

## **Glenn A. Iba**

8 Forest Court, Lexington, MA 02421  
home phone: 781-652-8100  
mobile: 781-640-3561  
email: [giba@alum.mit.edu](mailto:giba@alum.mit.edu)  
citizenship: U.S.

### **Education**

1974-1979 **Massachusetts Institute of Technology - Cambridge, MA**  
**S.M. in Mathematics, 1979**

Studied in an interdisciplinary Ph.D. program in artificial intelligence through the Division for Study and Research in Education at MIT. Received Master of Science degree in Mathematics, September, 1979. Thesis title "Learning Disjunctive Concepts from Examples". Completed all requirements for Ph.D. with exception of dissertation. Studies in mathematics, computer science, artificial intelligence, and developmental and cognitive psychology. Research centering on theories and modeling of learning processes. Extensive programming experience in LISP. Supported by a Fellowship from the Division for Study and Research in Education. Grade point average: 5.0/5.0.

1970-1974 **Massachusetts Institute of Technology - Cambridge, MA**  
**S.B. in Mathematics, June, 1974**

Studies in mathematics, computer science, and psychology. Recipient of National Merit Scholarship sponsored by IBM Corporation. Phi Beta Kappa honorary fraternity. Grade point average: 4.9/5.0.

1969,1970 **Summer Science Training Program at Ohio State University**

Program in mathematics for exceptional high-school students, sponsored by the National Science Foundation. Studies in Number Theory, Abstract Algebra, and Automata Theory.

### **Experience**

Sep-Dec 2010 Employed by ISLE (Institute for Learning), Palo Alto, CA.

Software development on Dr. Patrick Langley's ICARUS cognitive architecture. Extended and debugged execution and problem-solving modules. Modified system to integrate a new abductive inference engine.

Jan-Jul 2010 Private contractor to Arizona State University (ASU), Tempe AZ, working on cognitive architectures.

Worked for Dr. Patrick Langley on various aspects of his ICARUS cognitive architecture projects. Collaborated in redesigning and implementing a new version of ICARUS, integrating problem-solving and execution. Developed methods to enable the architecture to learn higher-level macro-operators from problem-solving/execution traces. Additional work on specifying testbed domains and tasks for comparing and evaluating different cognitive architectures.

1994-present Part-time free-lance work designing and analyzing puzzles and games.

Applied my game and puzzle expertise, along with my skills in AI/ML to the design and analysis of a variety of games and puzzles. Numerous puzzles published in puzzle magazines and calendars. Developed software tools using search techniques and constraint satisfaction for automatically generating puzzles and for analyzing number and quality of solutions. Developed many innovative puzzle ideas and contributed in various ways to some marketed puzzles. Developed and analyzed software implementations (Java applets, Javascript WebApps, and CommonLISP applications) for interactive puzzles and games which have both recreational and educational applications. Completed a book of path-puzzles published January 4, 2011 (Sterling Publishing).

2004-present Fundamental research in AI and machine learning (part-time, self-funded)

Exploring basic issues in AI/ML knowledge acquisition, focusing on empirical learning from experience with an external environment, models of skill-acquisition, along with planning and problem-solving.

2001-2004 MIT Lecturer in the Experimental Study Group, Cambridge, MA.

Taught introductory Calculus, Fall 2001. Taught an IAP Seminar on Machine Learning by Discovering Macro-Operators, January 2002. Taught an undergraduate research seminar on Skill Development in Humans and Computers, Spring 2002. Supervised three UROP (Undergraduate Research Opportunity Program) student projects during Spring and Summer 2002. Taught single and multi-variable Calculus during the 2002-2003 and 2003-2004 academic years.

2001-2003 Volunteer teacher of 4<sup>th</sup> and 5<sup>th</sup> grade Math Olympiads, Estabrook Elementary School, Lexington, MA.

Worked with approximately 25 students as part of the Estabrook 4<sup>th</sup> and 5<sup>th</sup> Grade Math Olympiad team. Taught mathematics and problem-solving

skills, and helped students prepare for the competitive exams given as part of the National Math Olympiad program.

2000-2001 Visiting Scholar in the Experimental Study Group (ESG) at MIT, Cambridge, MA.

Taught seminar on Mathematics and Puzzle Challenges in the Tetris Target Video Game, January, 2001. Was involved in ESG study groups such as Godel, Escher, Bach; MIDI music, Special Topics in Mathematics. Served as alumni mentor to 2 ESG freshmen.

1999-2002 President of Experimental Study Group Alumni Network (ESGAN) as part of the ESG program at MIT, Cambridge, MA

Led alumni outreach activities for ESG, including fund-raising, reunions, monthly Alumni Nights. Started an alumni mentoring program to match local ESG alums with current ESG freshman. Worked on ESGAN web pages, and an ESG Alumni Directory.

1997-1998 Senior Software Developer, Gensym Corp., Cambridge, MA.

Worked on design and implementation of a Lisp-to-C translator in support of multi-platform deployment of Genysm's G2 real-time intelligent system product. Additional work on bug fixing and feature implementation for the G2 product itself.

1985-1996 Senior Member of Technical Staff at GTE Laboratories, Waltham, MA.

Theoretical and applied research and development in the areas of machine learning, artificial intelligence, adaptive control, constraint satisfaction, and intelligent agents. Applications to network traffic control, wireless channel assignment, personalized information services, among many others. (Detailed descriptions of projects available upon request)

1981-1985 Assistant Professor of Computer Science at Hampshire College in Amherst, MA.

Hampshire College is an experimental liberal arts college with an emphasis on interdisciplinary studies. Teaching and involvement in areas such as artificial intelligence, cognitive science, computers in education, computer literacy, and computer science. Extensive supervision of individual student projects. Initiated innovative educational experiment called "Computer Studies Learning Community" based on my experiences in MIT's Experimental Study Group (ESG) program.

1979-1980     Research Assistant / computer programmer in the Department of Psychology, Carnegie-Mellon University, Pittsburgh, PA.

Work included teaching an undergraduate the programming language LISP, and collecting detailed protocols of her learning behavior. Other work on constructing computer models of cognitive processes, including learning and perceptual abilities.

### **Skill Sets**

#### Artificial Intelligence/Machine Learning

Broad background in AI/ML with particular strengths in heuristic search, constraint satisfaction, concept learning, discovery of macro-operators, planning, and adaptive autonomous agents.

#### Mathematics and Computer Science

Broad background in mathematics and computer science with strengths in combinatorics, graph theory, number theory, abstract algebra, formal languages and automata theory, and computational complexity.

#### Programming/development

Excellent programming/debugging skills.

Excellent understanding of algorithms, algorithmic complexity, and data structures.

Languages: CommonLISP, Java, Javascript, LOGO, Applescript, C, some Python, C++, and TCL

Systems: MacOSX, Windows and NT, UNIX, Symbolics Lisp Machine.

#### Puzzles and Games

Highly developed skills in analyzing and solving puzzles, playing games, and creating and implementing original designs for both puzzles and games. I have had a long-standing interest in collecting, solving, and designing both puzzles and games. Extensive experience in applying computer techniques to the design and analysis of puzzles.

#### Teaching

Outstanding communication skills.

Tremendous patience in providing explanations, encouragement.

Strong enthusiasm and love for knowledge and learning.

Unique ability to simplify concepts, ideas, techniques, and methods.

Deep understanding of problem-solving processes.  
Extraordinary empathy and awareness for how others think and approach problems.

### **Awards and Honors**

Gensym Corporation Software Development Award of Excellence, February, 1998, for contributions to the Lisp-to-C translator project.

GTE Performance Recognition Award, June 1995, for work on Adaptive Sampling project.

GTE's Leslie H. Warner Technical Achievement Award, May, 1992, for work on the Integrated Learning System. The Warner Award is GTE's highest technical achievement award.

Phi Beta Kappa honorary fraternity, MIT, 1974.

Honorable Mention in the 33rd William Lowell Putnam Mathematics Competition, 1972.

National Merit Scholarship Finalist, 1970. Recipient of Thomas J. Watson Scholarship sponsored by IBM Corporation.

Class valedictorian and National Honor Society, Hershey Senior High School, Hershey, PA, May, 1970.

### **Background and Interests**

My interests include collecting, solving, and designing puzzles and games; playing chess, backgammon, go, and video games; tennis, sailing, bicycling; listening to and creating music; recreational mathematics; and trying to understand how people think and learn.

### **Publications**

Greene, C., and Iba, G., "Cayley's Formula for Multidimensional Trees,"  
Discrete Mathematics, vol. 13, no. 1 (1975), pp. 1-11.

Iba, G., "Learning Disjunctive Concepts from Examples,"  
MIT AI Memo 548, MIT Artificial Intelligence Laboratory, Cambridge,  
Mass., September, 1979.

Iba, G., "The Application of Heuristic Search and the Discovery of Macro-operators to Network Traffic Control", GTE Laboratories Technical Memorandum number TM-0062-10-88-506, GTE Laboratories, Waltham, MA., September, 1988.

- Iba,G., "A heuristic approach to the discovery of macro-operators",  
in Machine Learning, vol. 3, no. 4, March, 1989, pp. 285-317.
- Silver,B., Frawley,W., Iba,G., Vittal,J., and Bradford,K.,  
"ILS: A framework for multi-paradigmatic learning", in Porter,B., and  
Mooney,R., (eds.) Machine Learning: Proceedings of the seventh  
international conference, June, 1990, pp. 348-356.
- Silver,B., Vittal,J., Frawley,W., Iba,G., and Bradford,K., "ILS: A Framework for  
Integrating Multiple Heterogeneous Learning Agents", in David,J-M.,  
(editor) Proceedings of Avignon-90, Second Generation Systems, 1990,  
pp. 301-313.
- Silver,B., Frawley,W., Iba,G., and Vittal,J., "An Architecture for Self-Improving  
Distributed Heterogeneous Agents", Proceedings of the Fourth  
International Conference on Industrial & Engineering Applications of  
Artificial Intelligence and Expert Systems", 1991.
- Vittal,J., Silver,B., Frawley,W., Iba,G., Fawcett,T., Dusseault,S., and Doleac,J.,  
"A Framework for Cooperative Adaptable Information Systems", in Next  
Generation of Information Systems - From Data To Knowledge, M.P.  
Papazoglou and J. Zeleznikow (eds.), 1992.
- Iba,G., "On the Usefulness of Impasses for Limiting the Application of Learned Macro  
Operators in Order to Speed Up Problem Solving" in Proceedings of the  
ML92 Workshop on Knowledge Compilation and Speedup Learning,  
University of Aberdeen, Scotland, July 4, 1992.
- Silver,B., Frawley,W., Iba,G., and Vittal,J., "ILS: A System of Learning Distributed  
Heterogeneous Agents for Network Traffic Management", in Proceedings  
IEEE International Conference on Communications, Geneva,  
Switzerland, May 23-26, 1993.
- Iba,G., "Speedup and Scale-up in Experiential Learning" in Proceedings of the Third  
International Workshop on Knowledge Compilation and Speedup  
Learning, University of Massachusetts, Amherst, MA, June 30, 1993, pp.  
90-95.
- Iba,G., and Tanton, J., "Candy Sharing" in American Mathematical Monthly, January,  
2003, pp. 25-35.
- Iba,G., Round Trip Puzzles, New York: Sterling Publishing, 2011.