

BRADLEY J. ORCHARD, Ph.D.

**MIT Lincoln Laboratory
244 Wood Street
Lexington, MA 02420**

SUMMARY OF SKILLS

Mathematics and Computer Science Instructor: Have held part-time academic positions teaching mathematics at the college, high school, and middle school level. Currently adjunct faculty of mathematics at University of Massachusetts Lowell.

Data Analysis and Algorithm Development: As member of the Technical Staff at MIT Lincoln Laboratory, have significant experience performing system and algorithm development and evaluation for remote sensing systems. Primary focus algorithms for detection, estimation, tracking, and classification of targets in complex channel and signal environments.

Computer Modeling and Simulation: Extensive experience in problem formulation, model and code development, and computer simulation for a wide variety of problem areas, e.g., radar signal analysis, HF communication systems analysis, underwater acoustics, and computational chemistry.

Software Development: Very experienced with the design and development of software for scientific and engineering applications. Developed numerous applications for analyzing diverse phenomenon using a variety of languages, such as MATLAB, RAST-K (formerly RLSTAP), C++, Orbix, ModSim III, and FORTRAN.

Project Development and Management: Leadership experience as project leader, software development team leader, and task leader for a variety of scientific and software development efforts. Experienced with leading diverse groups of people to meet challenging technical and programmatic objectives. Assisted with the development and marketing of new programs to government sponsors.

Technical Presentations and Reports: Significant experience briefing sponsors and preparing technical reports. In addition to list of unclassified papers shown below, have prepared a significant number of classified briefings/papers.

SUMMARY OF EDUCATION

Ph.D. in Mathematics, Rensselaer Polytechnic Institute, Troy, NY, 1991

M.S. in Mathematics, University of Illinois, Chicago, IL, 1987

M.S. in Polymer Science and Engineering, University of Massachusetts, Amherst, MA, 1984

M.S. in Macromolecular Science, Case Western Reserve University, Cleveland, OH, 1982

B.S. in Mathematics, Loyola University, Chicago, IL, 1980

B.A. in Chemistry, Loyola University, Chicago, IL, 1980

SUMMARY OF PROFESSIONAL EXPERIENCE

MIT Lincoln Laboratory, Lexington, MA (5/98 – Present)

Primary responsibilities include data collection and analysis; algorithm evaluation and development; computer modeling and simulation; technical program development and marketing; and team leadership. The major achievements include:

- Developed and/or improved signal processing algorithms for (1) tracking, classification, and identification of moving ground targets from airborne radars; (2) detection and characterization of very weak ground-based RF emitters from a ground – based passive RF system; (3) detection of airborne targets using passive bistatic RF methods; (4) modeling of ionosphere for over-the-horizon radar (OTHR) and communication applications.
- Presented and wrote significant number of technical briefings for government sponsors.

University of Massachusetts, Lowell, MA (6/2019 – Present, part-time)

Part-time adjunct professor in the Department of Mathematics, teaching upper-level courses, such as complex analysis, linear algebra, and partial differential equations.

Russian School of Mathematics, Lexington, MA (8/2011 – 5/2021, part-time)

Responsible for teaching high school precalculus and calculus classes of 15-30 students. Developed accelerated three-year program for exceptionally talented high school students culminating in project-based advanced topics course (e.g., differential equations, computer modeling and simulation).

TASC, Reading, MA (3/96 to 5/98)

General responsibilities included the analysis, design, and implementation of distributed object-oriented systems for engineering and business applications for the defense and intelligence communities. The major activities include:

- Software Development Lead for 10 software engineers responsible for designing and implementing a multi-sensor data fusion software system.
- Member of a team developing a distributed, object-oriented client - server system for assisting military logistics planners with assessing readiness of logistics plans by simulating the flow of goods between customers, distributors, and manufacturers.

U.S. Naval Research Laboratory, Washington, DC (8/91 to 3/96)

General responsibilities included the design, development, and evaluation of algorithms for the detection of underwater objects. The major activities included:

- As a member of the Advanced Information Technology Branch (9/94 to 3/96), was part of a team developing the Processing Graph Method Tool (PGMT), which aids in the development of software intended for use on distributed heterogeneous multiprocessor architectures. Specific responsibilities included the design, development, and testing of a scheduling simulator for PGMT to help evaluate the performance of signal processing algorithms.
- In the Shallow Water Acoustics Section (8/91 to 8/94), helped develop and evaluate methods for the detection of underwater targets in shallow water environments.

PUBLICATIONS

Journal Articles

Nguyen, D.H., Benitz, G.R., Kay, J.H., Orchard, B.J., and Whiting, R.H., "Super-resolution HRR ATR with HDVI," IEEE Transactions on Aerospace and Electronics Systems, 37(4), October 2001.

Nguyen, D.H., Kay, J.H., Orchard, B.J., and Whiting, R.H., "Moving Target Classification and Tracking," MIT Lincoln Laboratory Journal, Vol. 13(2), 2002.

Orchard, B.J., Siegmann, W.L., G.J. Habetler, Jacobson, M.J., "Stability Analyses of Time-Domain Paraxial Approximations," J. Acoust. Soc. Am., 93, 1335-1352 (1993).

Orchard, B.J., Fromm, D.M., and Wolf, S.N., "Bistatic Reverberation, Target Echo, and Signal Excess Dependence on Array Types and Configurations in a Range-Dependent Shallow Water Environment (U)," U.S. Navy Journal of Underwater Acoustics (Oct. 1992). (SECRET)

Orchard, B.J., Siegmann, W.L., Jacobson, M.J., "Three-Dimensional Time-Domain Paraxial Approximations for Ocean Acoustic Wave Propagation," J. Acoust. Soc. Am., 788-801 (1992).

Claugh, S., Tripathy, S.K., Sun, X., and Orchard, B.J., "Comment on Random Versus Non-Random Defect Placement in Poly(acetylene)," Makromol. Chem., Rapid Commun., 9, 535-538 (1988).

Hall, L.H., Orchard, B.J., and Tripathy, S.K., "The Structure and Properties of Flavins: Molecular Orbital Study Based on Totally Optimized Geometries. I. Molecular Geometry Investigations," International Journal of Quantum Chemistry, 31, 195-216 (1987).

Orchard, B.J., Pearlstein, R.A., Tripathy, S.K., Hopfinger, A.J., and Taylor, P.L., "Conformational Analysis of Isotactic Poly(styrene) Based Upon a Revised Interaction Counting Method," Journal of Computational Chemistry, 8(1), 28-38 (1987).

Hall, L.H., Orchard, B.J., and Tripathy, S.K., "The Structure and Properties of Flavins: Molecular Orbital Study Based Upon Totally Optimized Geometries. II. Molecular Orbital Structure and Electron Distribution," International Journal of Quantum Chemistry, 31, 217-242 (1987).

Orchard, B.J. and Tripathy, S.K., "Electronic Structure and Property Modification of Poly(diacetylenes)," Macromolecules, 19(7), 1844-1851 (1986).

Orchard, B.J., Friedenrich, B., and Tripathy, S.K., "Theoretical Structural Study of Poly(pyrrole) and Poly(thiophene)," Polymer, 27, 1533-1541 (1986).

Jacobson, S.H., Pearlstein, R.A., Hopfinger, A.J., Tripathy, S.K., Orchard, B.J., Potenzzone, R., Doherty, D., and Grigoras, S., "Applications of Molecular Modelling to Problems in Chemical Research and Development," Scientific Computing and Automation, 1(2), 34 (1984).

Orchard, B.J., Tan, J.S., and Hopfinger, A.J., "Molecular Modelling of Polymer-Dye Complexes Involving Homopolymers of Poly(N-Vinyl-Imidazole) and Methyl Orange," Macromolecules, 17(2), 169-174 (1984).

Orchard, B.J., Tripathy, S.K., Hopfinger, A.J., and Taylor, P.L., "Conformational and Lattice packing Analyses of Poly(acetylene)," J. Appl. Phys., 52(10), 5949-5953 (1981).

Conference Proceedings

Nguyen, D.H., Kay, J.H., Orchard, B.J., Weatherwax, J.L., and Whiting, R.H., "Ground Moving Targets Move-stop-move Mitigation with Feature-aided Tracking," Proceedings of the Automatic Target Recognition Science and Technology Conference, October 2002.

Nguyen, D.H., Kay, J.H., Orchard, B.J., and Whiting, R.H., "Feature-aided Tracking of Ground Moving Vehicles," Proceedings of the SPIE Conference on Algorithms for Synthetic Aperture Imagery, Orlando, FL., 2002.

Nguyen, D.H., Kay, J.H., Orchard, B.J., Benitz, G.R., and Whiting, R.H., "Improving HRR ATR Performance at Low SNR by Multi-look Adaptive Weighting", SPIE Aerosense Proceedings 2001, Vol. 4739, pp. 266-276.

Nguyen, D.H., Kay, J.H., Orchard, B.J., and Whiting, R.H., "Classification-aided Tracking," Proceedings of the Eighth Science and Technology Symposium on Automatic Target Recognition Science and Technology Conference, July 2001.

Cooper, D.K., Orchard, B.J. and Wolf, S.N., "Environmentally Adaptive Depth Discriminates in Shallow Water," Proceedings of the Naval Symposium on Underwater Acoustics, June 1994, The Journal of Underwater Acoustics, July 1994, and The Proceedings of The Technical Cooperative Program (TTCP), July 1994.

Wolf, S.N., Cooper, D.K., and Orchard, B.J., "Environmentally Adaptive Signal Processing," Proceedings of the Oceans Conference, 1993.

Luther, K.H., Fromm, D.M., Orchard, B.J., "Computational Efficiency in a Bistatic, Range-Dependent, Normal-Mode Acoustic Reverberation Model," TTCP Proceedings (1992).

Theses

Orchard, B.J., "Derivation and Analysis of Time-Domain Paraxial Approximations for Ocean Acoustic Wave Propagation," Ph.D. Thesis, Rensselaer Polytechnic Institute, Troy, NY (1991).

Orchard, B.J., "Theoretical Conformational Analyses of Polymeric Systems," M.S. Thesis, Case Western Reserve University, Cleveland, OH (1982).