

Oleg VOLKOV

E-mail: ovolkov@stanford.edu

Citizenship: Canadian

Phone: (650) 223-4009

RESEARCH INTERESTS Development of numerical optimization algorithms for the optimal design and control of mechanical and multiphase fluid systems.

EDUCATION **Ph.D. in Applied Mathematics (2006)**,
Department of Mathematics & Statistics,
University of Montreal, Quebec, Canada

M.A.Sc. in Mechanical Engineering (1999),
Specialization in Industrial Design and Manufacturing,
Department of Mechanical Engineering,
École Polytechnique de Montréal, Québec, Canada

DEA (Master of Advanced Studies in France) (1997),
Specialization in Structural and Solid Mechanics,
École Polytechnique, Paris, France

Bachelor's degree in Engineering Mathematics & Mechanics (1995),
Faculty of Mathematics & Mechanics,
Novosibirsk State University, Russia

RESEARCH **Academic Research (July 2011 – present)**
Research Associate, Energy Resources Engineering Department, Stanford University, USA

- Adjoint gradient-based framework for hydrocarbon reservoir simulation and solution of production optimization and history matching problems

Contractual Research (June 2010 – April 2011)
Engineering consultant, Proctor & Gamble, Germany

- Optimal design of a porous material structure using advanced numerical modeling

Industrial Research (2007 – May 2010)

*Limited Term Assistant Professor, Department of Physics, St. Francis Xavier University, Canada (2009 – 2010),
Postdoctoral fellowship, Department of Mathematics & Statistics, McMaster University, Canada (2007 – 2009)*

- Methods of optimization and control of thermo-fluids multiphase systems including treatment of phase transition interfaces and triple-phase contact lines,
- Development of continuous gradient optimization methodology for the inverse heat transfer problems,
- Development of numerical simulation and optimization tools for Gas Metal Arc Welding (GMAW), in collaboration with *Commonwealth Scientific and Industrial Research Organisation (CSIRO) Australia* and *General Motors, Research & Development Center, (Warren, USA and Oshawa, Canada)*.

Postdoctoral Research (2005 – 2007)

Optimal Shape Design Laboratory, University of Ottawa and University of Ontario Institute of Technology, Canada

- Sensitivity analysis of the PDE reaction-diffusion model governing the mass and the electrical charge transfer inside catalyst pores in fuel cells,
- Asymptotic modeling of the triple-phase contact point and the adsorption-desorption boundary layer composing the catalyst surface.

Ph.D. Research (2000 – 2005)

Centre for Research on Computation and its Applications, University of Montreal, Canada

- Non-dimensional analysis of the advection-reaction-diffusion systems of PDEs in application to turbulent combustion,
- Asymptotic analysis of the regimes of turbulent combustion, development and validation of a multiscale model for an efficient numerical simulation of these regimes,
- Development of a model validation tool using direct numerical simulation of advection-reaction-diffusion systems featuring high-order accuracy in time and space and Lagrangian treatment of the flow.

M.A.Sc. Research (1997 – 1999)

Shape Memory Alloys Research Team, Applied Polymer Research Center, École Polytechnique de Montréal, Canada

- Application of the kriging interpolation method for modeling the thermo-elastic constitutive laws of the shape memory materials.

Industrial Training (May 1997 – July 1997)

PSA Peugeot Citroën Group, France

- Instability analysis for elastic shells, development of numerical tools for prediction of buckling defects.

Engineering training program (Jan 1996 – July 1996)*LMS (Solid Mechanics Laboratory), École Polytechnique de Paris, France*

- Numerical simulations of dynamic instabilities in elastic structures in application to TGV (French high speed trains) rail system.

**TEACHING
EXPERIENCE****Assistant Professor (2009–2010):** St. Francis Xavier University

- Classical Dynamics II - Fall 2009, third year course
- Digital Electronics (Logic Design) - Fall 2009, second year course with labs
- Statistical Mechanics - Winter 2010, fourth year course with labs
- Computational Physics - Winter 2010, fourth year course with labs

Lecturer (2006–2007): University of Ottawa

- Calculus I - Winter 2006, 89 students
- Calculus Life Sciences I - Fall 2006, 188 students
- Calcul Différentiel et Intégral pour les Sciences de la Vie I - Winter 2007, 26 students

Teaching assistant (2002 – 2004): University of Montreal

- Algebra II: Rings, Ideals and Modules (tutor, graduate level)
- Numerical Analysis I, (lab supervisor, upper undergraduate level)
- Calculus II, (tutor, undergraduate level)
- Introduction to Computing, (lab assistant, undergraduate level)
- Mathematics Assisted by Computer (lab assistant, undergraduate level)

Informal adviser of grad students (2005 – present):

- Hai Xuan Vo, Stanford University (2012 – present)
- Mehrdad Gharib Shirangi, Stanford University (2012 – present)
- Vladislav Bukshtynov, McMaster University (2007 – 2010)
- Mo'tassem Al-arydah, University of Ottawa (2006 – 2007)
- Pascal Turbis, University of Montreal (2005 – 2007)

**GRANTS AND
AWARDS**

Ontario Center of Excellence Professional Outreach Award (2009)

Going Global Science and Technology Grant (2008)

Quebec Merit Fellowship for Foreign Students (1999)

- VISITING RESEARCHER PEM Fuel Cell Research Development Workshop FC-Cubic, AIST, Japan (March 2009)
- Project continuity meeting: GM (Roland Menassa, Hui-Ping Wang) and McMaster (Bartosz Protas, Oleg Volkov), GM R&D Center, Warren, USA (Dec 2008)
- Project meeting: CSIRO (Anthony Murphy, John Lowke), McMaster (Bartosz Protas, Oleg Volkov), and GM (Donn Glander), Sydney, Australia (Aug 2008)
- Project meeting: GM (Donn Glander) and McMaster (Bartosz Protas, Oleg Volkov), GM R&D Center, Warren, USA (Feb 2008)
- Project start-off meeting: GM (Donn Glander, Dan Hayden), McMaster (Bartosz Protas, Oleg Volkov), and CSIRO (Anthony Murphy), McMaster University, Hamilton, Ontario (July 2007)
- LANGUAGES Trilingual English, French, and Russian (Russian to English co-translator of the book "Shape Memory Alloys: Fundamentals, Modeling and Applications", Ed. V. Brailovski, S. Prokoshkin, P. Terriault, F. Trochu, Editions ETS, 2003)
- Beginner Polish and Mandarin
- PUBLICATIONS **Referred articles**
- Bukshtynov V., Volkov O., Protas B. *On Optimal Reconstruction of Constitutive Relations*, Physica D, Volume 240, 1228-1244, (2011)
- Volkov O., Protas B., Liao W., Glander D.W. *Adjoint-based optimization of thermo-fluid phenomena in welding processes*, J. Eng. Math., Volume 65, Number 3, 201-220, (2009)
- Volkov O., Protas B., *An inverse model for free-boundary problems with a contact line: steady case*, J. of Comp. Phys., Volume 228, Issue 13, 4893-4910 (2009)
- Berg P., Novruzzi A., Volkov O., *Reaction kinetics at the triple-phase boundary in PEM fuel cells*, J. Fuel Cell Sci. Technol. 5, 021007 (2008)
- Bourlioux A., Majda A. J., Volkov O., *Conditional statistics for a passive scalar with a mean gradient and intermittency*, Phys. Fluids 18, 104102 (2006)
- Volkov O., Trochu F., Brailovski V., Sacepe N., Terriault P., *Material law for NiTi shape memory alloys using dual kriging interpolation*, Journal of the Mechanical Behavior of Materials, Vol. 10, No. 4, pp. 215-226 (1999)
- Trochu, F., Sacepe, N., Volkov, O., Turenne, S., *Characterization of NiTi Shape Memory Alloys Using Dual Kriging Interpolation*. Materials Science and Engineering. Part A, Structural Materials: Properties, Microstructure and Processing, 275, p. 395-399 (1999)

In book

Volkov O., Brailovski V. and Trochu F., *Coupled Thermo-Mechanical Model for Shape Memory Alloys* in book "Shape Memory Alloys: Fundamentals, Modeling and Industrial Applications", The Canadian Institute of Mining, Metallurgy and Petroleum (1999)

Theses

Validation of unsteady flamelet models for non-premixed turbulent combustion with intermittency Ph.D. thesis, University of Montreal (2006)

Modelling of the thermomechanical behaviour of the shape memory alloys, Master in Applied Sciences thesis, École Polytechnique, Montreal (1999)

Seminars, Contributed talks, Research Reports

Volkov O., Voskov D. *Advanced Strategies of Forward Simulation for Adjoint-Based Optimization* SPE Reservoir Simulation Symposium held in The Woodlands, Texas USA, 18-20 February (2013)

Volkov O. *Efficient adjoint gradient framework in AD-GPRS*, Smart Fields affiliates meeting, Stanford University, November 8-9 (2012)

Volkov O. *Efficient History Matching and Optimization of Well Controls*, The 8th International Conference on Integrated Operations in the Petroleum Industry, Trondheim, Norway, September 25-26 (2012)

Volkov O., Protas P. *A unified approach to solving direct and inverse free-boundary problems in fluid mechanics*, 10th US National Congress on Computational Mechanics, Columbus, Ohio, July 16-19 (2009)

Volkov O., Protas P. *A unified approach to solving direct and inverse free-boundary problems in fluid mechanics*, Conference "Optimization with interfaces and free boundaries", Regensburg, Germany, March 23-27 (2009)

Volkov O., Protas P. *Optimal Control of Thermo-Fluid Phenomena in Variable Domains*, 61st Annual Meeting of the APS Division of Fluid Dynamics, San Antonio, Texas, November 23-25 (2008)

Volkov O., Bukshtynau U., Protas P. General Motors - CSIRO Report *A unified approach to solving free-boundary and inverse problems for a stationary weld pool, with some notes on the related problem of parameter estimation* (2008)

Volkov O., Berg P., Novruzzi A. *Modeling of the Triple-Phase boundary in PEM Fuel Cells*, Fuel Cell Gordon Research Conference, Smithfield, RI, July 22-27 (2007)

- Berg P., Volkov O. Novruzi A., *Triple-phase boundary in PEM fuel cell catalyst layers* Workshop on Modelling and Simulation of PEM Fuel Cells, WIAS, Berlin, Germany, (2006)
- Volkov O., Berg P., Novruzi A. *Triple-phase boundary in PEM fuel cell catalyst layers: modeling, simulation, and optimization*, Workshop on Numerical, Mathematical and Modeling Analysis related to Fluid Dynamics in Hydrogen Fuel Cells, University of Ottawa, May 10-12 (2006)
- Volkov O., *Validation of unsteady flamelet models for non-premixed turbulent combustion with intermittency*, University of Ontario Institute of Technology (2005)
- Volkov O., Bourlioux A., *Validation of unsteady flamelet models*, Tenth International Conference on Numerical Combustion, May 9-12, Arizona (2004)
- Bourlioux A., Volkov O., *Validation of unsteady flamelet models for non-premixed turbulent combustion with intermittency* CFD2003, May 28-30, Vancouver (2003)
- Bourlioux A., Volkov O., *An elementary model to validate unsteady flamelet approximations*, Ninth ICNC, Sorrento, (2002)
- Volkov O., Brailovski V. and Trochu F., *Coupled thermo-mechanical model for shape memory alloys*, 38th Annual Conference of Metallurgists, Symposium: Shape Memory Alloys: Fundamentals, Modeling and Industrial Applications, Quebec (1999)