Book Reviews

The Great 1980s AI Bubble: A Review of *The Brain Makers*

Hans Moravec

■ *The Brain Makers: Genius, Ego, and Greed in the Quest for Machines That Think,* Harvey P. Newquist, Sams Publishing, Indianapolis, Indiana, 1994, 488 pp., $24.95, ISBN 0-672-30412-0.

From a gleam in Alan Turing's eye in the 1940s, machine intelligence took root as an academic discipline in the 1950s; was cultivated in the 1960s; matured in the 1970s; and spread seed in the 1980s, which took root and bore fruit in a myriad companies in the 1990s.

Newquist is a business reporter who covered the field during the 1980s when academic researchers went commercial in one of the 1980's smaller speculative bubbles. His book begins with a history spanning Babbage to Turing to Minsky, McCarthy, Newell, Simon, Samuel, and others at the 1956 Dartmouth meeting and moves on to the 1980s, where the real story begins. Good, if glib, descriptions of people, places, and events are punctuated by technical explanations ranging from poor to inane. Because I am a little slow, it took me a quarter of the book to recognize a journalist with an attitude. Only laboratory geeks (variations on the term pepper the book) waste time on confusing technical minutiae; real people skim executive summaries, then spend quality time on the financials. The book never misses an opportunity to sneer at academics, who always fail to grasp this simple fact. By contrast, it fawns over A-team executives from the best business schools—masters of management, finance, and marketing, the core of America's greatness. Because most of the characters encountered in the first wave of AI businesses were researchers, sneering dominates over fawning.

The author's aversion to places away from the executive suite distorts the book's coverage. Information about Stanford University comes by way of companies founded by Ed Feigenbaum. In this perspective, John McCarthy's AI lab in the Stanford hills in the 1970s is a nonentity, despite the fact that it sparked a robot boom that foreshadowed the AI boom by five years, because pioneering companies making small assembly robots and industrial vision systems failed just as the robots became essential to manufacturing worldwide. Alan Newell's world-leading but unmarketed reasoning program research at Carnegie Mellon University, conducted vigorously through the 1980s, is dismissed. Companies and products oriented toward technical users, for example, Stephen Wolfram's Mathematica, are completely overlooked. Research labs, engineering offices, and factory floors are simply not on Harvey Newquist's beat. Within its one-sided scope, however, the book is pretty interesting.

The book's subtitle lists genius, ego, and greed, but naivete and dilettantism deserve equal billing because most of the book's antiheroes were as unprepared for business as Newquist is for technical comprehension. The first AI companies rushed to market academically interesting but underdeveloped techniques with few applications or customers. In the speculative hysteria of the 1980s, most found enough backing to support lavish facilities and bloated staffs, lured from academia with inflated salaries and promises. Symbolics, maker of Lisp machines invented by Richard Greenblatt, was the major player. It had several successful years in the mid-1980s selling machines to research groups and secondary AI companies and their immediate clients. The secondary companies sold application-oriented or generic expert systems at exorbitant prices.

The bubble developed fatal leaks by the end of the decade when rapidly evolving, cheap UNIX workstations started to run Lisp code as well as the Lisp machines could, followed a few years later by personal computers. In addition, when expert systems began to be written in C and other non-Lisp languages, client companies found they could implement their applications in house at a lower cost. Symbolics, Palladin, IntelliCorp, Teknowledge, Gold Hill, and other smaller companies, as well as the decade-long Japanese Fifth-Generation Project, evaporated with the 1980s, leaving behind a few viable puddles. Symbolics became Macsyma, Inc., marketing a symbolic mathematics program that was once a minor product. Teknowledge was reduced to a small division. Hundreds of traditional companies now use AI techniques in house for such things as geological exploration, financial decision making, medical advice, factory scheduling, and mechanical troubleshooting.

The expert system hype made its successes look like failures in comparison, giving young turks with a competing approach an opportunity to overreact. Biologically inspired neural nets, which learn input-output relationships from examples, lost to AI in 1965 when Minsky and Papert's *Perceptrons* proved fundamental limitations in two-layer nets. In 1983, John Hopfield showed how to train three-layer nets, and soon enthusiasts were claiming neural nets would deliver AI's failed promises. Nets were better in data-intensive applications, such as detecting fraud or classifying sensor data, but were unsuitable for long chains of inference, and the restrained economy of the 1990s has moderated attempts to imitate the

excesses of the AI bubble.

Meanwhile, speech and text recognizers, vision, control, and database systems, automatic design aids, and other successful programs infer and learn using dozens of powerful methods that are neither expert systems nor neural nets. In coming decades, machine intelligence will become commonplace as computers grow in power and ubiquity—a momentous transition that will be conducted more slowly, more thoughtfully, and more quietly than the 1980's party—at least the neighbors hope so!

Hans Moravec is a principal research scientist with the Robotics Institute at Carnegie Mellon University. He has been working on the development of spatial perception for mobile robots for two decades and promises practical results by the end of the third. He is author of *Mind Children: The Future of Robot and Human Intelligence* (Harvard, 1988) and the forthcoming "Mind Age: Transcendence through Robots."

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■ Borchardt, Gary C. *Thinking between the Lines: Computers and the Comprehension of Causal Descriptions*. Cambridge, Mass.: The MIT Press, 1994. 298 pp. ISBN 0-262-02374-1.

■ Carley, Kathleen, and Prietula, Michael J. *Computational Organization Theory*. Hillsdale, N.J.: Lawrence Erlbaum Associates, 1994. 318 pp. $69.95. ISBN 0-8058-1406-X.

■ Clancey, William J.; Smoliar, Stephen W.; and Stefik, Mark J., eds. *Contemplating Minds: A Forum for Artificial Intelligence*. Cambridge, Mass.: The MIT Press, 1994. 543 pp. $32.95. ISBN 0-262-53119-4.

■ Cresswell, M. J. *Language in the World*. Cambridge, U.K.: Cambridge University Press, 1994. 160 pp. $49.95. ISBN 0-521-44562-0.

■ Dasgupta, Subrata. *Creativity in Invention and Design: Computational and Cognitive Explorations of Technological Originality*. Cambridge, U.K.: Cambridge University Press, 1994. 250 pp. $39.95. ISBN 0-521-43068-2.

■ Dym, Clive L. *Engineering Design: A Synthesis of Views*. Cambridge, U.K.: Cambridge University Press, 1994. 204 pp. ISBN 0-521-44224-9.

■ Emmeche, Claus (Sampson, Steven, trans.). *The Garden in the Machine: The Emerging Science of Artificial Life*. Princeton, N.J.: Princeton University Press, 1994. 199 pp. $24.95. ISBN 0-691-03330-7.

■ Gibilisco, Stan, ed. *The McGraw-Hill Illustrated Encyclopedia of Robotics and Artificial Intelligence*. Blue Ridge Summit, Pa.: Tab Books, 1994. 512 pp. $40.00. ISBN 0-07-023613-5 (hardcover). $24.95. ISBN 0-07-023614-3 (paperback).

■ Gilbert, Nigel, and Doran, Jim. *Simulating Societies: The Computer Simulation of Social Phenomena*. London: UCL Press Limited, 1994. 306 pp. $59.95. ISBN 1085728-082-2.

■ Glaeser, Georg. *Fast Algorithms for 3-D Graphics*. Berlin: Springer-Verlag, 1994. 308 pp. ISBN 3-540-94288-2.

■ Hill, Patricia, and Lloyd, John. *The Gödel Programming Language*. Cambridge, Mass.: The MIT Press, 1994. 334 pp. $45.00. ISBN 0-262-08229-2.

■ Kaandorp, Jaap A. *Fractal Modeling Growth and Form in Biology*. Berlin: Springer-Verlag, 1994. 208 pp. $39.95. ISBN 3-540-56685-6.

■ Kinnear, Kenneth E., Jr. *Advances in Genetic Programming*. Cambridge, Mass.: The MIT Press, 1994. 518 pp. $45.00. ISBN 0-262-111188-8.

■ Luger, George F. *Cognitive Science: The Science of Intelligent Systems*. San Diego, Calif.: Academic Press, 1994. 666 pp. ISBN 0-12-459570-7.

■ Moss, Chris. *Prolog++: The Power of Object-Oriented and Logic Programming*. Reading, Mass.: Addison-Wesley, 1994. 312 pp. ISBN 0-201-56507-2.

■ Nalwa, Vishvjit S. *A Guided Tour of Computer Vision*. Reading, Mass.: Addison-Wesley Publishing, 1994. 361 pp. ISBN 0-201-54853-4.

■ Parberry, Ian. *Circuit Complexity and Neural Networks*. Cambridge, Mass.: The MIT Press, 1994. 268 pp. $35.00. ISBN 0-262-16148-6.

■ Pereira, Fernando C. N., and Grosz, Barbara. *Natural Language Processing*. Cambridge, Mass.: The MIT Press, 1994. 531 pp. $35.00. ISBN 0-262-66092-x.

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■ Rose, Daniel. *A Symbolic and Connectionist Approach to Legal Information Retrieval*. Hillsdale, N.J.: Lawrence Erlbaum Associates, 1994. 314 pp. $59.95.

■ Schank, Roger C.; Kass, Alex; and Riesbeck, Christopher. *Inside Case-Based Explanation*. Hillsdale, N.J.: Lawrence Erlbaum Associates, 1994. 416 pp. ISBN 0-8058-1029-3.

■ Schum, David A. *The Evidential Foundations of Probabilistic Reasoning*. New York: John Wiley and Sons, 1994. 545 pp. $64.95. ISBN 0-47-157936-X.

■ Sterling, Leon, and Shapiro, Ehud. *The Art of Prolog: Second Edition*. Cambridge, Mass.: The MIT Press, 1994. 509 pp. $49.95. ISBN 0-262-19338-8.

■ Strogatz, Steven H. *Nonlinear Dynamics and Chaos: With Applications to Physics, Biology, Chemistry, and Engineering*. Reading, Mass.: Addison-Wesley Publishing Company, 1994. 498 pp. $55.95. ISBN 0-201-54344-3.