI-85*, Los Angeles, CA, August, 1985, 532–539.

"Knowledge Level Interfaces to Information Systems," (with H. J. Levesque) in *Proc. Islamorada Workshop on Large Scale Knowledge Base and Reasoning Systems*, Islamorada, FL, February 25–27, 1985, 11–23.

"Argon: Knowledge Representation meets Information Retrieval" (with P. F. Patel-Schneider and H. J. Levesque), in *Proc. First Conference on Artificial Intelligence Applications*, Denver, December, 1984, 280–286.

"What Makes a Knowledge Base Knowledgeable? A View of Databases from the Knowledge Level" (with H. J. Levesque). *Expert Database Systems: Proceedings from the First International Workshop*. L. Kerschberg (*ed*.) Menlo Park, CA: The Benjamin/Cummings Publishing Company, 1986, 69–78.

"The Tractability of Subsumption in Frame-Based Description Languages" (with H. J. Levesque), *Proc. AAAI-84*, Austin, Texas, 1984, 34–37.

"Krypton: Integrating Terminology and Assertion" (with R. E. Fikes and H. J. Levesque), *Proc. AAAI-83*, Washington, D.C., August, 1983, 31–35.

"Competence in Knowledge Representation" (with H. Levesque), *Proc. AAAI-82*, The National Conference on Artificial Intelligence, Pittsburgh, August, 1982, 189–192.

"What 'ISA' Is and Isn't," *Proc. Fourth National Conference of the Canadian Society for Computational Studies of Intelligence*, Saskatoon, Saskatchewan, May 1982, 212–221.

"Distinctions and Confusions: A Catalogue Raisonne" (with D. J. Israel), *Proc. IJCAI-81*, Vancouver, B.C., August 1981, 452–459.

"Taxonomy, Descriptions, and Individuals in Natural Language Understanding," *Proc. 17th Annual Meeting of the Association for Computational Linguistics*, La Jolla, California, August 11–12, 1979, 33–37.

"What's in a Concept," 6th International Conference on Computational Linguistics (COLING '76), Ottawa, Ontario, June 1976.

Book Chapters and Technical Reports:

"'Reducing' CLASSIC to Practice: Knowledge Representation Theory Meets Reality" (revised version) (with A. Borgida, D. L. McGuinness, and P. F. Patel-Schneider), in *Conceptual Modeling: Foundations and Applications*, A. Borgida, et al. (*eds*.), 2009, Springer Verlag Berlin Heidelberg, pp. 436-465.

"Conceptual Modeling with Description Logics" (with A. Borgida), in *The Description Logic Handbook*, F. Baader, et al. (*eds*.), 2003, Cambridge University Press, pp. 349-372.

"An Introduction to Description Logics" (with D. Nardi), in *The Description Logic Handbook*, F. Baader, et al. (*eds*.), 2003, Cambridge University Press, pp. 1–40.

"The Process of Knowledge Discovery in Databases: A Human-Centered Approach," (with T. Anand) in *Advances in Knowledge Discovery and Data Mining*, U. M. Fayyad, G. Piatetsky-Shapiro, P. Smyth, and R. Uthurusamy (*eds.*). Menlo Park, CA: AAAI Press/The MIT Press, 1996, pp. 37–57.

"What is Knowledge Representation and Where is it Going?" in *Future Tendencies in Computer Science, Control and Applied Mathematics*, A. Bensoussan and J.-P. Verjus, *eds*., Springer-Verlag, Berlin, December, 1992, pp. 189–203.

"Living with CLASSIC: When and How to Use a KL-ONE-Like Language" (with A. Borgida, D. L. McGuinness, P. F. Patel-Schneider, and L. A. Resnick), in *Principles of Semantic Networks*. J. Sowa, *ed*. San Mateo, CA: Morgan Kaufmann Publishers, Inc., 1991, pp. 401–456.

"Krypton: The User Interface" (with P. Devanbu), AT&T Bell Laboratories Technical Memorandum, December, 1986.

"Knowledge Level Interfaces to Information Systems" (with H. J. Levesque), in *On Knowledge Base Management Systems: Integrating Artificial Intelligence and Database Technologies*. M. L. Brodie and J. Mylopoulos (*eds*.). New York: Springer-Verlag, 1986, 13–34.

"The Knowledge Level of Knowledge Base Management Systems" (with H. J. Levesque), in *On Knowledge Base Management Systems: Integrating Artificial Intelligence and Database Technologies*. M. L. Brodie and J. Mylopoulos (*eds*.). New York: Springer-Verlag, 1986, 9–12.

"A Fundamental Tradeoff in Knowledge Representation and Reasoning (Revised Version)" (with H. J. Levesque), in *Readings in Knowledge Representation*. R. J. Brachman and H. J. Levesque (*eds*.). Los Altos, CA: Morgan Kaufmann Publishers, Inc., 1985, 42–70.

"Some Remarks on the Semantics of Representation Languages" (with D. J. Israel), in *On Conceptual Modelling: Perspectives from Artificial Intelligence, Databases, and Programming Languages*. M. L. Brodie, J. Mylopoulos, and J. W. Schmidt (*eds*.). New York: Springer-Verlag, 1984, 119–142.

"What are 'Expert Systems'?" (with S. Amarel, C. Engelman, R. Engelmore, E. A. Feigenbaum, and D. E. Wilkins), in *Building Expert Systems*. F. Hayes-Roth, D. Lenat, and D. Waterman (*eds*.) Reading, MA: Addison-Wesley, 1983, 31–57.

"Research in Knowledge Representation for Natural Language Understanding, Annual Report, 1 September 1980–31 August 1981" (with C. L. Sidner, M. Bates, R. J. Bobrow, P. R. Cohen, D. J. Israel, B. L. Webber, and W. A. Woods), BBN Report No. 4785, Cambridge, MA: Bolt Beranek and Newman Inc., November, 1981.

"Research in Natural Language Understanding, Annual Report, 1 September 1978–31 August 1979" (with R. J. Bobrow, P. R. Cohen, J. W. Klovstad, B. L. Webber, and W. A. Woods), BBN Report No. 4274, Cambridge, MA: Bolt Beranek and Newman Inc., November, 1981.

"Theoretical Studies in Natural Language Understanding." BBN Report No. 3888, September 1978.

"Klone Reference Manual" (with E. Ciccarelli, N. Greenfeld and M. Yonke). BBN Report No. 3848, July 1978.

"On the Epistemological Status of Semantic Networks," in Nicholas V. Findler (*ed*.), *Associative Networks—The Representation and Use of Knowledge in Computers*. New York: Academic Press, 1979, 3–50. Also, BBN Report No. 3807, April 1978.

"Research in Natural Language Understanding" (with W. A. Woods), Quarterly Technical Progress Report No. 1, 1 September 1977 to 30 November 1977, BBN Report No. 3742, January 1978.

"A Structural Paradigm for Representing Knowledge," Ph.D. Dissertation, Harvard University, Cambridge, Massachusetts, May 1977. Also, BBN Report No. 3605, May 1978.

"Structural Knowledge in a Document Information Consulting System," TR6-75, Center for Research in Computing Technology, Harvard University, March 1975.

"Simulation Model of the St. Lawrence Seaway" (with T.H. Myer and D.A. Henderson), Report DOT-TSC-728-1, BBN Report No. 2908, prepared for the Department of Transportation, Transportation Systems Center, Cambridge, Massachusetts, October 1974.

"An Experimental Marine Information System" (with T.H. Myer), presented at the Twenty-ninth Annual Meeting of the Institute of Navigation, St. Louis, Missouri, June 1973.

Keynote and Invited Lectures:

"Representing Knowledge in Computers: A Surprising Development from the 1980's and Its Importance for Today's World," Yahoo! Big Thinkers India Series, Bangalore, India, November, 2011 (see http://in.bigthinkers.yahoo.com/event.php?id=19); also given in Indian Institute of Technology Delhi's Golden Jubilee celebration, November, 2011.

"Great Moments in Knowledge Representation: The 1984 Complexity Convergence," joint keynote address to the 12th International Conference on Principles of Knowledge Representation and Reasoning (KR-2010) and the 9th International Conference on Autonomous Agents and Multiagent Systems (AAMAS-2010), Toronto, Ontario, May, 2010 (joint with Hector J. Levesque).

Major invited addresses at DARPATech 2002 and 2004.

Other keynote and invited talks:

- Techonomy'15 panel: "Gods in Boxes," November 8, 2015.
- Georgia Institute of Technology, Web Science Distinguished Lecture, January 30, 2008.
- University of Michigan "FuturTech" Conference, January 25, 2008.
- European Semantic Web Conference, Innsbruck, Austria, June, 2007.
- INFORMATIK2006, German National Conference on Computer Science, Dresden, Germany, October, 2006.
- AI@50, Dartmouth Conference on the 50th Anniversary of Artificial Intelligence, July, 2006.
- Description Logic Workshop (20th Anniversary Workshop), Edinburgh, Scotland, July, 2005.
- Asahi Global Network Forum, Tokyo, Japan, 1998.
- INRIA 25th Anniversary, Paris, France, l992
- Second International Workshop on Terminological Logics, Dagstuhl, Germany, May, 1991
- Eight National Conference on Artificial Intelligence (AAAI-90), Boston, MA, July, 1990 ("The Future of Knowledge Representation").
- Rutherford Workshop on Knowledge Representation, Rutherford Appleton Laboratory, Abingdon, England, April, 1987.
- First International Conference on Expert Database Systems, Charleston, SC, April, 1986 ("Tales from the Far Side of KRYPTON," authored jointly with H. J. Levesque).
- Fourth National Conference of the Canadian Society for Computational Studies of Intelligence, 1982 ("What ISA Is and Isn't").
- Workshop on Cognitive Science, Kaelberbronn, W. Germany, March 29–April 4, 1981.
- First National Conference on Artificial Intelligence, Stanford, CA, August, 1980 ("Recent Advances in Representation Languages").

Invited lectures, 2002-2008:

- University of Illinois Coordinated Science Laboratory Global Infotech conference

- Carnegie-Mellon University
- Columbia University
- Duke University
- Georgia Institute of Technology
- Massachusetts Institute of Technology
- New Jersey Institute of Technology
- New York University
- Northwestern University
- Princeton University
- Rutgers University
- Stanford University
- University of California at Berkeley
- University of California at San Diego
- University of Michigan
- University of Pennsylvania
- University of South Florida
- University of Southern California/Information Sciences Institute
- University of Texas
- University of Washington
- AT&T Labs
- BBN Technologies
- Lucent Technologies Bell Labs
- MITRE
- Santa Fe Institute
- Sarnoff Labs
- Siemens Corporate Research
- SRI International
- Telcordia Applied Science

Major Media Appearances:

Featured on BBC's *Horizons*, "Search and Beyond," November, 2015: http://www.bbc.com/specialfeatures/horizonsbusiness/seriesfive/episode-16-search-and-beyond/?vid=p038m009

Featured on Bloomberg West TV, March, 2014: http://www.bloomberg.com/video/yahoo-s-super-intelligent-internet-is-made-for-you-MVkjCsyGQJ~mL8ApU29zcA.html

Numerous related to the launch of Yahoo's $10M 5-year partnership with Carnegie Mellon University, February, 2014.

Numerous articles in Indian newspapers regarding my visit to Bangalore and opening of Yahoo! Research engineering group in India, January, 2007.

Numerous articles announcing my joining Yahoo! Research and the creation of Yahoo! Research New York, including personal profile in Crain's New York Business (2/6/06), December, 2005.

The Charlie Rose Show (PBS), "A Conversation about Artificial Intelligence," December 21, 2004

Numerous interviews for publications reviewing DARPA/IPTO strategy and programs, with numerous articles appearing between 2002 and 2004.

Satellite Television tour of approximately 13 cities and national appearance on CNBC, March, 2001, commemoration of 125th anniversary of the first telephone call and demonstration of new communications services.

Interviewed for documentary on the *Making of 2001: A Space Odyssey*, aired in England January, 2001. Appears on special two-DVD set for the film.

Continental Airlines in-flight magazine, "The Future is Calling," October, 2000.

ABC *Nightline*, "Thinking Machines," March 14, 1997.

Satellite Television tour of approximately 14 cities, 1997, commemoration of 150th anniversary of the birth of Alexander Graham Bell; demonstration of new communications services.

National and international appearances on *New York Times*, BBC Radio, CBS Radio, Michael Jackson's nationally syndicated radio show (ABC), PBS *Live from Bell Labs*, numerous newspapers.

Patents:

U.S. Patent No. 8,527,623 (with C. Marlow, S. Amer-Yahia, and F. K. Schmidt): "User vacillation detection and response," issued September 3, 2013.

U.S. Patent No. 6,704,576 (with P. Driessen, E. Crandall, S. Greenspan, M. Kretschmer, S. Quackenbush, and J. Weinman): "Method and System for Communicating Multimedia Content in a Unicast, Multicast, Simulcast or Broadcast Environment," issued March 9, 2004.

U.S. Patent No. 6,501,838 (with D. Henderson, L. Jackel, and F. Schmidt): "Method and Apparatus for Remotely Controlling Telephone Call-Forwarding," issued December 31, 2002.

U.S. Patent No. 6,374,102 (with Y. Chu, K. Huang, and J. Russell): "User Proactive Call Handling," issued April 16, 2002.

U.S. Patent No. 6,285,750 (with D. Henderson, L. Jackel, and F. Schmidt): "Method and Apparatus for Remotely Controlling Telephone Call-Forwarding," issued September 4, 2001.

U.S. Patent No. 5,806,060 (with A. Borgida, T. Kirk, P. Selfridge, and L. Terveen): "Interactive Data Analysis Employing a Knowledge Base," issued September 8, 1998.

U.S. Patent No. 5,659,724 (with A. Borgida, T. Kirk, P. Selfridge, and L. Terveen): "Interactive Data Analysis Apparatus Employing a Knowledge Base," issued August 19, 1997.

U.S. Patent No. 5,418,943 (with A. Borgida): "Information System with Knowledge Base and Data Base," issued May 23, 1995.