Resume / CV

Prof. Dr. Hugo de GARIS

Full Professor of Computer Science
Supervisor of PhD Students in Computer Science and Mathematical Physics
Director of the Artificial Brain Laboratory,
Department of Cognitive Science,
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Xiamen University, Xiamen, Fujian Province, CHINA
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Education

PhD, 1992, Brussels University, Brussels, Belgium, Europe.
Thesis Topic : Artificial Intelligence, Artificial Life.

Who's Who

 Prof. Dr. Hugo de Garis, biographical entry in Marquis's *"Who's Who in Science and Engineering", USA, 2008.*

Editorial Board Memberships of Academic Journals (5)

1. *Executive Editor* of the **"Journal of Artificial General Intelligence"** (JAGI), an online journal at http://journal.agi-network.org (from 2008).

2. "**Engineering Letters**" journal (International Association of Engineers, IAENG)

3. **"Journal of Evolution and Technology**" (Institute for Ethics and Emerging Technologies, IEET)

4. "**Evolutionary Computation**" journal (MIT Press) (former editorial board member, 1992-2007).

5. "**Neurocomputing**" journal (Elsevier) (former editorial board member, 2000-2006)

Publications Summary

Movie 1
Books 4
Journal Articles 27
Conference Papers 100
Book Chapters 15

Total 147

Movie (1)

6 minutes in the movie "Transcendent Man : The Life and Ideas of Ray Kurzweil", Ptolemaic Productions, 2009. The movie discusses the rise of massively intelligent machines.

Books (4)

Hugo de Garis, *"The Artilect War : Cosmists vs. Terrans : A Bitter Controversy Concerning Whether Humanity Should Build Godlike Massively Intelligent Machines",* ETC Publications, ISBN 0-88280-153-8, 0-88280-154-6, 2005. (Chinese version) "History of Artificial Intelligence –The Artilect War", Tsinghua University Press, 2007.

Hugo de Garis, *"Multis and Monos : What the Multicultured Can Teach the Monocultured : Towards the Growth of a Global State",* ETC Publications, ISBN 978-088280162-9, 2009.

Hugo de Garis*, "Artificial Brains : An Evolved Neural Net Module Approach"*, contracted with World Scientific (Singapore), to be finished by the end of 2009.

Hugo de Garis, *"Topological Quantum Computing : Making Quantum Computers Robust, by Manipulating Quantum Bits in Topological Quantum Fields",* contracted with World Scientific (Singapore), to be finished by the end of 2010.

Keynote Speeches (9)

2008 (3)

Int. Conf. Computer Science and Education, Xiamen, 2008

Int. Conf. Telecommunications Engineering, Wuhan, 2008

A third one with 3 IEEE fellows from the US in China.

2009(6)

Malaysia, Tokyo, Wuhan (3 of them, at international conferences at Wuhan University, Huagong, Wuhan Normal University), Shenzhen

Media (Movie, TV) Appearances

www.thoughtware.tv, type "Hugo de Garis" in the search window, to see 20 video documentaries

Worldwide Media Appearances : 100s   http://www.iss.whu.edu/degaris (click on "media").

"Sir Roger Penrose vs. Prof. Hugo de Garis", Discovery Channel, US TV, http://www.kurzweilai.net/articles/videos/hugo_discovery_today.ram

"Building Gods", an 80 minute movie by Ken Gumbs, on http://www.thoughtware.tv/videos/watch/3

"Prof. Hugo De Garis: Artilect War (part 1)".
http://www.thoughtware.tv/videos/watch/2014

Prof. Hugo De Garis: Artilect War (part 2)
http://www.thoughtware.tv/videos/watch/2013

BBC Horizon - Human v2.0 (part 1)
http://www.youtube.com/watch?v=ArYzyE63MH8

BBC Horizon - Human v2.0 (part 2)
http://www.youtube.com/watch?v=GFwbYlOisPU&feature=related

BBC Horizon - Human v2.0 (part 3)
http://www.youtube.com/watch?v=-Paiwpl8iwc&feature=related

BBC Horizon - Human v2.0 (part 4)
http://www.youtube.com/watch?v=I5bfNKIKXBE&feature=related

BBC Horizon - Human v2.0 (part 5)
http://www.youtube.com/watch?v=l1PW3oIK1jU&feature=related

BBC Horizon - Human v2.0 (part 6)

http://www.youtube.com/watch?v=VS1NebnAnUA&feature=related

ABC TV, USA, "Last Days on Earth", October 2006.

Journal Publications (peer reviewed, with more than one peer)

Hugo de Garis, "Topological Quantum Computing : The TQC Shock Effect and Its Impact on University Computer Science Teaching", <u>submitted</u> to the Int. Journal of Engineering Education, 2010.

 Z. Fan, Hugo de Garis (equal author precedence) "Braid Matrices and Quantum Gates for Ising Anyons Topological Quantum Computing", European Physical Journal B, 74(3): pp 419-427, April 2010, ISSN 1434-6028.

Hugo de Garis, Ben Goertzel, "Report on the Second International Conference on Artificial General Intelligence (AGI-09)", "*Artificial Intelligence Magazine*", Vol. 30, Number 4, 2009. (SCI journal)

Hugo de Garis, Ben Goertzel, "Guest Editorial", in "Special Issue on Artificial Brains", for the journal "*Neurocomputing*", to appear Oct 2010. (SCI journal)

Hugo de Garis, Ben Goertzel, "A World Survey of Artificial Brain Projects", in "Special Issue on Artificial Brains", for the journal "*Neurocomputing*", to appear Oct 2010. (SCI journal)

Hugo de Garis, Ben Goertzel, "Report on the First International Conference on Artificial General Intelligence (AGI-08)", "*Artificial Intelligence Magazine*", Vol. 30, Number 1, p121ff, March 2009. (SCI journal)

Kang Zhuo, Li Yan, Hugo de Garis, David Evans, Kang Li-Shan, "Multi-Modal Function Optimization with the ZEDS (Zoomed Evolutionary Dual Strategy) Algorithm", *International Journal of Computational Mathematics 81* (6): pp 675-684 (2004).

Jonathan Dinerstein, Parris Egbert, Hugo de Garis, Nelson Dinerstein, "Fast and Learnable Behavioral and Cognitive Modeling for Virtual Character Recognition", *Journal of Visualization and Computer Animation*, 2004.

Jonathan Dinerstein, Parris Egbert, Hugo de Garis, Nelson Dinerstein, "Fast and Learnable Behavioral and Cognitive Modeling for Virtual Character Recognition", *Journal of Computer Animation and Virtual Worlds* 2004.

Yan Li, Lishan Kang, Hugo de Garis, Zhuo Kang, Pu Liu, "A Robust Algorithm for Solving Nonlinear Programming Problems", *International Journal of Computational Mathematics 79* (5): pp 523-536 (2002).

Hugo de Garis,, "Guest Editorial", *Neurocomputing* journal, Elsevier, Vol. 42, Issue 1-4, February, 2002. Special issue on Evolutionary Neural Systems, guest editor Prof. Hugo de Garis.

Hugo de Garis, Michael Korkin,, "The CAM-Brain Machine (CBM), An FPGA Based Hardware Tool which Evolves a 1000 Neuron Net Circuit Module in Seconds and Updates a 75 Million Neuron Artificial Brain for Real Time Robot Control", *Neurocomputing* journal, Elsevier, Vol. 42, Issue 1-4, February, 2002. Special issue on Evolutionary Neural Systems, guest editor Prof. Hugo de Garis.

Hugo de Garis, Michael Korkin, Gary Fehr, "The CAM-Brain Machine (CBM) : An FPGA Based Tool for Evolving a 75 Million Neuron Artificial Brain to Control a Lifesized Kitten Robot", *Autonomous Robots* Journal, Vol. 10, No. 3, May 2001.

Hugo de Garis, Michael Korkin, Felix Gers, Eiji Nawa, Michael Hough C, "Building an Artificial Brain Using an FPGA Based CAM-Brain Machine", *Applied Mathematics and Computation* Journal, Special Issue on "Artificial Life and Robotics, Artificial Brain, Brain Computing and Brainware", Vol. 111, 2000, pp163-192, North Holland.

Hugo de Garis, Michael Korkin,, "An Artificial Brain : Using Evolvable Hardware Techniques to Build a 75 Million Neuron Artificial Brain to Control the Many Behaviors of a Kitten Robot", *Handbook of Biomimetics,* HTS Publishers, Japan, Sept. 2000, pp 729-736, (in Japanese).

Hugo de Garis, "Review of Proceedings of the First NASA/DoD Workshop on Evolvable Hardware, IEEE *Transactions on Evolutionary Computation* (IEEE-TEC), Nov 1999, Vol. 3 No. 4.

Hugo de Garis, Sung-Bae Cho, "Towards the Development of an Artificial Brain Using an Artificial Life Approach", *Korean Information Science Society Review*, Vol. 17, No. 5, pp 20-26, May 1999 (in Korean).

Hugo de Garis, Felix Gers, Michael Korkin, Arvin Agah, Norberto Eiji Nawa, "CAM-brain" ATR's Billion Neuron Artificial Brain Project : A Three Year Progress Report", *Artificial Life and Robotics Journal*, Vol. 2, 1998, pp 56-61.

Hugo de Garis, "An Artificial Brain : ATR's CAM-Brain Project Aims to Build/Evolve an Artificial Brain with a Million Neural Net Modules Inside a Trillion Cell Cellular Automata Machine", *New Generation Computing Journal*, Vol.12, No.2, pp 215-221, 1994, Ohmsha & Springer Verlag.

Hugo de Garis,, "CAM-Brain : Growing an Artificial Brain with a Million Neural Net Modules inside a Trillion Cell Cellular Automata Machine", *Journal of the Society of Instrument and Control Engineers* (SICE), Vol.33, No.2, Society of Instrument and Control Engineers of Japan, 1994

Hugo de Garis,, "Genetic Neural Nets Can Be Dynamic Too, You Know!", *Neural Network Review*, Lawrence Erlbaum, Vol. 4, No. 1, pp 50-51, 1990.

Hugo de Garis, "The 21st Century Artilect : Moral Dilemmas Concerning the Ultra Intelligent Machine", *Int. Philosophical Review (Revue Int. de Philosophie),* Vol. 44, No. 172, pp 131-138, May 1990.

Hugo de Garis,   "What if AI Succeeds? The Rise of the 21st Century Artilect", *AI Magazine*, Vol.10, No. 2, Summer 1989.

Journal Publications (invited by editor-in-chief) (5)

Hugo de Garis, "Conference Review : Evolvable Hardware 2005", *Evolutionary Computation*, Vol. 13, Winter, pp 545-550, MIT Press, 2005.

Hugo de Garis, "Evolvable Hardware 2004", *Evolutionary Computation* journal, Fall 2004, Vol. 12, No. 3, pp 397-402, MIT Press.

Hugo de Garis, "Introduction to Evolutionary Computing", *Evolutionary Computation* journal, Summer 2004, Vol. 12, No. 2, pp 269-271.

Hugo de Garis, "The Second NASA/DoD Workshop on Evolvable Hardware", *IEEE Transactions on Evolutionary Computation,* Vol. 5, No. 3, June 2001.

Hugo de Garis, "Review of Proceedings of the First NASA/DoD Workshop on Evolvable Hardware, IEEE *Transactions on Evolutionary Computation* (IEEE-TEC), Nov 1999, Vol. 3 No. 4.

Conference Papers (Peer Reviewed) (102)

2010

Hugo de Garis, Chen Xiaoxi, Yang Ye, Chen Shuo, Ben Goertzel, Lian Ruiting, "Object/Gesture Recognition Software in the "China Brain Project", IEEE Int. Conf. on Computational Intelligence (ICCI), Tsinghua University, July 7-9, Beijing, China.

Ben Goertzel, Hugo de Garis, Shuo Chen, Ruiting Lian, Min Jiang, "Articial Brains: a Review of the State of the Art and a Roadmap for Future Development", International Conference on Advanced Intelligence (ICAI), Beijing, August 2010.

Ben Goertzel, Hugo de Garis, Cassio Pennachin, Nil Geisweiller, Samir Araujo, Joel Pitt, Shuo Chen, Ruiting Lian, Min Jiang, Ye Yang, Deheng Huang, "OpenCogBot: Achieving Generally Intelligent Virtual Agent Control and Humanoid Robotics via Cognitive Synergy", International Conference on Advanced Intelligence (ICAI), Beijing, August 2010.

2009

Prof. Dr. Hugo de GARIS, Dean Prof. Dr. ZHOU Changle, Prof. Dr. SHI Xiaodong, Dr. Ben GOERTZEL, Prof. PAN Wei, Prof. MIAO Kehua, Prof. Dr. ZHOU Jianyang, Dr. JIANG Min, Prof. ZHEN Lingxiang, Prof. Dr. WU Qinfang, Prof. Dr. SHI Minghui, LIAN Ruiting, CHEN Ying, "The China-Brain Project : Report on the First Six Months", *Proceedings of the Second International Conference on Artificial General Intelligence*, Washington DC, USA, March 2009.

Hugo de GARIS, "The China-Brain Project", *Congress on Evolutionary Computation (CEC-09),* Trondheim, Norway, Europe, May 18-21, 2009.

2008

de Garis, Hugo and Ben Goertzel (2008). XIA-MAN: An Extensible, Integrative Architecture for Intelligent Humanoid Robotics. Proceedings of the AAAI Symposium on Biologically Inspired Cognitive Architectures, Virginia, USA.

Hugo de Garis, "The "China-Brain" Project : A Four Year, 3 Million RMB Project to Build a 15,000 Evolved Neural Net Module Artificial Brain in China", *Proceedings of the World Conference on Computational Intelligence (WCCI),* Hong Kong, China, June, 2008.

Hugo de Garis, "The China Brain Project", *Proceedings of the 1st International Conference on Artificial General Intelligence*, Memphis, Tennessee, USA, March 2008.

Hugo de Garis, "The Artilect War : Cosmists vs. Terrans : A Bitter Controversy Concerning Whether Humanity Should Build Godlike Massively Intelligent Machines", *Proceedings of the 1st International Conference on Artificial General Intelligence*, Memphis, Tennessee, USA, March 2008.

Hugo de Garis, Keynote Paper, "PARCONE, A PARtially Connected Neural Evolutionary" Model Serving as the Basis for Building China's First Artificial Brain", 3rd

Int. Conf. on Intelligent System and Knowledge Engineering, Xiamen, China, November 2008.

Hugo de Garis, "(First) Keynote Speech : Topological Quantum Computing (TQC)", IEEE Int. Conf. on Computer Science and Software Engineering, Wuhan China, December 2008.

2007

Hugo de Garis, "Artificial Brains : An Evolved Neural Net Module Approach", Invited Speaker talk, Congress on Evolutionary Computation (CEC), Singapore, September 2007.

Hugo de Garis, Tang Jianyu, Huang Di, "Artificial Brains - A Cheap Method for Speeding the Evolution of Neural Network Modules for Artificial Brain Building", International Joint Conference on Neural Networks, August 2007, Orlando, Florida, USA.

Hugo de Garis, "Simultaneous Multi-module Evolution : The Need for Simultaneous Evolution of Multiple Neural Net Modules for Brain Building", IEEE Workshop on Evolvable and Adaptive Hardware (WEAH), Honolulu, Hawaii, April 2007.

2006

Hui Shi, Sanyou Zeng, Guang Chen, Hugo de Garis, Lishan Kang, "Orthogonal Dynamic Hill-climbing Algorithm for Dynamic Optimization Problems", Congress on Evolutionary Computation (CEC), Vancouver, British Colombia, Canada, July 2006.

Guang Chen, Sanyou Zeng, Hui Shi, Hugo de Garis, Lishan Kang, "A Dynamic Multi-objective Evolutionary Algorithm Based on an Orthogonal Design", Congress on Evolutionary Computation (CEC), Vancouver, British Colombia, Canada, July 2006.

Hugo de Garis, "Artificial Brains, An Evolved Neural Net Module Approach", Workshop on Artificial General Intelligence, Washington DC, May 2006, Springer.

2005

Hugo de Garis, "Femtocomputing : New Architectural Ideas for Procedural and Evolutionary Computers Whose Components Switch in Femto-Seconds", *Proceedings of DoD/NASA Evolvable Hardware Conference*, 2005, Washington DC, June 29- July 1 2005.

Hugo de Garis, Ce Wang, Thayne Batty, "Building a Cheaper Artificial Brain", *Proceedings* Int. Joint Conf. Neural Networks (IJCNN), Montreal, Quebec, Canada, July 31-August 4, 2005.

Sanyou Zeng, Hugo de Garis, Jun He, Lishan Kang, "A Novel Evolutionary Algorithm Based on an Orthogonal Design for Dynamic Optimization Problems (ODEA)", *Congress on Evolutionary Computation* (CEC05), Edinburgh, Scotland, Sept 2-5, 2005.

Hugo de Garis, "Femtocomputing : New Architectural Ideas for Procedural and Evolutionary Computers Whose Components Switch in Femto-Seconds", *Int. Conf. on Artificial Intelligence and Evolutionary Computation,* Wuhan, China, April 2005.

Hugo de Garis, Ce Wang, Thayne Batty, "Building a Cheaper Artificial Brain", *Int. Conf. on Artificial Intelligence and Evolutionary Computation,* Wuhan, China, April 2005.

2004

Hugo de Garis, Thayne Batty, "Multi-Mod : A PC Based Software System for Controlling an Artificial Brain Containing 10,000 Evolved Neural Net Modules", *Congress on Evolutionary Computation (CEC),* Portland, Oregon, June 2004.

Hugo de Garis, Thayne Batty,, "Robust Reversible, Nano-Scale, Femto-Second-Switching Circuits and their Evolution", *Congress on Evolutionary Computation* (CEC), Portland, Oregon, June 2004.

Sree Harsha Aleti, Hugo de Garis,, "Evolutionary Algorithms Based on Machine Learning Accelerate Mathematical Function Optimization but not Neural Net Evolution", *Congress on Evolutionary Computation* (CEC), Portland, Oregon, June 2004.

Hugo de Garis, Thayne Batty, "The Evolution of Robust, Reversible, Nano-Scale Femto-Second-Switching Circuits", *NASA/DoD Evolvable Hardware Conference*, Seattle, Washington, USA, June, 2004.

Hugo de Garis, Thayne Batty, "Multi-Mod : A PC Based Software System for Handling the Interconnectivity and Neural Signaling of an Artificial Brain Containing 10,000 Evolved Neural Net Modules", *Int. Joint Conf. Neural Networks* (IJCNN), Budapest, Hungary, June, 2004.

2003

Ravichandra Sriram, Hugo de Garis, Zijun Zhang, "A Hybrid Quantum Evolutionary Algorithm ", *Genetic and Evolutionary Computation Conference* (late breaking papers), Chicago, Illinois, USA, July 14-18, 2003.

Hugo de Garis, Ravichandra Sriram, Zijun Zhang, "Quantum Computation vs. Evolutionary Computation : Could Evolutionary Computation Become Obsolete?", *Congress on Evolutionary Computation,* Canberra, Australia, Dec. 8-12, 2003.

Yuya Sasaki, Hugo de Garis, "Faster Evolution and Evolvability: Control of Genetic Algorithms Using a Softmax Mutation Method", *Congress on Evolutionary Computation,* Canberra, Australia, Dec. 8-12, 2003.

Jonathan Dinerstein, Nelson Dinerstein, Hugo de Garis, "Automatic Multi-Module Neural Network Evolution in an Artificial Brain", *NASA/DoD Conf. on Evolvable Hardware,* Chicago, Illinois, USA, July 9-11, 2003.

George Holling, Hugo de Garis, "On the Application of Advances in Artificial Intelligence Technologies for the Design of Autonomous Intelligent Robots", *IEEE Electro/Information Technology Conf.,* Indianapolis, IN, USA, June 5-6, 2003.

Hugo de Garis, Ravichandra Sriram, "Building Artificial Brains at Universities Using a Purely Software Based Approach", *Int. Joint Conf. on Machine Learning*: Models, Technologies & Applications, Las Vegas, Nevada, USA, June 23-26, 2003.

Hugo de Garis, Ravichandra Sriram, Zijun Zhang, "Quantum Generation of Nerual Networks", *Int. Joint Conf. on Neural Networks,* Portland, Oregon, USA, July 20-24, 2003.

Hugo de Garis, Amit Gaur, Ravichandra Sriram,, "Quantum versus Evolutionary Systems : Total versus Sampled Search", *5th. Int. Conf. on Evolvable Systems* (ICES), Trondheim, Norway, March 2003.

2002

Sabra Dinerstein, Jonathan Dinerstein, Hugo de Garis, Nelson Dinerstein, "A Data Streaming Approach to Pattern Recognition with Evolvable Neural Networks", *Genetic & Evolutionary Computation Conf.* (late breaking papers), July 9-13, 2002, New York, USA.

Jonathan Dinerstein, Hugo de Garis, Sabra Dinerstein, Nelson Dinerstein,, "TiPo - A New Dynamic Neural Net Model for Implementation in a Brain Building Machine", *Genetic & Evolutionary Computation Conf.* (late breaking papers), July 9-13, 2002, New York, USA.

Hugo de Garis, Jonathan Dinerstein, Ravichandra Sriram, "Reversisible Evolvable Networks: A Reversible Evolvable Boolean Network Architecture and Methodology to Overcome the Heat Generation Problem in Molecular Scale Brain Building", *Genetic & Evolutionary Computation Conf.* (late breaking papers), July 9-13, 2002, New York, USA.

Jonathan Dinerstein, Hugo de Garis, "TiPo - A Timed Pointer Neural Net Model with Superior Evolvabilities for Implementation in a Second-Generation Brain-Building Machine BM2", *NASA/DoD Conference on Evolvable Hardware,* July 15 - 18, 2002, Washington DC, US.

Hugo de Garis, Jonathan Dinerstein, Ravichandra Sriram, "Reversible Evolvable Networks : A Reversible Evolvable Boolean Network Architecture and Methodology to Overcome the Heat Generation Problem in Molecular Scale Brain Building", *NASA/DoD Conference on Evolvable Hardware* July 15 - 18, 2002, Washington DC, USA.

Hugo de Garis, "DePo : A "Delayed Pointer" Neural Net Model with Superior Evolvabilities for Implementation in a Second Generation Brain Building Machine BM2", *Int. Joint Conf. on Neural Networks,* May 12-17, 2002, Honolulu, Hawaii, USA.

Hugo de Garis, "Evolvability Limits : A Case Study Concerning the Modular Evolvable Capacities (MECs) of a New Neural Net Model for a Second Generation Brain Building Machine BM2", *Congress on Evolutionary Computation,* May 25-29, 2002, Honolulu, Hawaii, USA.

2001

Hugo de Garis, Leo de Penning, Andrzej Buller, Derek Decesare, "First Evolution Experiments on a Physical CAM-Brain Machine (CBM)", *4th. Int. Conf. Evolvable Systems* (ICES2001), Tokyo, Japan, 3-5 Oct 2001.

Hugo de Garis, Leo de Penning, Andrzej Buller, Derek Decesare, "Early Experiments on the CAM-Brain Machine (CBM)", *3rd NASA/DoD Workshop on Evolvable Hardware,* JPL, Pasadena, CA, USA, July 12-14, 2001.

Hugo de Garis, Andrzej Buller, Leo de Penning, Tomasz Chodakowski, Derek Decesare, "Initial Evolution Results on CAM-Brain Machines (CBMs)", *Int. Conf. Artificial Neural Networks* (ICANN2001), Vienna, Austria, August 2001.

Hugo de Garis, Andrzej Buller, Leo de Penning, Tomasz Chodakowski, Derek Decesare, "Initial Evolvability Experiments on the CAM-Brain Machines (CBMs)", *Int. Conf. on Evolutionary Computation* (CEC2001), Seoul, Korea, May 2001.

Hugo de Garis, "Starbrain and Eurobrain: Starlab's and Europe's Artificial Brain Projects : An Overview", *5th Int. Conf. on Artificial Neural Networks* (ICANNGA2001), Prague, Czech Republic, Apr 20, 2001.

2000

Hugo de Garis, Andrzej Buller, Thierry Dob, Jean Honlet, Padma Guttikonda, Derek Decesare, "Building Multimodule Systems with Unlimited Evolvable Capacities from Modules with Limited Evolvable Capacities (MECs)", *2nd DoD/NASA Workshop on Evolvable Hardware* EH2000, Silicon Valley, California, USA, July 2000.

Hugo de Garis, Michael Korkin, Padma Guttikonda, Donald Cooley, "Evolving Detectors of 2D Patterns on a Simulated CAM-Brain Machine, an Evolvable Hardware Tool for Building a 75 Million Neuron Artificial Brain", *SPIE's 45th Annual Meeting, Int. Symposium on Optical Science and Technology,* San Diego, USA, July/August 2000.

Hugo de Garis, Michael Korkin, Padma Guttikonda, Donald Cooley, "Simulating the Evolution of 2D Pattern Recognition on the CAM-Brain Machine, an Evolvable Hardware Tool for Building a 75 Million Neuron Artificial Brain", *Int. Joint Conf. on Neural Networks,* Como, Italy, summer, 2000.

1999

Hugo de Garis, Andrzej Buller, Michael Korkin, Felix Gers, Eiji Nawa, Michael Hough, "ATR's Artificial Brain ("CAM-Brain") Project : A Sampler of What Individual CAM-Brain "CoDi-1Bit" Model Evolved Neural Net Circuit Modules Can Do with Digital and Analog I/O", *NASA/JPL Evolvable Hardware Workshop,* Pasadena, CA, USA, July 19-21, 1999.

Hugo de Garis, Felix Gers, Michael Korkin, Eiji Nawa, Michael Hough, "Evolving an Optimal De/Convolution Function for the Neural Net Modules of ATR's CAM-Brain Machine (CBM)", *Int. Joint Conf. Neural Networks*, Washington DC, USA, July 10-16, 1999.

Hugo de Garis, Felix Gers, Michael Korkin, Michael Hough, "ATR's Artificial Brain (CAM-Brain) Project : A Sample of What Individual CoDi-1Bit Model Evolved Neural Net Modules Can Do", *Congress on Evolutionary Computation,* Washington DC, USA, July 6-9, 1999.

Michael Korkin, Hugo de Garis, Eiji Nawa, William Dee Rieken,, "ATR's Artificial Brain Project : CAM-Brain Machine (CBM) and Robot Kitten (Robokoneko) Issues", *Int. Conf. on Artificial Neural Networks and Genetic Algorithms,* Slovenia, Europe, April 1999.

Michael Hough, Hugo de Garis, Michael Korkin, Felix Gers, Eiji Nawa,, "Spiker: Analog Waveform to Digital Spiketrain Conversion in ATR's Artificial Brain "CAM-Brain" Project, *Int. Conf. on Robotics and Artificial Life,* Beppu, Japan, January 1999.

Hugo de Garis, Michael Korkin, Felix Gers, Eiji Nawa, Michael Hough,, "ATR's Artificial Brain (CAM-Brain) Project : A Sample of What Individual CoDi-1Bit Model

Evolved Neural Net Modules Can Do", *Int. Conf. on Robotics and Artificial Life,* Beppu, Japan, January 1999.

1998

Hugo de Garis, Michael Korkin, Norberto Nawa, "ATR's Artificial Brain Project : CAM-Brain Machine (CBM) and Robot Kitten (Robokoneko) Issues", *Information Processing Society of Japan (IPSJ) Magazine*, Tokyo, 1998.

Norberto Eiji Nawa, Michael Korkin, Hugo de Garis, "Digital Spikes : Information Representation in ATR's CAM-Brain Machine", *5th. Int. Conf. on Neural Information Processing,* (ICONIP'98), Kitakyushu, Japan, October 1998.

Michael Korkin, Hugo de Garis, Norberto Eiji Nawa, "A 'Spike Interval Information Coding' Representation for ATR's CAM-Brain Machine (CBM)", *Int. Conf. on Evolvable Systems,* Sept. 24-26, Lausanne, Switzerland.

Norberto Eiji Nawa, Michael Korkin, Hugo de Garis, "ATR's CAM-Brain Project : The Evolution of Large-Scale Recurrent Neural Network Modules", *Int. Conf. on Parallel and Distributed Processing Techniques and Applications,* July 13-16, 1998, Las Vegas, USA.

Andrzej Buller, Hugo de Garis, "Brain-Building Strategy : Some Remarks and Questions", *Symposium on Intelligent Information Systems,* June 15-19, 1998, Malbork, Poland.

Norberto Eiji Nawa, Hugo de Garis, Felix Gers, Michael Korkin,, "ATR's CAM-Brain Machine (CBM) Simulation Results and Representation Issues", *Genetic Programming Conference*, July 1998, USA.

Hugo de Garis, Felix Gers, Michael Korkin, Arvin Agah, Norberto Eiji Nawa, "ATR's Artificial Brain (CAM-Brain) Project : A Progress Report", Special Session on "Evolutionary Algorithms for Large-Scale Problems", *Int. Conf. Evolutionary Computation,* Anchorage, Alaska, May 1998.

Hugo de Garis, Felix Gers, Michael Korkin, Arvin Agah, Norberto Eiji Nawa, "Building an Artificial Brain Using an FPGA Based 'CAM-Brain Machine'", *Int. Symposium on Artificial Life and Robotics, Jan*. 1998, Beppu, Oita, Japan.

Felix Gers, Hugo de Garis, Michael Korkin,, "CoDi-1Bit : A Cellular Automata Based Neural Net Model Simple Enough to be Implemented in Evolvable Hardware", *Int. Symposium on Artificial Life and Robotics,* Jan. 1998, Beppu, Oita, Japan.

1997

Felix Gers, Hugo de Garis, Michael Korkin,, "CoDi-1Bit : A Simplified Cellular Automata Based Neuron Model", AE97, *Artificial Evolution Conference,* Nimes, France, Oct 1997.

Hugo de Garis, Lishan Kang, Qiming He, Zhengjun Pan, Masahiro Ootani, Edmund Roland,, "Million Module Neural Systems Evolution : The Next Step in ATR's Billion Neuron Artificial Brain (CAM-Brain) Project", *Artificial Evolution Conference,* Nimes, France, Oct 1997.

Hugo de Garis, Sung-Bae Cho, Michael Korkin, Arvin Agah,, "Designing an Artificial Brain with 10,000 Evolved Neural Network Modules : Initial Thoughts", *Int. Joint Conf. on Artificial Intelligence Workshop on Evolutionary Systems,* August 1997, Nagoya, Japan.

Michael Korkin, Hugo de Garis, Felix Gers, Hitoshi Hemmi, "CBM (CAM-Brain Machine) : A Hardware Tool which Evolves a Neural Net Module in a Fraction of a Second and Runs a Million Neuron Artificial Brain in Real Time", *Genetic Programming Conference,* July 1997, Stanford, USA.

Hugo de Garis, "One Chip Evolvable Hardware : 1C-EHW", *Int. Conf. on Artificial Neural Networks and Genetic Algorithms,* April 1997, Norwich, UK.

1996

Gers F.A. & de Garis H., "Porting a Cellular Automata Based Artificial Brain to MIT's Cellular Automata Machine CAM-8", *Int. Conf. on Simulated Evolution and Learning,* November 1996, Taejon, Korea.

Gers F. & de Garis H., "CAM-Brain : A New Model for ATR's Cellular Automata Based Artificial Brain Project', *Int. Conf. on Evolvable Systems,* October 1996, Tsukuba, Japan. Hugo de Garis, "ATR's Billion Neuron Artificial Brain Project", *Int. Conf. on Neural Information Processing,* September 1996, Hong Kong, China.

Hugo de Garis, "CAM-BRAIN : ATR's Billion Neuron Artificial Brain Project : A Three Year Progress Report", *Int. Conf. on Evolutionary Computation,* May 1996, Nagoya, Japan.

Hugo de Garis, "CAM-Brain: ATR's Billion Neuron Artificial Brain Project", *Multistrategy Learning Workshop,* May 1996, West Virginia, USA.

Hugo de Garis, "CAM-Brain: ATR's Billion Neuron Artificial Brain Project : A Three Year Progress Report", *Int. Conf. on Artificial Life and Robotics*, February, 1996, Beppu, Japan.

1995

Hugo de Garis, "CAM-Brain: The Evolutionary Engineering of a Billion Neuron Artificial Brain by 2001 which Grows/Evolves at Electronic Speeds inside a Cellular Automata Machine (CAM), *Int. Conf. on Artificial Neural Networks and Genetic Algorithms,* April, 1995, Ales, France.

Hugo de Garis, "CAM-Brain: The Evolutionary Engineering of a Billion Neuron Artificial Brain by 2001 which Grows/Evolves at Electronic Speeds inside a Cellular Automata Machine (CAM)", *Workshop on Biologically Inspired and Evolutionary Systems,* February 1995, Tokyo, Japan.

Hugo de Garis, "CAM-Brain : The Evolutionary Engineering of a Billion Neuron Artificial Brain by 2001 which Grows/Evolves at Electronic Speeds inside a Cellular Automata Machine (CAM), *World Wise Men Workshop on Soft Computing,* 1995, Nagoya, Japan.

1994

Hugo de Garis, "The CAM-BRAIN Project : The Evolutionary Engineering of a Billion Neuron Artificial Brain which Grows/Evolves at Electronic Speeds in a Cellular Automata Machine", *Int. Conf. on Neural Information Processing Systems,* October 1994, Seoul, Korea.

Hugo de Garis, "CAM-Brain: Towards the Genetic Programming of a Billion Neuron Artificial Brain which Grows/Evolves at Electronic Speeds in a Cellular Automata Machine", *Int. Symposium on Robotics and Manufacturing,* August 1994, Maui, Hawaii, USA.

Hugo de Garis, "CAM-Brain Issues: Implementation and Performance-Scaling Issues Concerning the Genetic Programming of a Cellular Automata Based Artificial Brain", *Int. Conf. on Evolutionary Computation,* June 1994, Orlando, Florida, USA.

Hugo de Garis, "CAM-Brain: The Genetic Programming of an Artificial Brain which Grows/Evolves at Electronic Speeds in a Cellular Automata Machine", *Int. Conf. on Neural Networks,* June 1994, Orlando, Florida, USA.

Hugo de Garis, "The CAM-Brain Project : The Genetic Programming of a Billion Neuron Artificial Brain which Grows/Evolves at Electronic Speeds in a Cellular Automata Machine", *Conf. on Parallel Processing and Artificial Intelligence Conference,* Tokyo, Japan, 1994.

Hugo de Garis, "Growing an Artificial Brain : The Genetic Programming of Million-Neural-Net-Module Artificial Brains with Trillion Cell Cellular Automata Machines",

3rd. Annual Conference on Evolutionary Programming, February 1994, San Diego, CA, USA.

1993

Hugo de Garis, "Evolvable Hardware : The Genetic Programming of Darwin Machines", *Int. Conf. on Artificial Neural Nets and Genetic Algorithms,* 1993, Innsbruck, Austria.

Hugo de Garis, "Neurite Networks : The Genetic Programming of Cellular Automata Based Neural Nets Which Grow", *Int. Joint Conf. on Neural Networks,* October 1993, Nagoya, Japan.

Hugo de Garis, "Artificial Life : Growing an Artificial Brain with a Million Neural Net Modules Inside a Trillion Cell Cellular Automata Machine", 4th. *Int. Symposium on Micro Machine & Human Science,* October 1993, Nagoya, Japan.

Hugo de Garis, "Incremental Evolution of Neural Nets : Genetic Programming in Incremental Steps", *World Congress on Neural Networks,* July 1993, Portland, Oregon, USA.

Hugo de Garis, "Evolving a Replicator : The Genetic Programming of Self Reproduction in Cellular Automata", *2nd. European Conference on Artificial Life,* May 1993, Brussels, Belgium.

Hugo de Garis, "Multistrategy Learning in Neural Nets : An Incremental Approach to Genetic Programming", *Multistrategy Learning Workshop,* May 1993, West Virginia, USA.

1992

Hugo de Garis, "Artificial Nervous Systems : The Genetic Programming of Production-Rule-GenNet Circuits", *Int. Joint Conf. on Neural Networks,* November 1992, Beijing, China.

Hugo de Garis, "Differentiable Chromosomes : The Genetic Programming of Switchable Shape-Genes", Conf on Parallel Problem Solving from Nature, Sept. 1992, Brussels, Belgium.

Hugo de Garis, "Artificial Embryology : The Genetic Programming of Cellular Differentiation", *Artificial Life III Workshop,* June 1992, Santa Fe, New Mexico, USA.

Hugo de Garis, "Exploring GenNet Behaviors : Using Genetic Programming to Explore Qualitatively New Behaviors in Recurrent Neural Networks", *Int. Joint Conf. on Neural Networks,* June 1992, Baltimore, USA.

1991

Hugo de Garis, "Steerable GenNets: The Genetic Programming of Controllable Behaviors in GenNets", *1st. European Conference on Artificial Life,* 1991, Paris, France.

Hugo de Garis, "GenNets: Genetically Programmed Neural Nets : Using the Genetic Algorithm to Train Neural Nets Whose Inputs and/or Outputs Vary in Time", *Int. Joint Conf. on Neural Networks,* November 1991, Singapore.

Hugo de Garis, "Using the Genetic Algorithm to Train Time Dependent Behaviors in Neural Networks", *Multistrategy Learning Workshop,* October 1991, West Virginia, USA.

Hugo de Garis, "The LIZZY Project : Genetically Programming an Artificial Nervous System", *Int. Conf. on Artificial Neural Networks,* June 1991, Espoo, Finland.

Hugo de Garis, "GENBLOCK : Block Diagonalization of Very Large Binary Matrices Using the Genetic Algorithm", *5th. Int. Symposium on Applied Stochastic Models and Data Analysis*, April 1991, Granada, Spain.

Hugo de Garis, "Genetic Control : Building Artificial Nervous Systems and Artificial Embryos", *1991 Benelux Meeting on Systems and Control,* March 1991, Blankenberge, Belgium.

Hugo de Garis, "Genetic Programming : Artificial Nervous Systems, Artificial Embryos and Embryological Electronics", in "Parallel Problem Solving from Nature", *Lecture Notes in Computer Science 496,* Springer Verlag, 1991.

1990

Hugo de Garis, "Genetic Programming : Evolution of Time Dependent Neural Network Modules Which Teach a Pair of Stick Legs to Walk", *9th. European Conf. on Artificial Intelligence,* August 1990, Stockholm, Sweden.

Hugo de Garis, "Genetic Programming : Building Artificial Nervous Systems Using Genetically Programmed Neural Network Modules", in Porter B.W. & Mooney R.J. eds., *Proc. 7th. Int. Conf. on Machine Learning,* pp 132-139, Morgan Kaufmann.

Hugo de Garis, "Brain Building with GenNets", *Int. Neural Networks Conf.,* July 1990, Paris, France.

Hugo de Garis, "Genetic Programming : Building Nanobrains with Genetically Programmed Neural Network Modules", *Int. Joint Conf. on Neural Networks,* June 1990, San Diego, California, USA.

Hugo de Garis, "Genetic Programming : Modular Evolution for Darwin Machines", *Int. Joint Conf. on Neural Networks,* January 1990, Washington DC, USA.

1989

Hugo de Garis, "Compo: Conceptual Clustering with Competitive Learning and the Genetic Algorithm", *1st. IEE Conference on Artificial Neural Networks,* October 1989, London, UK.

1988

Hugo de Garis, "Minimum Length Classification Rules for Qualitative Data", *4th Int. Symposium on Applied Stochastic Models and Data Analysis,* December 1988, Nancy, France.

Other Publications (Books, Book Chapters, and Others)

Book Chapters (15)

15) Hugo de Garis, Ben Goertzel, "The China Brain Project : An Evolutionary Engineering Approach to Building China's First Artificial Brain Containing 10,000s of Evolved Neural Net Minsky-Like Agents", to appear in 2010 in the book, "Kansei Software Engineering", edited by SHI Minghui et al.

14) Hugo de Garis, "Artificial Brains: An Evolved Neural Net Module Approach", in book "Computational Intelligence: A Compendium (Studies in Computational Intelligence) by John Fulcher and Lakhmi C. Jain (eds.), Springer, 2008.

13) Hugo de Garis, Sam Halioris, "The Artilect Debate : Why Build Superhuman Machines, and Why Not?", in book "Parsing the Turing Test: Philosophical and Methodological Issues in the Quest for the Thinking Computer", Robert Epstein, Gary Roberts, and Grace Beber (eds.), Springer-Verlag, 2008.

12) Hugo de Garis, "Artificial Brains", in book "Artificial General Intelligence (Cognitive Technologies)" by Ben Goertzel and Cassio Pennachin (eds.), Springer, 2007.

11) Hugo de Garis, Norberto Eiji Nawa, Andrzej Buller, Michael Korkin, Felix Gers, Michael Hough, "Evolution of Neural Network Modules: ATR's Artificial Brain Project Ch. 7 in book *"Evolution of Engineering and Information Systems and their Applications",* Lakhmi C. Jain (Editor), CRC Press, 1999.

10) Hugo de Garis, "Artificial Embryology and Cellular Differentiation", Ch. 12 in book *"Evolutionary Design by Computers",* (ed.) Peter J. Bentley, pp 281-295, Morgan Kaufmann, 1999.

9) Felix Gers, Hugo de Garis, "Evolution of Neural Structures Based on Cellular Automata", Ch. 9 in book *"Soft Computing Techniques in Knowledge-based Intelligent Engineering Systems : Approaches and Applications",* Lakhmi C. Jain (Editor), Physica-Verlag, 1997.

8) Hugo de Garis, "Evolutionary Engineering in System Design", Ch 6 in book *"Hybrid Intelligent Engineering Systems",* L.C. Jain & R.K. Jain (eds.), World Scientific, 1997.

7) Hugo de Garis, "CAM-BRAIN : The Evolutionary Engineering of a Billion Neuron Artificial Brain by 2001 which Grows/Evolves at Electronic Speeds inside a Cellular Automata Machine (CAM)", in book "Fuzzy Logic, Neural Networks, and Evolutionary Computation", IEEE/Nagoya-University World Wisepersons Workshop, Nagoya, Japan, November 1995, Selected Papers, Lecture Notes in Artificial Intelligence 1152, Takeshi Furuhashi, Yoshiki Uchikawa (eds.), Springer Verlag, pp 215-243, 1996.

6) Hugo de Garis, "Brain Building for a Biological Robot : How to Genetically Program a Billion Neuron Artificial Brain which Grows/Evolves at Electronic Speeds inside a Cellular Automata Machine", Ch 3 in book *"Neural Networks for Robotic Control : Theory and Applications",* A.M.S. Zalzala and A.S. Morris (eds.), Ellis Horwood, 1996.

5) Hugo de Garis, "Cam-Brain: The Evolutionary Engineering of a Billion Neuron Artificial Brain by 2001 which Grows/Evolves at Electronic Speeds inside a Cellular Automata Machine (CAM)", in book *"Towards Evolvable Hardware : The Evolutionary Engineering Approach",* E. Sanchez & M. Tomassini (eds.), Lecture Notes in Computer Science, No. 1062, Springer Verlag, 1996.

4) Hugo de Garis, "Genetic Programming : Evolutionary Approaches to Multistrategy Learning", Ch.21 in book *"Machine Learning : A Multistrategy Approach, Vol. 4",* eds. R.S.Michalski, and G. Tecuci, Morgan Kauffman, 1994.

3) Hugo de Garis, "Artificial Embryology : The Genetic Programming of an Artificial Embryo", Ch. 14 in book *"Dynamic, Genetic, and Chaotic Programming",* ed. Branko Soucek and the IRIS Group, Wiley, 1992.

2) Hugo de Garis, "Brain Building : The Genetic Programming of Artificial Nervous Systems and Artificial Embryos", in book *"Progress in Neural Networks, Vol. 4",* ed. O.M. Omidvar, Ablex Publ. Corp., 1991.

1) Hugo de Garis, "Genetic Programming : Building Artificial Nervous Systems with Genetically Programmed Neural Network Modules", Ch. 8 in book *"Neural and Intelligent Systems Integration",* ed. Prof. Branko Soucek, Wiley, 1991.

Major Research Grants

2008, Xiamen, China, at Xiamen University, *3,000,000 RMB* to build an artificial brain, paid by Xiamen University.

2000, Brussels, Belgium, Europe, at Starlab (Research Laboratory), *$1,000,000* to build an artificial brain, paid by the Brussels Government.

1997, Kyoto, Japan, ATR (Advanced Telecom Research Labs), *$400,000* to build the CAM-Brain Machine (CBM), a specialized piece of hardware to evolve neural net circuits at electronic speeds for brain building.

Supervision of PhD Students (5)

1. ZHANG Zijun, Theoretical Physics, successfully defended Nov 2 2005, with a thesis on "Quantum Evolutionary Computation (QEC) and Quantum Evolution of Neural Networks (QENN)", USU, Logan, USA.

2. HU Jing, Computer Science, started June 2005, transferred June 2006, USU, Logan, USA.

3. WANG Ce, Computer Science, started June 2005, transferred June 2006, USU, Logan, USA.

4. YAN Xuesong, School of Computer Science, started November 2005, transferred June 2006, CUG, Wuhan, CHINA.

5. LIAN Ruiting, School of Information Sciences, started June 2008, Xiamen University, Xiamen, CHINA.

Other Publicity, etc.

"Hugo de Garis" on Google, gives 16,000 hits (June 2008).

"artilect" (Prof. de Garis's word for a massively intelligent machine) gives 19,000 hits on Google (June 2008).

Davos Scientific Fellow, World Economic Forum, Davos, Switzerland, 1998.

Prof. Dr. Hugo de Garis, biographical entry in Marquis's *"Who's Who in Science and Engineering",* USA, 2008.

Personal Details

Work Address

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Director, Artificial Brain Lab,
Institute of Artificial Intelligence,
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School of Information Science and Technology,
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tel. (home): (+86) (0)592 256 4072
mobile: (+86) 131 5920 2735
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http://www.iss.whu.edu.cn/degaris

Birthdate : 24 August 1947
Sex : Male
Citizenship : British (European Union) / Australia
Marital State : Married (two children from first wife), divorced, remarried, widowered, remarried.
Countries Lived In : Australia, UK, Holland, Belgium, Japan, US, China

Research Interests

Artificial Brains (Primary Interest)
Topological Quantum Computing (TQC) (Primary Teaching Interest)
Evolvable Hardware (EH), Prof. de Garis is the father of this field
Evolutionary Engineering
Autonomous Robots
Neural Networks
Genetic Algorithms
Machine Learning
Artificial Embryology
Future of Artificial Intelligence

Artificial Nervous Systems
Electronics
Brain Sciences
Biological Evolution
Molecular Scale Technologies
3D-Femto-Computing
Theoretical Physics
Quantum Computing
Reversible Computing
Frontiers of Computing
Nanotechnology
Mathematical Physics
Lie Groups, Lie Algebras

Brief Scientific Biography

Prof. Dr. Hugo de Garis obtained a B.Sc. (Hons) in Applied Mathematics and Theoretical Physics at Melbourne University, Victoria, Australia, in 1970. He moved to the UK where he was a supervisor (instructor) to the mathematics undergraduates of Cambridge University for 4 years. He then joined Philips in Holland and Belgium as a software and hardware architect, covering most branches of computer science. Growing discontent with industry, he switched careers to do research at Brussels University, where he finished a PhD in Artificial Intelligence and Artificial Life. Prof. Dr. de Garis has published some 130+ journal/conference papers and book chapters. He met Professor Ryszard Michalski (pioneer of Machine Learning, of George Mason University, GMU) in 1988, and was invited by him to spend 6 months at the GMU AI Center as a graduate student. A year later de Garis was made a senior research affiliate of GMU.

At Brussels University (ULB), de Garis was head of CADEPS's (Center for Data Analysis and Stochastic Processes) Artificial Intelligence and Artificial Life Research Unit, doing research into "Evolutionary Engineering" (i.e. using Genetic Algorithms to build/evolve complex systems, such as artificial nervous systems for biots (biological robots), artificial embryos etc). de Garis was chosen by the European Commission to be in the top 10 of a short list of 60 postdoctoral candidates in Engineering and Science over the whole of Europe, to take up a 2 year postdoctoral fellowship (STA) in Japan. The ETL (Electrotechnical Lab) in Tsukuba, Japan, then confirmed this recommendation for a two year stay. In May of 1992, as a postdoctoral fellow at Tsukuba, de Garis was made an editorial board member of MIT Press's "Evolutionary Computation Journal".

From February 1993 to January 2000, de Garis was the head of the Brain Builder Group in the Evolutionary Systems Department at ATR Labs in Kyoto, Japan. The aim was to use Cellular Automata Machines (CAMs) to grow/evolve a 75 million neuron (64K module) artificial brain at electronic speeds, using state of the art evolvable hardware (Xilinx XC6264 FPGA chips) which can update CA cells at over 130 Billion a second,

and evolve neural network modules in about a second. The name of this research effort was the "CAM-Brain Project". It is de Garis's ambition to see the building of artificial brains grow into a major effort equivalent to America's NASA moon shot. See de Garis's extensive web site for details on the "CAM-Brain Project".
http://www.iss.whu.edu.cn/degaris

From February 2000 to June 2001, de Garis was the leader of the Brain Builder Group at STARLAB, in Brussels, Belgium, Europe, continuing the work he did at ATR. He had hoped to show off to the world the planet's first artificial brain (controlling a cute life sized robot kitten) in the year 2001.

Unfortunately, the lab STARLAB went bankrupt in June 2001 in the dotcom crash, and the Brain Builder Project was stopped in its tracks. The 4 CBMs built were priced at $0.5M each, so were too expensive to be purchased by Dr. de Garis's next institution.

From Sept 2001 to May 2006, Dr. de Garis was an associate professor of computer science at Utah State University (USU), Logan, Utah, USA, teaching the planet's first (M.Sc./PhD) course in "Brain Building", and another new course, "Frontiers of Computing" (quantum computing, reversible computing, nanotechnology, DNA computing, membrane computing, quantum dots, molecular computing, etc). In 2005, he started teaching a PhD level course in Quantum Computing. He aimed to build a new generation of brain building machine and an artificial brain, each 5 years or so. In 2005 he bought a programmable electronic board (Celoxica) and used it to evolve neural networks quickly. These are downloaded one by one into a PC, interconnected in their 10,000s to form an artificial brain whose neural signaling is executed by the PC. The artificial brain is used to control a robot whose task is to detect unexploded cluster bomblets (yellow marbles in the lab), pick them up and deposit them at some central location.

From June 2006 to January 2008, Prof. de Garis was Head of the Artificial Intelligence group at the International Software School, at Wuhan University, Wuhan, China.. He was made a full professor of Computer Science and Mathematical Physics. He taught masters students in math and physics topics relevant to Topological Quantum Computing (QTC), and continued his research into Artificial Brains.

From February 2008 to now, Prof de Garis is Director of the Artificial Brain Lab, Artificial Intelligence Institute, Department of Cognitive Science, School of Information Science and Technology, Xiamen University, Xiamen, China. He is a full professor of Computer Science and Mathematical Physics, and was made a supervisor of both Computer Science and Mathematical Physics PhD students. He teaches masters students in math and physics topics relevant to Topological Quantum Computing (QTC). As Director of the Artificial Brain Lab, he continues his research, with a 4 year research project, 3,000,000 RMB, to build an artificial brain.

Education

B.Sc.(Hons), 1970, Applied Maths & Theoretical Physics, Melbourne University, Australia.

Ph.D., 1992, Artificial Intelligence & Artificial Life, Brussels University (ULB), Belgium
Thesis Title : "Genetic Programming : GenNets, Artificial Nervous Systems, Artificial Embryos"

Patents

Some half dozen patents taken out world wide by ATR for the CAM-Brain Project and CAM-Brain Machine (CBM).

Publicity

240,000 Personal Website Hits (June 2008)
Hundreds of International Media Reports
http://www.iss.whu.edu.cn/degaris

Teaching Experience

2008 – now,

Full Professor of Computer Science and Mathematical Physics, Supervisor of PhD students in Computer Science and Mathematical Physics, in the Artificial Intelligence Institute, Department of Cognitive Science, School of Information Science and Technology, Xiamen University, Xiamen, China. Teaching masters level courses in math and physics for Topological Quantum Computing (TQC).

2006-2007, Full Professor of Computer Science and Mathematical Physics, International School of Software, Wuhan University, Wuhan, China. Taught masters students in math, physics, and computer science topics for Topological Quantum Computing (TQC).

2001-2006, Associate Professor at USU, teaching 2 courses in the spring semester, and 1 in the fall semester. These courses include two annual PhD level courses in a) Brain Building, and b) Quantum Computing, and a fresher level C++ class, plus occasionally, a Masters level course in machine learning and artificial intelligence.

12th Grade Mathematics Teacher in State High Schools (Victoria, Australia) (Summer Job during University Vacations)1968-1970.

Mathematics Supervisor (Instructor) to Undergraduates of Cambridge University Colleges, Cambridge, UK, 1972-1976

Frequently Invited Lecturer and Seminar Speaker to Universities, Research Labs around the World, 1987-now.

Human Languages Spoken

English, French, Dutch, German (all fluent), Japanese (5000 words), Chinese (3000 words)

Computer Language Known

HTML, C, ++, C, Lisp, Prolog, Fortran, Pascal, Assembler.

Work History

2008 – now

Full Professor of Computer Science and Mathematical Physics, Supervisor of PhD students in Computer Science and Mathematical Physics, Director of the "Artificial Brain Lab" (a 4 year (2008-2011), 3,000,000 RMB project to build an artificial brain containing 10,000s of evolved neural net modules, to control the 100s of behaviors of an autonomous robot), in the Artificial Intelligence Institute, Department of Cognitive Science, School of Information Science and Technology, Xiamen University, Xiamen, China.

2006-2007

Full Professor of Computer Science and Mathematical Physics, International School of Software, Wuhan University, Wuhan, China. Taught masters students in math, physics, and computer science topics for Topological Quantum Computing (TQC), plus research into TQC and Artificial Brains.

2001-2006

Associate Professor of Computer Science at Utah State University, Logan, Utah, USA. Teaching PhD students in brain building, frontiers of computing, quantum computing,

and researching into artificial brains, evolvable hardware, brain building machines, accelerating evolutionary algorithms with machine learning techniques, quantum computing and its link with evolutionary computing.

2000-2001

Head of Brain Builder Group, STARLAB, Brussels, Belgium, Europe. Continuing the work to build an artificial brain, as at ATR below.

1993-1999

Head of Brain Builder Group, Evolutionary Systems Dept, ATR Labs, Kyoto, Japan. The aim was to build a 75 million neuron artificial brain (64K neural net modules) using cellular automata based neural nets that grow/evolve at electronic speeds (about a second) inside Xilinx XC6264 chip FPGAs.

1992

STA Postdoctoral Research Fellow, at Electrotechnical Lab (ETL), Tsukuba Science City, Japan. Working on Artificial Nervous Systems, Artificial Embryology, Embryonics (Embryological Electronics). Editorial board member of "Evolutionary Computation" Journal.

1991-now

Senior research affiliate at the Center for Machine Learning and Inference, at George Mason University, Virginia, USA.

1987-1991

PhD student in Artificial Intelligence and Artificial Life, and head of CADEPS's AI/ALife Research Unit at the Universite Libre de Bruxelles (ULB). (Includes 6 months at George Mason University with Professor Michalski, by invitation; and a 2 month stay at Boston University working on a Connection Machine to evolve shapes). Specialities : Artificial Nervous Systems, Artificial Life, Neural Networks, Genetic Algorithms, Symbolic Programming (Lisp, Prolog), Expert Systems, Machine Learning, Concept Learning, Data Analysis.

1985-1986

Industrial researcher at Leuven University, Leuven, Belgium, in Artificial Intelligence, Machine Learning, Expert Systems.

1984-1985

SOBEMAP, Brussels. Consultant (Advanced Computer Systems). Specialist in Standard Generalized Markup Language (SGML) for computerized markup of documents. Team member of SOBEMAP's ESPRIT (Europe's 5th Generation Research Effort) research project into advanced office systems.

1982-1983

TRASYS, Brussels. Software Engineer. Conception and coding of a Data Description Language (DDL) compiler for a hierarchical data base.

1981-1982

CL SYSTEMS, Melbourne Australia. Software Engineer.

1976-1981

PHILIPS, Holland and Belgium. Computer Systems Architect. Hardware, software, telephony, bit slicing, fast fourier transform, digital signaling, math package software, telephone simulations.

1972-1976

Teaching assistant (supervisor) in mathematics to undergraduates at Cambridge University colleges, England.

Hobbies

Job, reading (books on most of the physical and social sciences, philosophy), watching scientific university lecture programs on satellite TV and the internet, playing the piano (Chopin, Liszt, Debussy, etc), listening to classical music, international travel, writing scientific and political philosophical books, etc.

Honors

Davos World Economic Forum (WEF) Scientific Fellow (one of several hundred in the world), 1998.

Prof. Dr. Hugo de Garis, biographical entry in Marquis's *"Who's Who in Science and Engineering",* USA, 2008.