

Curriculum Vitae

George E. Mobus

Associate Professor Emeritus

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Education

- **Ph.D.** Computer Science, University of North Texas, 1994. Dissertation: *A multi-time scale learning mechanism for neuromimic processing.*
- **M.B.A.** Information Systems and Management Science, San Diego State University, 1983. Thesis: *A Cybernetic Model-based Method for the Development of Information Systems.*
- **B.A.** Zoology, University of Washington, 1973
- **Upsilon Pi Epsilon** Honor society member

Professional Experience Summary

- **Associate Professor Emeritus**, Institute of Technology, University of Washington Tacoma, 2016.
- **Associate Professor**, Computing and Software Systems Program, University of Washington, Tacoma, 2001 to present.
- **Assistant Professor**, Dept. of Computer Science, Western Washington University, 1998 to 2001.
- **Interim Director**, Internet Studies Center, Western Washington University, 1999 to present.
- **Visiting Assistant Professor**, Dept. of Computer Science, Western Washington University, 1995 to 1998.
- **Research Scientist and Adjunct Assistant Professor**, Dept. of Computer Science, Western Washington University, 1994 to 1995.
- **Lecturer**, Dept. of Computer Science, University of North Texas, 1989 to 1994
- **Associate**, Center for Research in Parallel and Distributed Computing, University of North Texas, 1990 to 1994
- **Vice President**, R & D, Chandas Corporation, Escondido, CA, 1987 to 1989.
- **Executive Vice President & General Manager**, Technetics, Inc., El Cajon, CA, 1983 to 1987.

Academic Experience

- **Courses Taught (Computer Science and Engineering)**
 - ***Undergraduate***
Introduction to Computer Science, Systems Software, Data Structures, Data Communications and Internetworking, Algorithms Analysis, Systems Architecture, Operating Systems, Embedded Systems, Mobile Autonomous Robotics, Microcontroller Interfacing, Real-time OS
 - ***Graduate***
Pattern Recognition, Neural Networks, Survey of Computing Problems in Internetworking , Autonomous Internet Agents, Mobile Autonomous Robotics, Computation, Information, & Cybernetics.
- **Achievements**
 - Served on a number of University and campus faculty councils, including chair positions in the Curriculum and Academic Policy councils.
 - Served on the Curriculum Committee tasked with creating the lower division program when the campus transitioned from a 2-year program to a full 4-year program.
 - Developed a “Bright Line” concept for articulation between community colleges and the University of Washington, Tacoma 2+2 program.
 - Conducted a workshop for community college instructors to promulgate the Bright Line concept.
 - Named Mentor for 1998-99 Outstanding Graduate, Jennifer Gregor (WWU)
 - Voted Outstanding Faculty, 1999-00, by the Student Chapter of the Association for Computing Machinery (ACM)
- **Curriculum Development**
 - CS1 & 2
 - CS1 & 2 guidelines for teaching for community and technical college instructors
 - Practicum in Computer Programming
 - Computer Architecture for computer science majors
 - Computer Architecture for computer engineering majors
 - Operating Systems for computer science majors
 - Operating Systems with Emphasis on Real-Time OS for computer engineering majors
 - Internet Studies
 - Software Engineering with Java
 - Behavior-based Robotics
 - Embedded Systems for computer science majors
 - Embedded Systems for computer engineering majors
- **Undergraduate Research**
 - NSF RUI IIS-9907102 *Foraging Search in a Mobile Robot*, supporting four undergraduate research assistants
 - Independent Studies: *Personal Web Search Agent*, three students
- **Outreach and Development Service**

- Organized a departmental Industry Board of Advisors
- Coordinated organization of the Internet Studies Center (WWU) with half of the funding from non-state sources
- Coordinated receipts of scholarship funds from various companies
- Coordinated alumni events
- Coordinated alumni newsletter production
- Conduct a Programming Clinic for beginning programmers in CS

Research Interests

- **General Systems Science** - Identifying and categorizing the major principles of systems that allow us to build better models: The following subcategories of systems science –
 - **Energy Systems and Biophysical Economics** - The true basis of wealth production and the limits to growth
 - **Autonomous Adaptive Agents** - Robots that can learn aspects of their environments that support or threaten their missions
 - **Global Issues** - Background investigations in global warming, resource depletion, population (ecological footprint), biodiversity losses, political and economic ideologies, and the threats these pose to the future of humanity and the natural world
 - **Sapience: The Brain Science Behind Intelligence and Wisdom** - Exploring the background of how the prefrontal cortex is involved in decision making and especially the subconscious components of judgement and intuitions that shape our rational thoughts more than we realize
 - **Hierarchical Cybernetic Systems: Brains and Management** - How the science of cybernetics can be expanded to understand operational level, coordination level, and strategic level decision making and system sustainability
 - **Evolution and Evolvability of Systems** - How auto-organization, emergence, and selection operate to produce more complexity in systems so long as free energy is available
 - **Modelling All of the Above** - Looking for a modelling language that would allow building models of all of these kinds of systems/phenomena in a more natural way
- **Research Specific to Computer Science:**
 - **Real-time, on-line, life-time learning algorithms.**
This work has led to the development of a learning algorithm that provides a solution to the *destructive interference* problem in life-long learning systems. A patent for the Adaptrade mechanism has been issued. The work was funded, in part, by Caterpillar, Inc. and the patent is held jointly with that company.
 - **Autonomous agents in dynamic, nonstationary environments.**
I have been investigating the application of the above learning algorithm to improve the search performance of agents in highly dynamic and

indeterminate environments. The research program is investigating how agents can encode causal relations between object cues and sought resources so that the cues can act as heuristic guides in future searches. This work has been funded, in part, by grants from Caterpillar, IBM and Ark Interfaces, a subsidiary of Packard-Bell NEC. A grant from the National Science Foundation has been used to extend the work using a mobile robot platform.

Grants and Consulting Contracts

Internet Studies Center, Higher Education Coordinating Board, State of Washington, \$250,000+, 9/99

Internet Studies Center, Microsoft (\$83,000), US WEST (\$50,000) and NetManage Inc. (\$25,000), 9/99

Foraging Search in a Mobile Autonomous Robot, National Science Foundation, Robotics and Human Augmentation Division, \$56,000, 9/1/1999

Startup Funding, College of Arts & Sciences, Western Washington University, \$32,000

Application of Neural Networks to the Control of Heavy Equipment, Caterpillar, Inc., \$67,000, 6/1/1990

Pattern Recognition Using Adaptrode-based Neural Networks, Caterpillar, Inc., \$13,500, 6/1/1991

Digital Signal Processing Equipment, Texas Instruments, Inc., \$2,000, 9/1/1992

Transputer Parallel Processing Equipment and System Software, IBM, \$7,500, 2/20/1994

An Adaptive, Mobile Agent, IBM, \$15,000, 3/1/1994

Application of Machine Learning to Profile Link Usage Patterns, Ark Interfaces - a subsidiary of Packard-Bell NEC., \$32,000, 5/1/1996

Impact of the Internet on Securities Registered Agents, Pacific Harbor Securities, Seattle, WA., \$5,000, 9/27/1996

Feasibility of Adaptive Bookmark Management, Exodus Technologies, Bellevue WA, \$5,000, 6/1/97

Publications, Scholarly Works and Patents

- **Mobus, G.E.**, (2018). "Teaching systems thinking to general education students", *Ecological Modelling*, Elsevier, vol. 373(C), pages 13-21.
- **Mobus, G.E.** (2017). "A Framework for Understanding and Achieving Sustainability of Complex Systems", *Systems Research and Behavioral Science*, 34:5, John Wiley & Sons, Ltd, doi: 10.1002/sres.2482.
- **Mobus, G.E.** & Anderson, K. (2016). "System Language: Understanding Systems", *Proceedings of the 60th Annual Meeting of the ISSS - 2016*, Boulder, Colorado.
- **Mobus, G.E.** (2015). "A Systems Science Framework for Understanding the Nature of Governance", *Proceedings of the 59th Annual Meeting of the ISSS - 2016*, Berlin, Germany.

- **Mobus, G.E.** & Kalton, M. (2014). *Principles of Systems Science*, Springer (Nov. 2014), New York.
- **Mobus, G.E.** (2012). “The Evolution of Wisdom”, *Science, Wisdom, and the Future: Humanity's Quest for a Flourishing Earth*, Collins Foundation Press, Santa Margarita, CA. pp 83-89.
- **Mobus, G.E.** (2011). “Net Energy and the Economy: A Primer”, *The Third International Biophysical Economics Meeting*, April 15-16, 2011, SUNY-ESF, Syracuse New York
- **Mobus, G.E.** (2009). Peak Energy, EROI, and the Economy: Modeling Contraction in the Flow of Net Energy and Its Impact on Economic Activity, *The Second International Biophysical Economics Meeting*, Oct. 2009, SUNY-ESF, Syracuse New York.
- **Mobus, G.E.** (2008). “Money and Energy”, *The First International Biophysical Economics Meeting*, Oct. 2008, SUNY-ESF, Syracuse New York.
- **Mobus, G.E.,** (2002). Lessons Learned from MAVRIC's Brain: An Anticipatory Artificial Agent and Proto-consciousness, *Computing Anticipatory Systems*, D. Dubois (Ed.), in press. This journal article is an expanded version of the invited talk below.
- **Mobus, G.E.,** (2001). *Lessons Learned from MAVRIC's Brain: An Anticipatory Artificial Agent and Proto-consciousness*, Invited Talk: *5th Intl. Conf. on Computing Anticipatory Systems, CASYS'01*, Liege, Belgium
- **Mobus, G.E.,** (2000). Adapting Robot Behavior to a Nonstationary Environment: A Deeper Biologically Inspired Model of Neural Processing. Accepted for presentation: *International Society for Optical Engineering, Photonics East, Sensor Fusion and Decentralized Control in Robotic Systems III*, Boston, MA. [Refereed]
- **Mobus, G.E.** and Fisher, P., (2000). Edge-of-chaos search. In D.S. Levine, V. Brown and V.S. Shirey (Eds.), *Oscillations in Neural Systems*, Chapter 16, pp 309-325, Lawrence Erlbaum Associates, Publishers.
- **Mobus, G.E.,** (2000). Foraging Search: Prototypical Intelligence, in *Computing Anticipatory Systems*, D. Dubois (Ed.), American Institute of Physics 517, pp 592-605.
- **Mobus, G.E.,** (1999). *Foraging Search: Prototypical Intelligence*, Invited Talk: 3rd Intl. Conf. on Computing Anticipatory Systems, Liege, Belgium, [selected as Best Paper for the Symposium].
- **Mobus, G.E.** and Caterpillar, Inc., (1995). A patent, #5,504,839, "Processor and Processing Element for Use in a Neural Network", has been awarded for the Adaptrade leaning mechanism and a neuromimic processor in which it is used.
- **Mobus, G.E.,** (1994). Toward a theory of learning and representing causal inference in neural networks. In *Neural Networks for Knowledge Representation and Inference*, D.S. Levine and M. Aparicio (Eds.), Lawrence Erlbaum Associates, Publishers.
- **Mobus, G.E.,** (1994). *A multi-time scale learning mechanism for neuromimic processing*. Ph.D. Dissertation (unpublished), University of North Texas, Denton, TX.

- **Mobus, G.E.** and Aparicio, M. (1994). Foraging agents. In *Proc. Center for Advanced Systems Conf.*, IBM Toronto Laboratory, Toronto, Canada. [Refereed]
- **Mobus, G.E.** and Fisher, P. (1994). MAVRIC's Brain. In *Proc. Seventh Intl. Conf. on Industrial & Engineering Applications of Artificial Intelligence & Expert Systems*, Austin, TX. [Refereed]
- **Mobus, G.E.** and Fisher, P. (1991). Conditioned response training of robots using adaptrode-based neural networks. In *Proc. Intl. Joint Conf. on Neural Networks*, IEEE & Intl. Neural Networks Society, Seattle, WA. [Refereed]
- **Mobus, G.E.** and Fisher, P. (1991). Conditioned response training for robot control: I - Continuous adaptive learning. In *AMSE Proc. Intl. Conf. on Neural Networks.*, San Diego, CA.
- **Mobus, G.E.** and Fisher, P. (1991). Conditioned response training for robot control: II - Simulation results. In *AMSE Proc. Intl. Conf. on Neural Networks.*, San Diego, CA.
- **Mobus, G.E.** and Fisher, P. (1990). *The adaptrode neuristor: a spatio-temporal memory encoding mechanism for neurocomputing*. Technical Report CRPDC-90-5, University of North Texas, Dept. of Computer Science, Denton, TX.
- **Mobus, G.E.** (1990). *The adaptrode learning model: applications in neural network computing*. Technical Report CRPDC-90-6, University of North Texas, Dept. of Computer Science, Denton, TX.
- **Mobus, G.E.** (1983). *A cybernetic model for use in the development of formal information systems*. Master's Thesis (unpublished), San Diego State University, San Diego, CA.
- **Mobus, G.E.** (1982). The hierarchical control model basis for structured analysis. In, *Proc. Joint National Meeting, ORSA and IMS.*, San Diego, CA. [Refereed]
- **Mobus, G.E.** (1981). Harvesting the sun's energy. *Byte*.