

Lorraine G. Olson
Professor
Fellow, American Society of Mechanical Engineers

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Teaching and Scholarship Interests

Over the past twenty-five years, I have enjoyed teaching a wide variety of topics, including solid mechanics, fluid mechanics, finite element methods, mathematical methods in engineering, introductory computer programming, and (most recently) Mechatronics. I particularly enjoy incorporating projects into courses, even traditional lecture courses.

My scholarship activities relate to applications of finite element methodology to non-traditional areas such as ultrasonic cleaning of semiconductor wafers, laser welding, online machine tool monitoring, rotational molding of polymers, wear-resistant coatings, and inverse electrocardiography. Currently, my research focuses on inverse problems and early detection of breast cancer.

Education

Ph.D., Mechanical Engineering, June 1985, Massachusetts Institute of Technology, Cambridge, MA. Thesis on "Finite Element Analysis of Fluid-Structure Interactions" under Prof. K. J. Bathe.

M.S., Mechanical Engineering, June 1983, Massachusetts Institute of Technology, Cambridge, MA

B.S., Mechanical Engineering, June 1980, Massachusetts Institute of Technology, Cambridge, MA

Positions Held

Professor, Mechanical Engineering, Rose-Hulman Institute of Technology, Fall 2002 - Present.

Professor and Interim Chair, Engineering Mechanics, University of Nebraska, Lincoln, Fall 2000 - Summer 2002.

Professor, Mechanical Engineering, University of Nebraska, Lincoln, Fall 1999 - Summer 2002.

Associate Professor (Courtesy), Internal Medicine, University of Nebraska Medical Center, Omaha, Fall 1993 - Summer 2002.

Associate Professor, Mechanical Engineering, University of Nebraska, Lincoln, Fall 1991 - Summer 1999.

Associate Professor, Mathematics, Illinois Institute of Technology, Chicago, Fall 1990 - Summer 1991.

Assistant Professor, Mechanical Engineering and Applied Mechanics, University of Michigan, Ann Arbor, Fall 1985 - Summer 1990.

Finite Element Consultant, Boston, Summer 1985.

Teaching Assistant, Mechanical Engineering, Massachusetts Institute of Technology, Cambridge, 1983.

Design Engineer, Rosemount, Inc, Eden Prairie, MN, 1980-1981.

Honors and Awards

Fraternity Faculty Dinners: Lambda Chi Alpha (2010), Alpha Tau Omega (2009, 2011), Pi Kappa Alpha (2007, 2008). (Each year, fraternities at Rose-Hulman invite a few faculty who they feel have had a large impact on their undergraduate careers to a student/faculty dinner.)

Fellow of the American Society of Mechanical Engineers, 1999.

Awarded "Certificate of Recognition for Contributions to Students" by University of Nebraska-Lincoln Parents Association and the Teaching Council, January 1999.

University of Nebraska Mechanical Engineering Department Service Award 1996, 1997, 1998

University of Nebraska Mechanical Engineering Department Research Award 1996

University of Michigan Mechanical Engineering Department Exxon Teaching Award 1987, 1986

IBM Doctoral Fellow 1983-85

MIT Green Fellow 1981-1982

Member of Phi Beta Kappa

Member of Tau Beta Pi

MIT Honeywell Award for Academic Excellence 1979

Courses Taught

At Rose-Hulman:

- *Statics and Mechanics of Materials II*
- *Mechanics of Materials*
- *Statics and Mechanics of Materials I*
- *Statics*
- *Computer Applications in Mechanical Engineering*
- *Mechanical Engineering Laboratory*
- *Introduction to Finite Element Analysis*
- *Advanced Finite Element Analysis*
- *Mechatronics*
- *Conservation and Accounting Principles*
- *Fluid and Thermal Systems*
- *Introduction to Design*
- *Mechanical Measurements*

At University of Nebraska:

- *Advanced Finite Element Methods*
- *Finite Element Methods in Mechanical Engineering*
- *Finite Element Methods in Fluid Mechanics*
- *Finite Difference and Finite Element Methods in Mechanical Engineering*
- *Foundations of the Finite Element Method*
- *Advanced Analysis of Mechanical Engineering Systems*
- *Mechanical Engineering Analysis*
- *Fluid Mechanics*
- *Fluid Mechanics Laboratory (Supervisor)*

At Illinois Institute of Technology:

- *Undergraduate Numerical Analysis*
- *Graduate Numerical Analysis I*
- *Engineering Mathematics*

At University of Michigan:

- *Advanced Finite Element Methods in Mechanics*
- *Finite Element Methods in Mechanical Engineering and Applied Mechanics*
- *Fluid Mechanics*

Internal (Rose-Hulman) Professional/Service Activities

Co-director, pilot Independent Project/Research Opportunities Program, Spring 2011 - present.

Promotion, Tenure, and Retention Committee, elected member Fall 2008 - Spring 2011. Committee Chair, Fall 2010 - Spring 2011.

Accompanied Robotics Team to International Ground Vehicle Competition, Rochester, MI, June 5-8, 2009.

Search Committee for the Head of Engineering Management, Spring 2008.

Employee Relations Committee, Fall 2006 - Spring 2008.

Chair of ASEE IN/IL 2008 Local Technical Program committee, June 2007 - April 2008.

ME Department Curriculum Committee, Fall 2006 - Spring 2007.

Academic Computing Environment Review Committee, Spring 2006 - Spring 2007.

Search committee for VP for Development, Spring 2006 - Spring 2007.

Compensation Task Force, Spring 2006 - Fall 2007.

Faculty Affairs Committee, Fall 2006 - Spring 2008.

ME Department Search Committee, Spring 2006.

Academic Technology Committee, Fall 2003 - Spring 2005. Secretary, Fall 2004 - Spring 2005.

ME Department webmaster, Fall 2002 - Fall 2009.

L. Olson, Z. Chambers, and J. Fine. Teaching programming to freshmen mechanical engineers. Presentation for the RHIT Mechanical Engineering Department Industrial Advisory Board, May 5, 2004.

L. Olson, Z. Chambers, and J. Fine. Teaching programming to freshmen mechanical engineers. Presentation for the RHIT Digital Resource Center, May 2004.

L. Olson, R. Throne, and J. Windle. Inverse electrocardiography. Seminar for the RHIT Mathematics Department, November 5, 2003.

L. Olson, R. Throne. Inverse electrocardiography. Presentation for RHIT AB301: Junior Colloquium, October 22, 2003.

L. Olson, Finite element analysis. Presentation for RHIT ME470: Engineering System Design (Senior Design) , September 2002 - 2008.

Significant Internal (Nebraska) Professional/Service Activities

Faculty Advisor to the Society of Women Engineers, Fall 1993 - Summer 2002.

Dean of Engineering Search Committee Member, Fall 2001 - Spring 2002.

University of Nebraska Graduate Council Member, Fall 1999 - Spring 2002.

ME Department Promotion and Tenure Committee Member, Fall 1998 - Summer 2002.

University of Nebraska College of Engineering Promotion and Tenure Committee Member, Fall 1999 - Summer 2000.

Chair, Graduate Committee, Department of Mechanical Engineering, Fall 1995 to Fall 1999.

Mentor, Chancellor's Mentoring project.

Future Nebraska Task Force Member, Fall 1998 - Spring 2000.

External Professional/Service Activities

Reviewer for NSF Graduate Research Fellowships, Spring 2008.

Professional development/tenure evaluation for faculty candidate at Penn State Erie, Fall 2006.

Paper reviewer for Rocky Mountain Bioengineering Society Annual Conference, 2006.

External Examiner for "Computer Aided Structural Mechanics", Department of Mechanical and Aeronautical Engineering, University of Pretoria, South Africa, Spring 2006.

Associate Editor for *Inverse Problems in Engineering* (1999 - 2002).

Member of Editorial Advisory board for *Computers and Structures* (through December 2004).

Chair of the ASME Committee on Computing in Applied Mechanics (Applied Mechanics Division) August 2001- August 2003. Vice-Chair of the Committee August 1999-August 2001. (Member of the committee since 1988. Fellow of the ASME since 1999.)

Member, International Association for Computational Mechanics. Member of founding council of the U.S. Association for Computational Mechanics.

Member, ASEE.

Symposiums Organized

Organizer for Symposium on Inverse Problems in Mechanics, 6th U. S. National Congress on Computational Mechanics, August 2001.

Co-organizer for Structural Acoustics Symposium, ASME WAM 1991, and co-editor of the symposium proceedings *Structural Acoustics*, AMD-Vol.128, ASME Press, New York, 1991.

Co-organizer for Symposium on Computational Methods for Solution of Inverse Problems in Mechanics, ASME WAM 1994, and co-editor of the symposium proceedings *Inverse Problems in Mechanics*, AMD-Vol. 186, ASME Press, New York, 1994.

Co-organizer for Symposium on Rotational Molding, SPE ANTEC 1997, Toronto, Canada.

Co-organizer for Symposium on Rotational Molding, SPE ANTEC 1998, Atlanta, Georgia.

Co-organizer for Symposium on Computational Methods for Solution of Inverse Problems in Mechanics for ASME IMECE 1998, and co-editor of the symposium proceedings *Computational Methods for Solution of Inverse Problems in Mechanics*, AMD-Vol. 228, ASME Press, New York, 1998.

Organized a symposium on Inverse Problems from Thermal/Fluids and Solid Mechanics Applications for the Second MIT Conference on Fluid and Solid Mechanics, held June 17-20, 2003 in Boston, MA.

Founding member of the Special Interest Group on Rotational Molding, Society of Plastics Engineers.

Grant reviewer for National Center for Supercomputing Applications.

Grant reviewer for Air Force Office of Scientific Research.

Reviewer for National Science Foundation

Small Business Innovative Research Program

Chemical and Thermal Science Division, Fall 1990

Design, Manufacture, and Industrial Innovation Division, Fall 1994

Engineering Education and Centers Division, Spring 1997

Knowledge and Distributed Intelligence, Summer 1998

Design, Manufacture, and Industrial Innovation Division, Fall 1998

Chemical and Transport Systems, Spring 1999

Surface Engineering and Material Design, Spring 2000

Nanoscale Interdisciplinary Research Teams, Spring 2001

Fellow Nominations Organized for ASME

Organized successful Fellow Grade nomination for Peter Pinsky (Stanford University).

Organized successful Fellow Grade nomination for Brian Moran (Northwestern University).

Presented talk on: "Is a Master's right for me?" *1999 Region I Society of Women Engineers Conference*, October 1999.

Referee for

IEEE Transactions on Medical Imaging

Journal of Physics D: Applied Physics I
Physics in Medicine and Biology
Engineering with Computers
Inverse Problems in Engineering
Inverse Problems
Journal of Computational Physics
International Journal for Numerical Methods in Fluids
International Journal for Numerical Methods in Engineering
Finite Elements in Analysis and Design
Journal of Sound and Vibration
ASME Journal of Engineering for Industry
ASME Journal of Fluids Engineering
ASME Journal of Pressure Vessel Technology
ASME Journal of Applied Mechanics
ASME Journal of Heat Transfer
International Journal for Numerical Methods in Heat and Fluid Flow
Computational Mechanics
ASCE Journal of Engineering Mechanics
Computers and Structures
Communications in Numerical Methods in Engineering
Computers and Mathematics
Polymer Engineering and Science
International Journal of Heat and Mass Transfer
International Journal of Thermal Sciences
AIAA Journal
Measurement Science and Technology

Book Chapter

- R. D. Throne and L. G. Olson. Algorithms for the inverse problem of electrocardiography, *Computational Methods in Biophysics, Biomaterials, and Medical Systems*. Vol. 1, (C.T. Leondes, Editor), Kluwer Academic Publishers, 2003, pp. 29-92.

Refereed Journal Publications

- L. Olson and R. Throne. An Inverse Problem Approach to Stiffness Mapping for Early Detection of Breast Cancer. Submitted to *Inverse Problems in Science and Engineering*.
- L. Olson and R. Throne. Numerical simulation of an inverse method for tumor size and location estimation. *Inverse Problems in Science and Engineering*. Volume 18 (2010), pages 813-834
- L. Olson, R. Throne, and E. Rost. Improved inverse solutions for on-line machine tool monitoring. *ASME Journal of Manufacturing Science and Engineering*, **126** (2004) 311-316.
- T. Z. Gorishnyy, L. G. Olson, M. Oden, S. M. Aouadi, and S. L. Rohde. Optimization of wear-resistant coating architectures using finite element analysis. *Journal of Vacuum Science and Technology A*, **21** (2003) 332-339.
- R. D. Throne, L. G. Olson, and J. R. Windle. A new method for incorporating weighted temporal and spatial smoothing in the inverse problem of electrocardiography. *IEEE Transactions on Biomedical Engineering*, **49** (2002) 1054-1059.
- R. D. Throne, L. G. Olson, and J. R. Windle. Improved parameter choice methods and temporal filtering for the generalized eigensystem method applied to the inverse problem of electrocardiography. *Inverse Problems in Engineering*, **9** (2001) 339-365.
- L. G. Olson and R. D. Throne. Estimation Of Tool/Chip Interface Temperatures For On-Line Tool Monitoring: An Inverse Problem Approach. *Inverse Problems in Engineering*, **9** (2001) 367-388.
- R. D. Throne and L. G. Olson. The Steady Inverse Heat Conduction Problem: A Comparison Of Methods With Parameter Selection. *ASME Journal of Heat Transfer*, **123** (2001) 633-644.
- L. G. Olson, R. Crawford, M. Kearns, and N. Geiger. Rotational molding of plastics: comparison of simulation and experimental results for an axisymmetric mold. *Polymer Engineering and Science*, **40** (2000) 1758-1764.
- L. G. Olson and R. D. Throne. A Comparison Of Generalized Eigensystem, Truncated Singular Value Decomposition, And Tikhonov Regularization For The Steady Inverse Heat Conduction Problem. *Inverse Problems in Engineering*, **8** (2000) 193-227.
- R. D. Throne and L. G. Olson. Fusion Of Body Surface Potential And Body Surface Laplacian Data For Electrocardiographic Imaging. *IEEE Transactions on Biomedical Engineering*, **47** (2000) 452-462.
- L. Olson, G. Gogos, and V. Pasham. Axisymmetric finite element models for rotational molding. *International Journal for Heat and Fluid Flow*, **9** (1999) 515-542.
- G. Gogos, X. Liu, and L. G. Olson. Cycle time predictions for the rotational molding process with and without mold/part separation. *Polymer Engineering and Science*, **39** (1999) 617-629.

- R. D. Throne, L. G. Olson, and T. J. Hrabik. A comparison of higher-order generalized eigensystem techniques and Tikhonov regularization for the inverse problem of electrocardiography. *Inverse Problems in Engineering*, **7** (1999) 143-193.
- D. Remmler, L. Olson, D. Duke, R. Ekstrom, A. Matamoros, D. Matthews, and C. Ullrich. Pre-surgical CT/FEA for craniofacial distraction: I. Methodology, development, and validation of the cranial finite element model. *Medical Engineering and Physics*, **20** (1998) 607-619.
- J. W. Hirsch, L. G. Olson, Z. Nazir, and D. R. Alexander. Axisymmetric laser welding of ceramics: Comparison of experimental and finite element results. *Optics and Lasers in Engineering*, **29** (1998) 465-484.
- D. Remmler, L. Olson, D. Duke, R. Ekstrom, A. Matamoros, D. Matthews, and C. Ullrich. Pre-surgical CT/FEA for craniofacial distraction: II. An engineering prediction model for gradual correction of asymmetric skull deformities. *Plastic and Reconstructive Surgery*, **102** (1998) 1395-1404.
- G. Gogos, L. G. Olson, X. Liu, and V. R. Pasham. New models for rotational molding of plastics. *Polymer Engineering and Science*, **38** (1998) 1387-1398.
- L. G. Olson, R. D. Throne, and J. R. Windle. Performance of generalized eigensystem and truncated singular value decomposition methods for the inverse problem of electrocardiography. *Inverse Problems in Engineering*, **5**, (1997) 239-277.
- L. G. Olson and D. Jamison. Application of a general purpose finite element method to elastic pipes conveying fluid. *Journal of Fluids and Structures*, **11** (1997) 207-222.
- R. D. Throne, L. G. Olson, T. J. Hrabik, J. R. Windle. Generalized eigensystem techniques for the inverse problem of electrocardiography applied to a realistic heart-torso geometry. *IEEE Transactions on Biomedical Engineering*, **44** (1997) 447-454.
- G. Georgiou, L. Olson, and Y. Smyrlis. A singular function boundary integral method for the Laplace equation. *Communications in Numerical Methods in Engineering*, **12** (1996) 127-134.
- J. A. Thomazin, L. G. Olson, and J. W. Hirsch. Axisymmetric laser welding of ceramic and metallic materials: finite element modeling, *International Journal for Numerical Methods in Heat and Fluid Flow*, **6** (1996) 35-46.
- R. D. Throne and L. G. Olson. The effects of errors in assumed conductivities and geometry on numerical solutions to the inverse problem of electrocardiography. *IEEE Transactions on Biomedical Engineering*, **42** (1995), 1192-1200.
- L. G. Olson and R. D. Throne. Computational issues arising in multidimensional elliptic inverse problems: the inverse problem of electrocardiography, *Engineering Computations*, **12** (1995), 343-356.
- R. D. Throne and L. G. Olson. A generalized eigensystem approach to the inverse problem of electrocardiography, *IEEE Transactions on Biomedical Engineering*, **41** (1994), 592-600.

- L. G. Olson and E. D. Kock. A variational approach for modeling surface tension effects in inviscid fluids, *Computational Mechanics*, **14** (1994), 140-153.
- L. G. Olson and Y. Yang. Simplified models for ultrasonic cleaning: wave incidence angle effects, *Computational Mechanics*, **12** (1993), 245-254.
- L. G. Olson. A simplified finite element model for ultrasonic cleaning, *Journal of Sound and Vibration*, **161** (1993), 137-156.
- G. C. Georgiou, L. G. Olson, and W. W. Schultz. The integrated singular basis function method for the stick-slip and the die-swell problems, *International Journal for Numerical Methods in Fluids*, **13** (1991), 1251-1265.
- L. G. Olson, G. C. Georgiou, and W. W. Schultz. An efficient finite element method for treating singularities in Laplace's equation, *Journal of Computational Physics*, **96** (1991), 391-410.
- E. Kock and L. G. Olson. Fluid-structure interaction analysis by the finite element method – a variational approach, *International Journal for Numerical Methods in Engineering*, **31** (1991), 463-491.
- G. C. Georgiou, W. W. Schultz, and L. G. Olson. Singular finite elements for the sudden-expansion and the die-swell problems, *International Journal for Numerical Methods in Fluids*, **10** (1990), 357-372.
- L. G. Olson and T. Vandini. Eigenproblems from finite element analysis of fluid-structure interactions, *Computers and Structures*, **33** (1989), 679-687.
- G. C. Georgiou, L. G. Olson, W. W. Schultz, and S. Sagan. A singular finite element for Stokes flow: The stick-slip problem, *International Journal for Numerical Methods in Fluids*, **9** (1989), 1353-1367.
- L. G. Olson. Finite element model of ultrasonic cleaning, *Journal of Sound and Vibration*, **126** (1988), 387-405.
- L. G. Olson. Static analysis of contained fluids with potential-based and displacement-based fluid finite elements, *Engineering Computations*, **4** (1987), 131-138.
- L. G. Olson and K. J. Bathe. An infinite element for analysis of transient fluid-structure interactions, *Engineering Computations* **2** (1985) 319-329.
- L. G. Olson and K. J. Bathe. Analysis of fluid-structure interactions – a direct symmetric coupled formulation based on the fluid velocity potential, *Computers and Structures* **21** (1985) 21-32.
- L. G. Olson and K. J. Bathe. A study of displacement-based fluid finite elements for calculating frequencies of fluid and fluid-structure systems, *Nuclear Engineering and Design* **76** (1983) 137-151.

Conference Papers, Presentations, and Reports

- L. Olson and R. Throne. Early detection of breast cancer through an inverse problem approach to stiffness mapping: Improved formulation and parallelization, *11th U.S. National Congress on Computational Mechanics*, July 2011.
- L. Olson and R. Throne. Estimation of tumor size and location for early detection of breast cancer, *10th U.S. National Congress on Computational Mechanics*, July 2009.
- L. Olson and R. Throne. Estimation of tumor size and location for early detection of breast cancer, *Inaugural International Conference of the Engineering Mechanics Institute (EM08)*, May 2008.
- L. Olson, R. Stamper, Z. Chambers, and J. Fine. A different kind of "statics" project. *2008 Annual ASEE IL/IN Section Conference*, April 2008.
- L. Olson, R. Throne, and J. Butcher. Early detection of breast cancer: Feasibility of inverse estimation of tumor size and location, *U. S. National Congress on Computational Mechanics*, July 2007.
- U. Hansen and L. Olson. Modal studien an handglocken, *33rd German Annual Conference on Acoustics (DAGA)*, March 2007.
- L. Olson and R. Throne. Exploring the principle components of time method for estimating potentials from a noncontact probe, report to St. Jude Medical, November 2006.
- R. Throne, L. Olson, J. Windle, J. Schweitzer, and E. Voth. Estimates of endocardial potentials from non-contact intracavitary probes. *28th Annual Conference of the IEEE Engineering in Medicine and Biology Society*, September 2006.
- L. Olson, R. Throne, J. Windle, J. Schweitzer, and E. Voth. Inverse electrocardiography: Endocardial potential estimates from non-contact intracavitary probes with special treatments for valve/hole regions. *7th World Congress on Computational Mechanics*, July 2006.
- L. G. Olson, R. D. Throne, J. R. Windle, J. A. Schweitzer, and E. J. Voth. Special treatments for valve/hole regions in endocardial potential estimates from non-contact intracavitary probes. *Rocky Mountain Bioengineering Symposium*, April 2006.
- L. Olson and R. Throne. Estimating potentials from a noncontact probe, report to St. Jude Medical, January 2006.
- L. Olson, Z. Chambers, and J. Fine. Teaching programming to freshmen mechanical engineers. *International Mechanical Engineering Congress and Exposition*, November 2004.
- E. Bender, L. G. Olson, R. D. Throne, J. R. Windle. Effect of intracavitary probe size on the accuracy of inverse endocardial potential estimates. *IEEE Computers in Cardiology*, September 2004.

- Y. Zaghoul, R. Throne, L. Olson, and J. Windle. Automating the selection of expansion modes using the principal components of time method for solving the inverse problem of electrocardiography. *IEEE Computers in Cardiology*, September 2004.
- L. Olson, R. Throne, and J. Windle. Estimating endocardial (heart surface) potentials from a non-contact probe. *Seventh U.S. National Congress on Computational Mechanics*, Albuquerque, NM, July 27-31, 2003.
- L. Olson, R. Throne, and J. Windle. Estimating endocardial potentials from a non-contact probe. *Second MIT Conference on Computational Solid and Fluid Mechanics*, Boston, MA, June 17-20, 2003. Text in *Computational Fluid and Solid Mechanics 2003*, Volume 2, K.J. Bathe, ed, Elsevier, Oxford, UK, 2003, pp 1782-1785.
- G. Bu, R. Throne, L. Olson, and J. Windle. The maximum a posteriori approach to the inverse problem of electrocardiography. *Rocky Mountain Bioengineering Symposium*, April 2003, pp. 158-162.
- R. Throne, L. Olson, G. Bu, and J. Windle. A comparison of methods for estimating endocardial potentials from a noncontact probe. *IEEE Computers in Cardiology Conference*, 2002, pp. 309-312.
- G. Bu, R. Throne, L. Olson, and J. Windle. Analysis of the maximum a posteriori method for the inverse problem of electrocardiography for different depolarization sequences. *IEEE Computers in Cardiology Conference*, 2002, pp. 493-496.
- J. R. Windle, L. G. Olson, and R. D. Throne. Application of Novel Inverse Solutions to Three-Dimensional Electric Mapping of the Heart: Fundamental Mathematics to Clinical Application. *6th Annual Cardiovascular Research Symposium*, University of Nebraska Medical Center, February 2002.
- S. L. Rohde, L. G. Olson, S. M. Aouadi, D. M. Hornyak, and T. Z. Gorishnyy. FEA modeling of multilayer films under Hertzian contacts. *International Conference on Metallurgical Coatings and Thin Films*, April 2001.
- L. G. Olson, R. D. Throne, and J. R. Windle. Recent advances in the inverse problem of electrocardiography. *6th U.S. National Congress on Computational Mechanics*, August 2001.
- E. A. Rost, L. G. Olson, and R. D. Throne. Improved solutions for on-line tool monitoring. *6th U.S. National Congress on Computational Mechanics*, August 2001.
- L. G. Olson and R. D. Throne. Estimation of tool/chip interface temperatures for on-line tool monitoring: An inverse problem approach. *First MIT Conference on Fluid and Solid Mechanics*, June 2001.
- R. D. Throne, L. G. Olson, and J. Windle. Parameter choice methods and temporal filtering for the generalized eigensystem method applied to the inverse problem of electrocardiography. *Rocky Mountain Bioengineering Symposium*, April 2001, pp. 37-42.

- S. L. Rohde, L. G. Olson, S. M. Aouadi, D. M. Mihut, B. P. Neville, and D. M. Hornyak. Tribological performance and initial finite element modeling of reactively sputtered single and multi-layer Chromium. *47th International Symposium of the American Vacuum Society*, October 2000.
- D. M. Hornyak, S. L. Rohde, L. G. Olson, S. M. Aouadi, D. M. Mihut, and B. P. Neville. Reactively sputtered single and multi-layer Chromium: Tribological performance and initial finite element modeling. *27th Annual Symposium of the Rocky Mountain Chapter of the American Vacuum Society*, August 2000.
- R. D. Throne and L. G. Olson. A comparison of spatial regularization with zero and first order Tikhonov regularization for the inverse problem of electrocardiography. *IEEE Computers in Cardiology*, 2000, pp. 493-496.
- L. G. Olson and R. D. Throne. The steady inverse heat conduction problem: A comparison of methods for inverse parameter selection. *ASME National Heat Transfer Conference 2000*.
- R. D. Throne and L. G. Olson. Fusion of body surface potential and body surface Laplacian signals for electrocardiographic imaging. *IEEE Engineering in Medicine and Biology Conference*, 1999.
- L. G. Olson and R. D. Throne. Data fusion for the steady inverse heat conduction problem. *5th U.S. National Congress on Computational Mechanics*, August 1999.
- L. G. Olson and R. D. Throne. Regularization matrices for inverse electrocardiography. *ASME IMECE*, 1998. Text in *Computational Methods for Solution of Inverse Problems in Mechanics AMD-Vol. 228*, 1998, pp 81-90.
- L. G. Olson and R. D. Throne. A comparison of five methods for construction of regularization operators for higher order Tikhonov regularization. *IEEE Computers in Cardiology*, 1998, pp 357-360.
- L. G. Olson and R. D. Throne. Alternative generalized eigensystem vectors which minimize the epicardial surface Laplacian for a given area-weighted amplitude. *IEEE Computers in Cardiology*, 1998, pp 685-688.
- R. D. Throne, L. G. Olson, and Terry J. Hrabik. The minimum distance to origin: A method for choosing the number of expansion modes for the generalized eigensystem method. *IEEE Computers in Cardiology*, 1998, pp 697-700.
- R. D. Throne and L. G. Olson. Generalized eigensystem techniques and Tikhonov regularization for a spherical heart/torso model with an intracavitary probe. *IEEE Computers in Cardiology*, 1998, pp 361-364.
- L. G. Olson, G. Gogos, V. Pasham, and X. Liu. Axisymmetric finite element models of rotational molding. *SPE ANTEC*, 1998. Text in *Conference Proceedings at ANTEC '98*, Volume 1, pp 1116-1120.

- G. Gogos, X. Liu, and L. G. Olson. Cycle time predictions for the rotational molding process with and without mold/part separation. *SPE ANTEC*, 1998. Text in *Conference Proceedings at ANTEC '98*, Volume 1, pp 1133-1136.
- R. D. Throne and L. G. Olson. Higher order regularization techniques for the inverse problem of electrocardiography. *Rocky Mountain Bioengineering Symposium*, April 1998, pp. 257-262.
- D. Remmler, L. Olson, R. Ekstrom, D. Duke, A. Matamoros, D. Matthews, and C. Ullrich. Finite element analysis of the early distractive correction of craniosynostosis using a mechanical matrix. *American Society of Plastic and Reconstructive Surgeons 66th Annual Scientific Meeting*, 1997.
- L. G. Olson and R. D. Throne. Inverse electrocardiography: Source of performance improvements for generalized eigensystem methods. *Fourth U.S. National Congress on Computational Mechanics*, 1997.
- D. Remmler, L. Olson, R. Ekstrom, A. Matamoros, D. Duke, D. Matthews, and C. Ullrich. Finite element analysis of the early distractive correction of craniosynostosis using a mechanical matrix. *The 42nd Annual Meeting of The Plastic Surgery Research Council*, 1997.
- D. Remmler, L. Olson, R. Ekstrom, D. Duke, A. Matamoros, D. Matthews, and C. Ullrich. Animated 3-d finite element analysis for surgeons using distraction osteogenesis to treat craniofacial deformities. *Medicine Meets Virtual Reality: Transformation of Medicine Through Communication*, 1997.
- G. Gogos, L. G. Olson, X. Liu, and V. Pasham. New models for rotational molding of plastics. *Society of Plastics Engineers ANTEC*, 1997.
- L. G. Olson, G. Gogos, V. Pasham, and X. Liu. Numerical modeling for rotational molding of thermoplastics. *ASME IMECE*, 1997. Text in *Proceedings of the ASME Heat Transfer Division*, Volume 1, HTD-Vol.351, 1997, pp 113-119.
- R. D. Throne, L. G. Olson, T.J. Hrabik. Higher order generalized eigensystem and Tikhonov regularization techniques for inverse electrocardiography. *IEEE Computers in Cardiology*, 1997, pp 17-20.
- L. G. Olson, R. D. Throne, J. R. Windle. A comparison of techniques for the inverse problem of electrocardiography applied to data from six isolated rabbit heart experiments. *IEEE Computers in Cardiology*, 1997, pp 437-440.
- G. Gogos, L. G. Olson, X. Liu, and V. Pasham. A model for rotational molding of thermoplastics. *25th North American Manufacturing Research Conference*, 1997. Proceedings in *Transactions of the North American Manufacturing Research Institution of SME*, Vol. 25, pp 13-18.
- D. Remmler, L. Olson, R. Ekstrom, D. Duke, A. Matamoros, D. Matthews, and C. Ullrich. Finite element analysis of the distractive correction of craniosynostosis using a mechanical rod and node matrix. *American Society of Plastic and Reconstructive Surgeons 65th Annual Scientific Meeting*, 1996.

- D. Remmler, L. Olson, R. Ekstrom, D. Duke, A. Matamoros, D. Matthews, and C. Ullrich. Use of finite element analysis to examine the early distractive treatment of craniosynostosis. *The Role of Endoscopic and Distraction Techniques in Facial Aesthetic and Reconstructive Surgery: New Technology or Improved Results?*, a course sponsored by the American Society Of Maxillofacial Surgeons and the Plastic Surgery Education Foundation, 1996.
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Funding

“RUI: An Inverse Problem Approach to Stiffness Mapping for Early Detection of Breast Cancer”, National Science Foundation, June 2012 - May 2015, \$310,733. L. G. Olson, R. D. Throne, and K. S. Toohey. *Pending*.

“Automated Palpation System: A Novel Technique for Early Detection of Breast Cancer”, Rose-Hulman Summer Professional Grants Program, June 1 - August 31, 2008, \$10,000. R. D. Throne and L. G. Olson.

“Inverse Electrocardiography”, St. Jude Medical, St. Paul, MN, July 17 - August 31, 2006, \$17,070. L. G. Olson and R. D. Throne.

“Inverse Electrocardiography”, St. Jude Medical, St. Paul, MN, June 1 - August 31, 2005, \$37,956. L. G. Olson and R. D. Throne.

“Data Fusion for Inverse Electrocardiography: Synthesis of Signals from Multiple Sensor Types and Locations”, National Science Foundation, September 2000 - August 2004, \$207,015. R. D. Throne, L. G. Olson, and J. R. Windle.

“Development of Application Specific Wear-Resistant Tribological Coatings Through Finite Element Analysis and Ultra-High Rate Reactive Sputtering”, National Science Foundation, July 1999 - June 2001, \$144,395. S. L. Rohde and L. G. Olson.

“Computational Support for Engineers and Scientists”, National Science Foundation EPSCoR program, January 1998 - December 2000, \$700,000. *Three PI's. I was one of 20 Co-PI's.*

“Engineering Research Equipment: Advanced Computing and Mapping Facilities for Inverse Electrocardiography Research”, National Science Foundation, August 1996 - August 1998, \$34,600. R. D. Throne, L. G. Olson, and J. R. Windle.

“Numerical Models for Rotational Molding of Thermoplastics”, Snyder Industries (Lincoln, NE), February 1996 - January 1997, \$10,000. L. G. Olson and G. Gogos.

“The Inverse Problem of Electrocardiography: New Computational Approaches, Numerical Simulations, and Experimental Verification”, National Science Foundation, September 1994 - August 1998, \$237,882. R. D. Throne, J. R. Windle, L. G. Olson. (45% Throne, 45% Olson, 10% Windle.)

“Research Experiences for Undergraduates Supplement”, National Science Foundation, September 1996-August 1997, \$10,000. R. D. Throne and L. G. Olson.

“Research Experiences for Undergraduates Supplement”, National Science Foundation, September 1995-August 1996, \$10,000. R. D. Throne and L. G. Olson.

“Research Experiences for Undergraduates Supplement”, National Science Foundation, September 1994-August 1995, \$10,000. R. D. Throne and L. G. Olson.

“A Prediction Model for the Preventive Correction of Skull Deformities”, Plastic Surgery Educational Foundation, May 1994 - May 1995, \$5,545. *This grant was awarded to Daniel Remmler, M.D., who was my Ph.D. student in the Medical Sciences Interdisciplinary Area Program.*

“Realistic Human Torso Models for Study of the Inverse Problem of Electrocardiography”, Layman Foundation, May 1994 - May 1995, \$16,823. L. G. Olson and R. D. Throne.

“Calculating Automobile Acoustic Responses Using Coupled Finite Element and Boundary Integral Techniques”, Chrysler Corporation, September 1989 - August 1991, \$30,592. L. G. Olson.

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“Frequency Analysis Techniques for Fluid-Structure Interactions”, Rackham Graduate School (UM), January 1987 - December 1987, \$9834. L. G. Olson.

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“Program in Ship Hydrodynamics”, Office of Naval Research University Research Initiative, October 1986 - August 1990. *Participant.*

“FEA of Fluid-Structure Interactions Including Gravity Effects”, Rackham Graduate School (UM), May 1986 - April 1987, \$4202. L. G. Olson.

“Sphere-Spring-Semi-infinite Solid Problem”, International Business Machines Corporation, October 1985 - April 1986, \$11,000. L. G. Olson.

Supercomputing Grants

“An Inverse Stiffness Mapping Approach to the Early Detection of Breast Cancer”, XSEDE, January 2012 - December 2012, 800K SU units. L. G. Olson and R. D. Throne. *Pending.*

“Early Detection of Breast Cancer through an Inverse Problem Approach to Stiffness Mapping”, TeraGrid, January 2011 - December 2011, 380K SU units. L. G. Olson and R. D. Throne.

“TG Startup Renewal: Automated Palpation System: A Novel Technique for Early Detection of Breast Cancer”, TeraGrid, September 2009 - December 2010, 90K SU units. L. G. Olson and R. D. Throne.

- “TG DAC: Automated Palpation System: A Novel Technique for Early Detection of Breast Cancer”, TeraGrid, September 2008 - August 2009, 30K SU units. L. G. Olson and R. D. Throne.
- “Improved Numerical Techniques for the Inverse Problem of Electrocardiography”, National Center for Supercomputing Applications, June 2000 - October 2001, 5000 SU units. L. G. Olson and R. D. Throne.
- “Improved Numerical Techniques for the Inverse Problem of Electrocardiography”, National Center for Supercomputing Applications, July 1999 - June 2000, 1000 SU units. L. G. Olson and R. D. Throne.
- “Improved Modal Techniques for the Inverse Problem of Electrocardiography”, National Center for Supercomputing Applications, November 1997 - October 1998, 660 SU units. L. G. Olson and R. D. Throne.
- “Improved Modal Techniques for the Inverse Problem of Electrocardiography”, National Center for Supercomputing Applications, April 1996 - October 1997, 340 SU units. L. G. Olson and R. D. Throne.
- “Improved Modal Techniques for the Inverse Problem of Electrocardiography”, National Center for Supercomputing Applications, April 1995 - March 1996, 350 SU units. L. G. Olson and R. D. Throne.
- “Improved Modal Techniques for the Inverse Problem of Electrocardiography”, National Center for Supercomputing Applications, June 1993 - August 1994, 86 SU units. L. G. Olson and R. D. Throne.
- “3-D Finite Element Model for Ultrasonic Cleaning”, National Center for Supercomputing Applications, May 1991 - May 1992, 15 SU units. L. G. Olson.