

Ben Goertzel, Ph.D.

Computer Scientist, Mathematician, Entrepreneur, Author

CEO and Chief Scientist
Novamente LLC
Biomind LLC

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Rockville MD 20851

RESEARCH AREAS

- **artificial intelligence** – probabilistic logic, machine learning, evolutionary programming, cognitive science, integrative general intelligence architectures
- **bioinformatics**, including analysis of gene and protein microarray data, and SNP and heteroplasmic mutation data, and use of databases such as the Gene Ontology and PIR and pathway databases
- **virtual worlds and gaming** – with a focus on the use of these platforms for AI and simulated robotics
- **natural language processing**, especially semantic analysis of texts
- **machine learning and data mining**, especially evolutionary algorithms, also support vector machines, frequent itemset mining and other techniques
- **quantitative finance**, especially algorithms for directional prediction of stocks, currency and commodity, futures and indices; and financial prediction based on news and other text sources
- **national security** applications of AI, language processing and data mining

EMPLOYMENT HISTORY

- July 2002 - **CEO**, Novamente LLC and Biomind LLC
- 2005 –2006, **Research Professor**, Virginia Tech National Capital Region, Applied Research Lab for National and Homeland Security
- 2001- 2002, **Research Associate Professor**, Computer Science Dept., University of New Mexico
- 1997 - March 2001: Founder, **Chief Technology Officer and Chairman**, Webmind Inc. (formerly called Intelligenesis Corp.), New York
- 1997-1998 : **Assistant Professor of Computer Science**, College of Staten Island, City University of New York, New York City
- 1995-1997: **Research Fellow**, Department of Psychology, University of Western Australia

- 1994: **Lecturer in Computer Science**, University of Waikato, Hamilton, New Zealand
- 1989-1993: **Assistant Professor of Mathematics**, University of Nevada, Las Vegas, USA

EDUCATION

- **1987-89**: Ph.D. in Mathematics, Temple University, Philadelphia, USA. Dissertation title: "A Multilevel Approach to Global Optimization."
- **1985-86**: Graduate coursework at Courant Institute of Mathematical Sciences, New York University, USA
- **1982-85**: B.A. in Mathematics, Simon's Rock College, Great Barrington MA, USA

PERSONAL INFO

- Date of Birth: Dec. 8, 1966
- Citizenship: USA, Brazil
- Married, with 3 children

COMPUTING TECHNOLOGY EXPERTISE

- Large-scale, object-oriented software system design
- Advanced algorithms and data structures, for conventional, distributed and parallel architectures
- Programming in a variety of languages, including Java, C++, Python and Haskell (plus some familiarity with many other languages such as Lisp, Fortran, etc. etc.)

MANAGEMENT EXPERIENCE

- 20+ reports at Novamente and Biomind, 2002-
- 80+ direct reports at Webmind Inc., 1998-2001
- Managed R&D, product development of multiple products, marketing and sales, and provision of software solutions to client firms
- Managed research and software development teams spanning all continents except Antarctica (plus New Zealand)

PATENTS

United States Patent 6532449: "Method of numerical time series prediction based on non-numerical time series," was granted to myself and Lisa Pazer in 2001. The target application for this patent was the prediction of financial markets based on patterns observed in online news.

CONFERENCE LEADERSHIP

2009

- **AGI-09** (Second Conference on Artificial General Intelligence), *Conference Chair*: March 2009, Washington DC
- **Machine Consciousness Workshop** (post-conference workshop to Toward a Science of Consciousness 2009), June 2009, Hong Kong

2008

- **AGI-08** (First Conference on Artificial General Intelligence; agi-08.org), *Program Committee Co-chair, Organizing Committee Member*: March 2008, Memphis Tennessee
- **WCCI 2008, Special Session on Human-Level AI**, *Co-chair*: June 2008, Hong Kong

2006

- **AGI-06** (Workshop on Artificial General Intelligence), *Conference Chair*: March 2006, Bethesda Maryland
- **ACL (Association for Computational Linguistics), Bio-NLP Workshop**, *Co-chair*: July 2006, New York

RESEARCH GRANTS AND GOVERNEMENT CONTRACTS

(Note: most of my work in the period 2001- has been commercially rather than research grant or government funded.)

- **2008**: IARPA contract for “Change Detection”; work exploring the application of spatial, temporal and contextual inference for detecting patterns and resolving queries related to large, heterogeneous knowledge stores
- **2008**: US Air Force (AFOSR/AOARD) grant for research involving the use of AI agents in a 3D simulation world to engage in game-playing behavior with humans of different cultures, with a purpose of studying cross-cultural behavior patterns
- **2008-present**: Research grant for AGI R&D, from Enhanced Education
- **2005-present**: Contracts and purchase orders from the *National Institutes of Health (NIAID)*, under the BISTI program, for software and services related to the ImmPort portal for analysis of immunological microarray and SNP data
- **2005**: Contract from NIH Clinical Center for the creation of a prototype software system carrying out information extraction from biomedical research abstracts
- **2003-2004**: Contracts and purchase orders from the *Centers for Disease Control and Prevention*, for analysis of microarray, SNP and clinical data regarding Chronic Fatigue Syndrome
- **2003-2004**: Contracts for natural language processing software development, from Object Sciences Corporation, largely via a contract vehicle funded through INSCOM (US Army intelligence)

- **2001:** \$100K grant from *Jeffrey Epstein Foundation*, for artificial general intelligence research
- **1996-99:** Together with Dr. Steve Lewandowsky and Michael Kalish I raised significant funding for computer equipment and computer support personnel for the UWA Cognitive Science Programme, from the *University of Western Australia Initiatives Fund*.
- **1993-96:** I obtained several small research grants from *University of Nevada*, *Waikato University* and the *Australian Research Council*

PUBLICATIONS: BOOKS

Authored Books

1. Goertzel, Ben, Matthew Ikle', Izabela Freire Goertzel and Ari Heljakka (2008). *Probabilistic Term Logic*. Springer Verlag
2. Goertzel, Ben (2006). *The Hidden Pattern: A Patternist Philosophy of Mind*, Brown-Walker Press
3. Goertzel, Ben and Stephan Vladimir Bugaj (2006). *The Path to Posthumanity*. Academica Press
4. Goertzel, Ben (2002). *Creating Internet Intelligence*. Plenum Press
5. Goertzel, Ben (1997). *From Complexity to Creativity*. Plenum Press
6. Goertzel, Ben (1997). *Chaotic Logic*. Plenum Press
7. Goertzel, Ted and Ben Goertzel (1995). *Linus Pauling: A Life in Science and Politics*. Basic Books
8. Goertzel, Ben (1993). *The Evolving Mind*. Plenum Press
9. Goertzel, Ben (1993). *The Structure of Intelligence*. Springer-Verlag

Edited Books

1. Goertzel, Ben, Pascal Hitzler and Marcus Hutter (2009). *Proceedings of the Second Conference on Artificial General Intelligence*. Atlantis Press.
2. Wang, Pei, Ben Goertzel and Stan Franklin (2008). *Artificial General Intelligence 2008: Proceedings of the First AGI Conference*. IOS Press: Frontiers in Artificial Intelligence and Applications
3. Goertzel, Ben and Pei Wang, Editors (2007). *Advances in Artificial General Intelligence*. IOS Press.
4. Goertzel, Ben and Cassio Pennachin, Editors (2006). *Artificial General Intelligence*. Springer-Verlag.
5. Combs, Allan, Ben Goertzel and Mark Germine (2003). *Mind in Time..* Plenum Press

PUBLICATIONS: JOURNAL AND CONFERENCE PAPERS

2009

1. Goertzel, Ben and Pennachin, Cassio. The Collective Pet Unconscious: Balancing Intelligence and Individuality in Populations of Learning-Enabled Virtual Pets, *The Reign of Catz and Dogz Symposium, ACM-CHI*, Boston, 2009
2. Goertzel, Ben. OpenCogPrime: A Cognitive Synergy Based Architecture for General Intelligence. *International Conference on Cognitive Informatics*, Hong Kong, 2009
3. Goertzel, Ben. Cognitive Synergy: A Universal Principle for General Intelligence?, *International Conference on Cognitive Informatics*, Hong Kong, 2009
4. Goertzel, Ben. The Embodied Communication Prior: A Characterization of General Intelligence in the Context of Embodied Social Interaction. *International Conference on Cognitive Informatics*, Hong Kong, 2009
5. Goertzel, Ben, Lucio Coelho, Mauricio Mudado and Cassio Pennachin. *Classifier Ensemble Based Analysis of a Genome-wide SNP Dataset Concerning Late-Onset Alzheimer Disease*. International Conference on Cognitive Informatics, Hong Kong, 2009
6. Goertzel, Ben. All Things Are Conscious, But Some Things Are More Conscious Than Others: A Panpsychist Approach to Quantifying Intensity of Consciousness in Natural and Engineered Systems. *Machine Consciousness Workshop, Toward a Science of Consciousness*, Hong Kong, 2009
7. Goertzel, Ben and Stephan Vladimir Bugaj. AGI Preschool: A Framework for Evaluating Early-Stage Human-like AGIs. *Proceedings of the Second Conference on Artificial General Intelligence*, Atlantis Press.
8. Ikle, Matthew, Joel Pitt, Ben Goertzel and George Sellman. Economic Attention Networks: Associative Memory and Resource Allocation for General Intelligence. *Proceedings of the Second Conference on Artificial General Intelligence*, Atlantis Press.
9. Looks, Moshe and Ben Goertzel. Program Representation for General Intelligence. *Proceedings of the Second Conference on Artificial General Intelligence*, Atlantis Press.
10. Goertzel, Ben. What Must a World Be That a Humanlike Intelligence Might Develop In It?, *Journal of Artificial General Intelligence*.
11. De Garis, Hugo and Ben Goertzel. The First Conference on Artificial General Intelligence. *AI Magazine* 30-1, p.121
12. Goertzel, Ben, Lucio Coelho and Cassio Pennachin. Identifying Potential Biomarkers for Chronic Fatigue Syndrome via Classification Model Ensemble Mining. in *Methods of Micorarray Data Analysis VI*, edited by McConnell, P,

Lim, S., and A.J. Cuticchia. Scotts Valley, California: CreateSpace Publishing, 2009).

2008

1. Goertzel, Ben, Lucio Souza, Mauricio Mudado and Cassio Pennachin . Identifying the Genes and Genetic Interrelationships Underlying the Impact of Calorie Restriction on Maximum Lifespan: An Artificial Intelligence Based Approach. *Rejuvenation Research*
2. Goertzel, Ben; Aam, O.; Smith, F.T.; Palmer, K. Mirror Neurons, Mirrorhouses, and the Algebraic Structure of the Self. *Cybernetics & Human Knowing*, Volume 15, Number 1, 2008 , pp. 9-28(20)
3. Goertzel, Ben and Hugo de Garis. XIA-MAN: An Integrative, Extensible Architecture for Intelligent Humanoid Robotics. *AAAI Symposium on Biologically-Inspired Cognitive Architectures*, Washington DC, November 2008
4. Goertzel, Ben . A Pragmatic Path Toward Endowing Virtually-Embodied AIs with Human-Level Linguistic Capability, *Special Session on Human-Level Intelligence, IEEE World Congress on Computational Intelligence (WCCI) Hong Kong*, 2008
5. Goertzel, Ben and Pennachin, Cassio . An Inferential Dynamics Approach to Personality and Emotion Driven Behavior Determination for Virtual Animals. *The Reign of Catz and Dogz Symposium, AI and the Simulation of Behavior (AISB)*, Edinburgh, 2008
6. Goertzel, Ben, Cassio Pennachin, Nil Geissweiller, Moshe Looks, Andre Senna, Ari Heljakka, Welter Silva, Carlos Lopes . An Integrative Methodology for Teaching Embodied Non-Linguistic Agents, Applied to Virtual Animals in Second Life, in *Proceedings of the First AGI Conference*, Ed. Wang et al, IOS Press
7. Goertzel, Ben and Stephan Vladimir Bugaj. Stages of Ethical Development in Artificial General Intelligence Systems, in *Proceedings of the First AGI Conference*, Ed. Wang et al, IOS Press
8. Ikle', Matthew and Ben Goertzel . Probabilistic Quantifier Logic for General Intelligence: An Indefinite Probabilities Approach, in *Proceedings of the First AGI Conference*, Ed. Wang et al, IOS Press
9. Hart, David and Ben Goertzel. OpenCog: A Software Framework for Integrative Artificial General Intelligence, in *Proceedings of the First AGI Conference*, Ed. Wang et al, IOS Press
10. Pennachin, Cassio and Ben Goertzel. How Might Probabilistic Reasoning Emerge from the Brain?, in *Proceedings of the First AGI Conference*, Ed. Wang et al, IOS Press

2007

1. Goertzel, Ben. Human-level artificial general intelligence and the possibility of a technological singularity. *Artificial Intelligence* 171-18

2. Goertzel, Ben, Cassio Pennachin, Lucio Coelho, Leonardo Shikida, Murilo Queiroz. Biomind ArrayGenius and GeneGenius: Web Services Offering Microarray and SNP Data Analysis via Novel Machine Learning Methods. In *Proceedings of IAAI 2007*, Vancouver CA, July 2007
3. Goertzel, Ted and Benjamin Goertzel, "Sociologische Wirklichkeit und ihre ökonomische Verzerrung – Sociological Realities and Econometric Distortions." Pages 417-452 in Wolfgang Koschnick, editor. *Focus-Jahrbuch 2007 – Schwerpunkt: Neuroökonomie, Neuromarketing und Neuromarktforschung. Mit weiteren Beiträgen über Messen und Befragen, Treiberanalysen, ökonomisches Modeling und Verkehrsmittelwerbung*. Munich, Germany: Focus Magazin Verlag GmbH, 2007.
4. Looks, Moshe, Ben Goertzel, Lucio de Souza Coelho, Mauricio Mudado, and Cassio Pennachin, "Clustering Gene Expression Data via Mining Ensembles of Classification Rules Evolved Using MOSES", *Genetic and Evolutionary Computation Conference (GECCO)*, 2007.
5. Looks, Moshe, Ben Goertzel, Lucio de Souza Coelho, Mauricio Mudado, and Cassio Pennachin, "Understanding Microarray Data through Applying Competent Program Evolution", *Genetic and Evolutionary Computation Conference (GECCO)*, 2007
6. Ikle', Matt and Ben Goertzel. Indefinite Probabilities for General Intelligence, in *Advances in Artificial General Intelligence*, IOS Press.
7. Goertzel, Ben. Virtual Easter Egg Hunting: A Thought-Experiment in Embodied Social Learning, Cognitive Process Integration, and the Dynamic Emergence of the Self, in *Advances in Artificial General Intelligence*, IOS Press.
8. Heljakka, Ari, Ben Goertzel, Welter Silva, Izabela Goertzel and Cassio Pennachin. Reinforcement Learning of Simple Behaviors in a Simulation World Using Probabilistic Logic, in *Advances in Artificial General Intelligence*, IOS Press.
9. Goertzel, Ben and Stephan Bugaj (2006). Stages of Cognitive Development in Uncertain-Logic-Based AI Systems. in *Advances in Artificial General Intelligence*, IOS Press.
10. Goertzel, Ben, Cassio Pennachin, Lucio Coelho and Mauricio Mudado. Application of MUTIC to the Exploration of Gene Expression Data on Prostate Cancer. *Genet. Mol. Res.* 6 (4): 890-900 (2007)
11. Goertzel, Ben, Ari Heljakka, Cassio Pennachin, Welter Silva, Teemu Keinonen, Matthew Ikle', Sanjay Padmane, *Proceedings of International Symposium on Intelligence Computation and Applications (ISICA) 2007*
12. Goertzel, Ben, and Matthew Ikle'. Assessing the Weight of Evidence Implicit in an Indefinite Probability. *Proceedings of International Symposium on Intelligence Computation and Applications (ISICA) 2007*

1. Goertzel, Ben, Cassio Pennachin, Lucio Coelho, Brian Gurbaxani, Elizabeth B. Maloney, James F. Jones (2006). *Combinations of single nucleotide polymorphisms in neuroendocrine effector and receptor genes are predictive of chronic fatigue syndrome*, Pharmacogenomics
2. Pennachin, Cassio, Ben Goertzel Lucio Coelho, Izabela Freire Goertzel, Murilo Queiroz, Francisco Prosdocimi, Francisco Lobo (2006). *Learning Comprehensible Classification Rules from Gene Expression Data Using Genetic Programming and Biological Ontologies*, Proceedings of CIBB 2006, Genova, Italy
3. Maloney, Elizabeth M. Maloney, Brian M. Gurbaxani, James F. Jones, Lucio de Souza Coelho, Cassio Pennachin, Benjamin N. Goertzel (2006). *Chronic Fatigue Syndrome is Associated with High Allostatic Load*, Pharmacogenomics
4. Goertzel, Ben, Cassio Pennachin, Lucio de Souza Coelho, Elizabeth B. Maloney, James F. Jones, Brian Gurbaxani (2006). *Allostatic Load is Associated with Symptoms in CFS Patients*, Pharmacogenomics
5. Gurbaxani, Brian, James F. Jones, Benjamin N. Goertzel, Elizabeth M. Maloney (2006). *Linear Data Mining the Wichita Clinical Matrix Suggests Sleep and Allostatic Load Involvement in Chronic Fatigue Syndrome*, Pharmacogenomics
6. Looks, Moshe and Ben Goertzel (2006). *Mixing Cognitive Science Concepts with Computer Science Algorithms and Data Structures: An Integrative Approach to Strong AI*, AAAI Spring Symposium, Cognitive Science Principles Meet AI-Hard Problems, San Francisco 2006
7. Goertzel, Ben, Moshe Looks, Ari Heljakka, and Cassio Pennachin (2006). *Toward a Pragmatic Understanding of the Cognitive Underpinnings of Symbol Grounding*, in Semiotics and Intelligent Systems Development, Edited by Ricardo Gudwin and João Queiroz, Eds., 2006
8. Duong, Deborah, Ben Goertzel and Jim Venuto (2006). *Support Vector Machines to Weight Voters in a Voting System of Entity Extractors*. Proceedings of International Joint Conference on Neural Networks, IJCNN 2006, Vancouver CA
9. Goertzel, Ben and Jim Venuto (2006). *Accurate SVM Text Classification for Highly Skewed Data Using Threshold Tuning and Query-Expansion-Based Feature Selection*. Proceedings of International Joint Conference on Neural Networks, IJCNN 2006, Vancouver CA
10. Goertzel, Ben (2006). *Patterns, Hypergraphs and General Intelligence*. Proceedings of International Joint Conference on Neural Networks, IJCNN 2006, Vancouver CA
11. Goertzel, Ben, Lucio Coelho, Cassio Pennachin and Mauricio Mudada (2006). *Identifying Complex Biological Interactions based on Categorical Gene Expression Data*. Proceedings of Conference on Evolutionary Computing 2006, Vancouver CA
12. Goertzel, Ben, Hugo Pinto, Ari Heljakka, Michael Ross, Izabela Goertzel, Cassio Pennachin. *Using Dependency Parsing and Probabilistic Inference to Extract Gene/Protein Interactions Implicit in the Combination of Multiple Biomedical Research Abstracts*, Proceedings of BioNLP-2006 Workshop at ACL-2006, New York
13. Queiroz, Murilo, Francisco Prosdocimi, Izabela Freire Goertzel,

- Francisco Pereira Lobo, Cassio Pennachin, Ben Goertzel. *Inferring Gene Ontology Category Membership via Gene Expression and Sequence Similarity Data Analysis*. Proceedings of KR-Med 2006: Biological Ontologies in Action
14. Goertzel, Ben, Cassio Pennachin, Lúcio de Souza Coelho and Maurício de Alvarenga Mudado (2006). *Identifying Complex Biological Interactions based on Classification of Gene Expression Data*. 14th ISMB – 2006 (<http://ismb2006.cbi.cnptia.embrapa.br/>), August 10th 2006, in a simultaneous co-event - the 2nd AB3C X-Meeting (Associação Brasileira de Bioinformática e Biologia Computacional - Brazilian Bioinformatics and Computational Biology Association).
 15. Goertzel, Ted and Ben Goertzel (2006). *Capital Punishment and Homicide Rates: Sociological Realities and Econometric Distortions*, Critical Sociology
 16. Goertzel, Ted and Ben Goertzel, *Popper, Lakatos and the Death Penalty* (2006), in Esperando a Godot (Buenos Aires)
 17. Goertzel, Ben, Ari Heljakka, Stephan Vladimir Bugaj, Cassio Pennachin, Moshe Looks, Exploring Android Developmental Psychology in a Simulation World, Symposium “Toward Social Mechanisms of Android Science”, Proceedings of ICCS/CogSci 2006, Vancouver

2005

1. Smigrodzki, Rafal, Ben Goertzel, Cassio Pennachin, Lucio Coelho, Francisco Prosdocimi, W. Davis Parker Jr. (2005). *Genetic algorithm for analysis of mutations in Parkinson's disease*. Artificial Intelligence in Medicine 35 (3):227-41.
2. Looks, Moshe, Ben Goertzel, and Cassio Pennachin, *Learning Computer Programs with the Bayesian Optimization Algorithm*, Genetic and Evolutionary Computation Conference (GECCO), 2005.
3. Goertzel, Ben (2005). *Levels of mind versus levels of being*, Cortex Vol. 41, No. 5, pp. 727-731)
4. Goertzel, Ben (2005). *Quantum Cognition: Foreseeing the Emergence of a Fundamentally Novel Form of Intelligence from Quantum Computing Technology*. In Mind Factory, edited by Louis Armand, Litteraria Pragensia

2004

1. Goertzel, Ben, Moshe Looks and Cassio Pennachin (2004). *Novamente: An Integrative Architecture for Artificial General Intelligence*. Proceedings of AAAI Symposium on Achieving Human-Level Intelligence through Integrated Systems and Research, Washington DC, August 2004

2003

1. Goertzel, Ben, Cassio Pennachin, Andre Senna, Thiago Maia and Guilherme Lamacie (2003). *Novamente: An Integrative Architecture for Artificial General*

- Intelligence. *Proceedings of IJCAI-03 Workshop on Agents and Cognitive Modeling*, Acapulco, August 2003
2. Goertzel, Ben (2003). *Chance and Consciousness*. In *Mind in Time*, Ed. by Combs et al. NY: Hampden Press
 3. Goertzel, Ben (2003). *On the Algebraic Structure of Consciousness*. In *Mind in Time*, Ed. by Combs et al. NY: Hampden Press
 4. Goertzel, Ben (2003). *Does Time Move Forward?* In *Mind in Time*, Ed. by Combs et al. NY: Hampden Press

2001

1. Goertzel, Ben (2001). *Neural Networks: The Promise and the Reality*, Future (German language magazine)

2000

1. Pressing, J., Goertzel, B., Wood, T. & Pazer, L. (2000). *Enhanced market prediction using textual analysis: Limitations in the efficient market hypothesis*. Proceedings of the International Conference on Advanced Investment Technology 1999, Bond University.
2. Ben Goertzel, Ken Silverman, Cate Hartley, Stephan Bugaj, Mike Ross (2000). *The Baby Webmind Project*, Proceedings of AISB 2000, the annual conference of The Society for the Study of Artificial Intelligence and the Simulation of Behaviour
3. Goertzel, Ben and Stephan Bugaj (2000). *WebWorld. A conceptual and software framework for Internet Alife*. Proceedings of VII International conference on Artificial Life, Portland OR
4. Goertzel, Ben, Yuri V. Macklakov, Vladimir C. Redko (2000). *A Model of the Evolution of Web Agents*. Herald of the Russian Academy of Sciences

1998

1. Goertzel, Ben (1998). *Symbolic Dynamics in Complex Psychological Systems*, in *Models of Action*, Edited by Wynne and Stadden, Lawrence Erlbaum Associates, Mahwah: N.J.
2. Goertzel, Ben (1998). *Meaning is a Fuzzy Web of Patterns*. In Proceedings of the 1998 Joint Conferences: Intelligent Control, International Symposium on Computational Intelligence in Robotics and Automation, Intelligent Systems and Semiotics (ISIC/CIRA/ISAS 98)

1997

1. Goertzel, Ben (1997). *The Complex Mind/Brain -- II. A Theory of Cortical Dynamics*, Complexity
2. Goertzel, Ben, Harold Bowman and Malwane Ananda (1996). *Second-Order Evolution*. Journal of Biological Systems

3. Goertzel, Ben (1997). *Chaos and Pattern in Complex Systems*. In *Chaos in Society*, Edited by Albert et al, IOS Press
4. Goertzel, Ben (1997). *The Complex Mind/Brain -- I. The Psynet Model of Mental Structure and Dynamics*, Complexity
5. Goertzel, Ben (1997). *Dream Dynamics: A Process Perspective*. In *Noetic Journal*, Special issue on Mind as a Complex System
6. Goertzel, Ben (1997). *Faces of Complexity in Psychology*. In *Noetic Journal*, Special issue on Mind as a Complex System
7. Goertzel, Ben and Mike Kalish (1997). *Mindspace Curvature*. In *Noetic Journal*, Special issue on Mind as a Complex System
8. Goertzel, B. (1997). *Subself dynamics in human and machine intelligence*, CC-AI (Communication and Cognition – Artificial Intelligence)

1996

1. Goertzel, Ben and Harold Bowman (1996). *Walks on Random Digraphs*, Applied Mathematics Letters, 9-1, pp. 43-47
2. Goertzel, Ben (1996). *Mobile Activation Bubbles in Kohonen Networks*, Applied Mathematics Letters.
3. Goertzel, Ben (1996). *Artificial Selfhood -- the Path to True Artificial Intelligence*, Informatica
4. Goertzel, Ben (1996). *Belief Systems as Attractors*, in A Chaos Psychology Reader, Ed. by Combs and Robertson. Hilldale NJ: Erlbaum
5. Goertzel, Ben (1996). *A Cognitive Equation*, in A Chaos Psychology Reader, Ed. by Combs and Robertson. Hilldale NJ: Erlbaum
6. Goertzel, Ben (1996). *Musical Psychology and the Aesthetics of Computer Music*. Journal of ElectroAcoustic Music.

1995

1. Goertzel, Ben (1995). *Rapid Generation of Chaotic Attractors with the Eugenic Genetic Algorithm*, Computers and Graphics 19-1, p. 151
2. Goertzel, Ben (1995). *The Convergence Rate of the Simple GA as Population Size Tends to Infinity*, Proceedings of ICEC 1995
3. Goertzel, Ben and Harold Bowman (1995). *Self-Reference, Computation and Mind*, J. Soc. and Ev. Sys, 18-1, p. 95
4. Goertzel, Ben (1995). *Evolutionary and Chaotic Dynamics in Minds and Immune Systems*, in *Chaos and Psychology*, Edited by Fred Abraham and Roger Gilgen, New York: Greenwood Press
5. *Goertzel, Ted and Ben Goertzel (1995)*. The Dynamics of Belief in the Anita Hill/Clarence Thomas Trial, in *Chaos and Society*, Ed. by Pierre Lemiux
6. Goertzel, Ben and Gwen Goertzel (1995). *The Markovian Language Algorithm: Toward a Neural Network Architecture for Grammar Induction*, Proceedings of ANZIIS 1995
7. Goertzel, Ben and Gwen Goertzel (1995) *Language as a Biological System*. ASSA Journal of System Science 3

1994

1. Goertzel, Ben (1994). *Lagrange Interpolation on a Processor Tree with Ring Connections*, J. of Parallel and Distributed Computation 22-2, p.321
2. Goertzel, Ben (1994). *Simulated Annealing on Uncorrelated Fitness Landscapes*, Int. J. Math. and Math. Sci. 17-4, p. 791
3. Karabekian, Moses and Ben Goertzel (1995). *Discriminant Analysis of Hydrocollapse in Las Vegas Soils*, Civil Engineering Systems
4. Goertzel, Ben, Hiroo Miyamoto and Yoshimasa Awata (1994). *Fractal Image Compression with the Genetic Algorithm*, Complexity International
5. Goertzel, Ben (1994). *Evolving Fractal Industrial Music*, Proceedings of SYNAESTHETICA94 Conference on Computer Animation and Computer Music, Canberra: Australian Centre for Arts and Technology
6. Goertzel, Ben (1994). *The Software Market as a Self- Organizing System*, J. Soc. and Ev. Sys. 17-1, p.9

1993

1. Goertzel, Ben (1993). *Brain Function as Evolution*, J. Soc. and Ev. Sys. 15-4, p. 399
2. Goertzel, Ben (1993). *Some Thoughts on Akin's Spiteful Computer*, Minds and Machines 4-1, p. 75
3. Goertzel, Ben (1993). *Psychology and Logic*, J. Soc. and Ev. Sys. 16-4, p. 439
4. Goertzel, Ben (1993). *Phase Transitions in Associative Memory Networks*, Minds and Machines 3-3, p. 313
5. Goertzel, Ben (1993). *Self-Reference and Complexity: Component-Systems and Self-Generating Systems in Biology and Cognitive Science*, Evolution and Cognition 2, p. 257
6. Goertzel, Ben, Harold Bowman and Richard Baker (1993). *Dynamics of the Radix Expansion Map*, J. Math. and Math. Sci. 17-1, p. 143

1992

1. Goertzel, Ben (1992) *Self-organizing Evolution*, J. Social and Evolutionary Systems 15-1, p. 7
2. Goertzel, Ben (1992). *What is Hierarchical Selection?* , Biology and Philosophy 7-1, p. 27
3. Goertzel, Ben (1992). *Measuring Static Complexity*, Int. J. Math. and Math. Sci. 15-1, p.161
4. Goertzel, Ben (1992) *Quantum Theory and Consciousness*, J. of Mind and Behavior 13-1, p. 29
5. Goertzel, Ben (1992). *Structural Complexity of Sequences, Images and Automata*, in Finite Fields, Coding, and Advances in Communication and Computing, ed. Shiue and Mullen, Marcel Dekker, p. 307
6. Goertzel, Ben (1992). *Global Optimization by Multilevel Search*, J. of Optimization Theory and Applications 77-2, p. 423

1991

1. Goertzel, Ben (1991). *Expression and Simulation in the Rock Guitar Solo*, Popular Music and Society

JOURNALISTIC ARTICLES

During the period 1999-2002 I published roughly two dozen articles in the newspaper Frankfurter Allgemeine Zeitung. Most dealt with topics or individuals in computer science or science in general, or with “visionary futuristic” themes. English-language versions of most of the articles can be found at <http://www.goertzel.org/benzine/>

More recently, since 2006 I have published numerous articles in various online futurist magazines including Kurzweilai.net and others. Also, since 2008 I have written a column for the quarterly futurist magazine H+.

PUBLIC SPEAKING

In addition to academic conferences, in the period since 2005 I have given roughly 5 invited talks per year at various commercial and nonprofit conferences, including but not limited to:

- futurist conferences such as Singularity Summit, Transvision, Convergence, Accelerating Change, World Future Society, etc.
- biomedical conferences such as those organized by the Cambridge Healthtech Institute
- government-funded science and technology workshops such as those organized at MITRE

I have also done some invited semi-public speaking for government or corporate audiences, generally on future-of-technology themes.