

Guglielmo Scovazzi, Ph. D.

Contact Information:

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Career Positions

- 10/2004 – Present **Sandia National Laboratories**
Computational Shock- and Multi-physics Department
Research Scientist (Member of the technical staff)
- 9/2002 – 9/2004 **University of Texas at Austin**
Institute for Computational Engineering and Sciences
Research visitor
Supervisor: Professor T.J.R. Hughes

Education

- 4/2001 – 9/2004 **Stanford University, Stanford, California**
Mechanics and Computation Division
Ph.D. in Mechanical Engineering
Dissertation title: "Multiscale methods in science and engineering"
Adviser: Professor T.J.R. Hughes
- 9/1999 – 3/2001 **Stanford University, Stanford, California**
M.S. in Mechanical Engineering
Concentration in flow physics, turbulence, signal analysis, wavelets
- 10/1992 – 2/1998 **Politecnico di Torino, Turin, Italy**
M.S. in Aerospace Engineering
Final Grade: "110/110, Magna cum Laude" (Award for Excellence)
GPA ranking: top 1%.

Awards

- May 2, 2007 **Sandia National Laboratories Award for Excellence:**
"For novel and important contributions to ALE discretizations for shock hydrodynamics and the high-quality journal publications"

Editorial Board Membership

- 5/2007 – Present Member of the editorial advisory board of the *International Journal for Numerical Methods in Fluids*.

Congress Organization Board Membership

- 2007 Member of the Organizing Committee of the *Finite Element in Fluids Conference*, Santa Fe, New Mexico.
- 2009 Member of the Organizing Committee of the *Conference on Numerical Methods for Multi-material Fluid Flows*, Pavia, Italy.

Skills and Expertise

Analytical Skills

Strength and concentration: Multiscale/multilevel analysis and modeling with applications to computational mechanics. Strong expertise in variational multiscale methods. Emphasis on:

- Advanced Lagrangian and ALE methods for generalized hyperbolic systems of conservation laws, with applications to shock-hydrodynamics, and multiphysics applications.
- Turbulence modeling and simulation.
- Numerical methods for subsurface modeling.
- General computational fluid dynamics applications.

Strong background: Multilevel signal analysis, wavelets, optimal/robust control and estimation.

Good knowledge: Applied probability and stochastic processes, stochastic differential equations.

Teaching Experience

Teaching Assistant: "ME200A, Numerical methods in engineering", Fall quarter 1999, Stanford University.

Instructor: Internal course on "Continuum mechanics on arbitrary moving domains", Fall quarter 2007, Sandia National Laboratories, Albuquerque, New Mexico.

Computational Skills

Programming Languages: C++, FORTRAN 95/90/77, Matlab, Mathematica, Maple.

Platforms: UNIX/Linux Systems, workstations and supercomputing platforms.

Publications

Book Chapters

Thomas J. R. Hughes, Guglielmo Scovazzi, Leopoldo P. Franca, "Multiscale and stabilized methods", in *Encyclopedia of Computational Mechanics*, eds. E. Stein, R. De Borst, T.J.R. Hughes, Wiley, 2004.

Peer Reviewed Journal Articles

- [1] Thomas J. R. Hughes, Guglielmo Scovazzi, Pavel B. Bochev, Annalisa Buffa, "A multiscale discontinuous Galerkin method with the computational structure of a continuous Galerkin method", *Computer Methods in Applied Mechanics and Engineering*, **195**(19-22), pp. 2761-2787, 2006.
- [2] Pavel B. Bochev, Thomas J. R. Hughes, Guglielmo Scovazzi, "A multiscale discontinuous Galerkin method", *Lecture Notes in Computer Science*, **3743**, pp. 84-93, Springer, 2006.
- [3] Guglielmo Scovazzi, Mark A. Christon, Thomas J. R. Hughes, and John N. Shadid, "Stabilized shock hydrodynamics: I. A Lagrangian method", *Computer Methods in Applied Mechanics and Engineering*, **196**(4-6), pp. 923-966, 2007.
- [4] Guglielmo Scovazzi, "Stabilized shock hydrodynamics: II. Design and physical interpretation of the SUPG operator for Lagrangian computations", *Computer Methods in Applied Mechanics and Engineering*, **196**(4-6), pp. 967-978, 2007.
- [5] Guglielmo Scovazzi, "A discourse on Galilean invariance, SUPG stabilization, and the variational multiscale framework", *Computer Methods in Applied Mechanics and Engineering*, **196**(4-6), pp. 1108-1132, 2007.
- [6] Guglielmo Scovazzi, "Galilean invariance and stabilized methods for compressible flows", *International Journal for Numerical Methods in Fluids*, **54**(6-8), pp. 757-778, 2007.
- [7] Guglielmo Scovazzi, Edward Love, Mikhail J. Shashkov, "Multi-scale Lagrangian shock hydrodynamics on $q1/P0$ finite elements: Theoretical framework and two-dimensional computations", *Computer Methods in Applied Mechanics and Engineering*, **197**(9-12), pp. 1056-1079, 2008.

- [8] Yury Bazilevs, Victor M. Calo, J. Austin Cottrell, Thomas J. R. Hughes, Alessandro Reali, G. Scovazzi, "*Variational Multiscale Methods in Turbulence*", Computer Methods in Applied Mechanics and Engineering, *in press*, 2008.

Conference Proceedings

- [1] Thomas J. R. Hughes, Victor M. Calo, Guglielmo Scovazzi, "Variational and multiscale methods in turbulence", in *Proceedings of the XXI International Congress of Theoretical and Applied Mechanics (IUTAM)*, Eds. W. Gutkowski and T. A. Kowalewski, Kluwer, 2004.
- [2] Yury Bazilevs, Victor M. Calo, J. Austin Cottrell, Thomas J. R. Hughes, Alessandro Reali, Guglielmo Scovazzi, "Variational multiscale residual-driven turbulence modeling for large eddy simulation of incompressible flow", In *Proceedings of ECCOMAS Thematic Conference in Multi-scale Methods for Solids and Fluids*, A. Ibrahimbegovic, F. Dias, H. Matthies, P. Wriggers Eds., Cachan, France, 2007.

Ph.D. Thesis

G. Scovazzi, "Multiscale methods in science and engineering", Ph.D. thesis, Mechanical Engineering Department, Stanford University, August 2004.

Invited-speaker Presentations (in chronological order, since doctoral graduation)

- [1] "*A Multiscale Discontinuous Galerkin Method with the Computational Structure of a Continuous Galerkin Method*", VIII U.S. National Congress on Computational Mechanics, Austin (Texas), July 25-28, 2005.
- [2] "*Stabilized Lagrangian Hydrodynamics: A new multiscale method for shock hydrodynamics*", VIII U.S. National Congress on Computational Mechanics, Austin (Texas), July 25-28, 2005.
- [3] "*The Variational Multiscale Framework for Discontinuous Galerkin Methods*", ASME International Mechanical Engineering Congress and Exposition, Orlando (Florida), November 5-11, 2005.
- [4] "*Stabilized Shock Hydrodynamics: A new multiscale method for Lagrangian computations*", Los Alamos Numerical Analysis Seminar Series, Los Alamos National Laboratory, Los Alamos (New Mexico), November 23, 2005.
- [5] "*Multiscale Discontinuous Galerkin Methods*", Workshop on Multiscale Methods in Computational Mechanics, Rolduc (The Netherlands), February 15-16, 2006.
- [6] "*Stabilized Shock Hydrodynamics: A new stabilized method for Lagrangian computations*", UCSD Aerospace/Mechanical Engineering Seminar Series, The University of California at San Diego, February 27, 2006.
- [7] "*A New Stabilized Method for Lagrangian Shock Hydrodynamics*", Mathematics of Finite Element and Applications Conference (MAFELAP), Brunel University of West London (UK), June 14, 2006.
- [8] "*Galilean Invariance and SUPG Stabilization*", ASME International Mechanical Engineering Congress and Exposition, Chicago, November 9, 2006.
- [9] "*A Discourse on Galilean Invariance and SUPG Stabilization*", VII World Congress on Computational Mechanics, Los Angeles, California, July 18, 2006.
- [10] "*Multiscale Discontinuous Galerkin Methods*", VII World Congress on Computational Mechanics, Los Angeles, California, July 21, 2006.
- [11] "*A New Stabilized Method for Lagrangian Shock Hydrodynamics*", SIAM Conference on Computational Science and Engineering, Costa Mesa, California, February 20, 2007.
- [12] "*Multiscale Discontinuous Galerkin Methods*", Finite Elements in Fluids Conference, Santa Fe (New Mexico), March 25-27, 2007.
- [13] "*Advances in Stabilized Method for Lagrangian Shock Hydrodynamics*", Finite Elements in Fluids Conference, Santa Fe (New Mexico), March 25-27, 2007.
- [14] "*A multi-scale Q1/P0 approach to Lagrangian Shock Hydrodynamics*", Conference on Numerical

Methods for Multi-material Fluid Flows, Prague (Czech Republic), September 10-14, 2007.

- [15] "A multi-scale Q1/P0 approach to Lagrangian Shock Hydrodynamics": IX U.S. National Congress on Computational Mechanics, San Francisco (California), July 22-26, 2007.
- [16] "A Multi-scale Hourglass Control for Lagrangian Shock Hydrodynamics", ASME International Mechanical Engineering Congress and Exposition, Seattle (Washington), November 12-14, 2007.
- [17] "Advances in Stabilized P1/P1 and Q1/Q1 Finite Elements for Lagrangian Shock Hydrodynamics", Workshop on the State of the Art of Lagrangian Methods for Shock Hydrodynamics, Lawrence Livermore National Laboratory, Livermore (California), November 14-15, 2007.

Peer Review Expertise

- Computer Methods in Applied Mechanics and Engineering (impact factor 2.015)
- SIAM Journal on Numerical Analysis (impact factor 1.392)
- International Journal for Numerical Methods in Fluids (impact factor 0.870)
- SIAM Journal on Applied Mathematics (impact factor 1.425)
- Journal of Scientific Computing
- Encyclopedia of Computational Mechanics. Editors: E. Stein, R. De Borst, T.J.R. Hughes, Wiley.

Language Skills

- **Italian:** native speaker
- **French:** fluent, **Diplôme de L'Alliance Française** (advanced diploma valid in 80+ French-Speaking Countries worldwide).
- **Spanish:** working knowledge, very good oral comprehension.

Extracurricular Activities

- May 1985 **Solo Vocalist** in "**The Magic Flute**" by W.A. Mozart at the **Teatro Regio di Torino** (Turin Opera House).
- June 1986 **Solo Vocalist** in "**The Golden Vanity**" by B. Britten at the **Auditorium R.A.I. di Torino**, (Turin, Italian National Broadcasting Network Concert Hall).
- May 1987 **Solo Vocalist** in "**Wozzeck**" by A. Berg at the **Auditorium R.A.I. di Torino**.
- 1985-1995 **Violin Practice**
Supervisor: C. Grasso (former solo violin of the *Opera di Roma* (Rome Opera House) Orchestra, *Auditorium RAI di Torino* Orchestra, *Teatro Regio di Torino* Orchestra).

Hobbies and Sports

- Classical music.
- Swimming, sailing, skiing, mountain biking, basketball, waterpolo, hiking.