ANTHONY M. BLOCH

Curriculum Vitae

Alexander Ziwet Collegiate Professor of Mathematics, The University of Michigan
Address:

Department of Mathematics	Tel: (734) 647-4980 (O)
The University of Michigan	(734) 994-3110 (H)
Ann Arbor, MI 48109	email: abloch@math.lsa.umich.edu.

Education:

1985	Ph.D.	Harvard University	(Applied Mathematics)
1981	M.Phil.	Cambridge University, England	(Control Engineering and Operations Research)
1979	M.S.	California Institute of Technology	(Physics)
1977,78	B.Sc., B.Sc.(Hons.)	University of the Witwatersrand	(Applied Mathematics and Physics)

Selected Awards and Honors:

2023-	MURI Award, AFOSR
2023-	Distinguished Visiting Professor, ICMAT, Spain
2023	30th Annual Owens Lecture, Wayne State University
2022-	Fellow, Asia-Pacific Artifial Intelligence Association
2021-	Member, Sigma Xi Honor Society
2021-	Life Fellow, IEEE
2019	Baillieul Distinguished Lecturer, University of Massachusetts
2018-	Book Series Editor, Springer Applied Mathematical Sciences
2018-	Co-Editor-in-Chief, Journal of Nonlinear Science
2015-2016	Simons Fellow
2012-	AMS Fellow
2012-	SIAM Fellow
2012-2018	Editor-in-Chief, SIAM Journal on Control and Optimization
2010-2014	Senior Fellow, Michigan Society of Fellows
2008	AMS Invited Lecture
2005-	Alexander Ziwet Collegiate Professorship
2003-	Fellow of the IEEE
2002	Senior Member of the IEEE
1996-97	Guggenheim Fellowship
1996-97	Membership in the Institute for Advanced Study, Term II
1996	University of Michigan LS&A Excellence in Research Award
1996	University of Michigan Faculty Recognition Award
1995	University of Michigan Advice Magazine Honors list, teaching
1991-98	Presidential Young Investigator Award (NSF)
1986	Horace H. Rackham Faculty Fellowship, University of Michigan
1979	Elsie Ballot Scholarship, Cambridge University
1978	Convocation Scholarship; Unico Co. Gold Medal for the most distinguished Honors graduand in the Faculty of Science
1978	Awarded Fulbright Fellowship
1977	Freda Lawenski Scholarship; William Cullen Medal
1976	Herbert le May Prize for the best student majoring in Applied Mathematics
1975-76	Robert Schlesin Memorial Scholarship

Grants:

2017-	AFOSR grant
2014-2017	AFOSR MURI Grant
2013-2017	National Science Foundation INSPIRE Grant
1993-present	(Multiple) National Science Foundation Grants
1992-99	Air Force Office of Scientific Research Grant
1991-98	Presidential Young Investigator Award (NSF)
1990-91	Ohio State University Seed Grant
1987-90	National Science Foundation/Air Force Office of Scientific Research Grant

Professional Career:

The University of Michigan

Alexander Ziwet Collegiate Professor	2005-
Affil. Faculty, Center Computational Medicine Bioinformatics	2022-
Chair of Mathematics Department	2005-2008, 2017-2023
Associate Chair for Graduate Affairs	2001-2004
Professor of Mathematics	1997-
Associate Professor of Mathematics	1994-1997

The Institute for Advanced Study, Princeton

Member	Jan – April, 1997

The Technical University of Vienna

Guest Professor	April, 1997

The Ohio State University

Associate Professor of Mathematics	1992-95
Assistant Professor of Mathematics	1988-92

Mathematical Sciences Institute, Cornell University

Postdoctoral Associate	1988-89

The University of Michigan

T.H. Hildebrandt Research Assistant Professor	1985-88

Royal Institute of Technology, Stockholm

Visiting Research Scientist	Spring 1985

Arizona State University

Faculty Associate	Fall 1984

Harvard University

Research Assistant	1982-85
Teaching Fellow	1982-84
Applied Mathematics Tutor, Leverett House	1983-84

Professional Affiliations:

Fellow:	American Mathematical Society
	Institute of Electrical and Electronics Engineers
	Society for Industrial and Applied Mathematics
Editor-in-Chief	Book Series Editor, Springer Applied Mathematical Sciences (2018-)
	Journal of Nonlinear Science (2018-)
	SIAM Journal on Control and Optimization (2012-2018)
Corresponding Ed.	SIAM Journal on Control and Optimization (2018-)
Associate Editor	IEEE Transactions on Automatic Control (1993-96)
	Electronic Journal of Differential Equations (1993-2017)
	SIAM Journal on Control and Optimization (1993-1999)
	Mathematics of Control, Signals and Systems (1997-)
	Journal of Nonlinear Science (2001-) (Senior Editor from 2017)
	Dynamical Systems (2002-2014)
	Systems and Control Letters (2002-2008)

	Elec. Journal of Mathematical and Physical Sciences (2002-)
	Journal of Geometric Mechanics (2009-)
	Michigan Mathematical Journal (2014-)
	Communications in Mathematics (2014-)
Associate Editor	IEEE Transactions on Automatic Control (1996-99)
at Large:	
Reviewer: multiple journals.	

Graduate Students:

Ph.D.'s completed: Dmitry Zenkov (Ohio State University), Kai-Yu Lum, Patrick Hagerty, Melinda Koelling, Eduard Kirr, Amit Sanyal, Vincent Guibout . Jason Kutch, Islam Hussein, Jared Maruskin, Oscar Fernandez, Tomoki Ohsawa, Patrick Rooney, Jake Ketchum, Hamed Razavi, Rohit Gupta, Chris Barot. Current: William Clark, Can Chen, Chris York.

Invited Lectures and Conferences:

"An infinite-dimensional variational problem arising in estimation theory," The Conference on Algebraic and Geometric Methods in Nonlinear Control Theory, Paris, June 1985.

"Total least squares estimation in infinite dimensions and completely integrable Hamiltonian systems," The 7th International Symposium on the Mathematical Theory of Networks and Systems, Stockholm, June 1985.

"An application of geometrical methods to estimation theory," The Workshop on Parametrization Problems in Systems Theory, Bremen, June 1985.

"Total least squares estimation and completely integrable Hamiltonian systems," The American Mathematical Society/Mathematical Association of America Meeting, Claremont, California, November 1985.

"Left invariant control systems on infinite-dimensional homogeneous spaces," The 24th IEEE Conference on Decision Theory and Control, Fort Lauderdale, Florida, December 1985.

"Hamiltonian flows on homogeneous spaces," The San Antonio Conference on Differential Geometry, San Antonio, April 1986.

"Infinite-dimensional Hamiltonian control systems," SIAM 1986 National Meeting, Boston, July 1986.

"Maximum likelihood estimation for errors-in-variables models," SIAM Conference on Linear Algebra in Signals, Systems and Control, Boston, August 1986.

"An algebra-geometric approach to the analysis of dynamic errors-in-variables models," The Workshop on Algebraic Methods in Systems Theory, Columbus, Ohio, June 1987.

"Identification of dynamic errors-in-variables models," 8th MTNS Symposium, Tempe, Arizona, June 1987.

"Stabilization of Hamiltonian systems with constraints," 8th MTNS Symposium, Tempe, Arizona, June 1987.

"Dynamics and control of flexible bodies," 8th MTNS Symposium, Tempe, Arizona, June 1987.

"Dynamics of a free flexible body," American Mathematical Society Summer Conference on Hamiltonian Systems, Boulder, Colorado, June 1987.

"Stability and equilibria of deformable systems," The 26th IEEE Conference on Decision and Control, Los Angeles, December 1987.

"Least squares, linear programming and Hamiltonian flows," AMS Summer Conference on Mathematical Developments arising from Linear Programming, Bowdoin, Maine, June 1988.

"Centrifugal forces and the stability of rotational motion," AMS Summer Conference on Control Theory and Multibody Systems, Bowdoin, Maine, July 1988.

"Approximate models of rotating beams," The 27th IEEE Conference on Decision and Control, Austin, December 1988.

"Bifurcation behavior in some rotating systems," SIAM Conference on Control in the ′90's, San Francisco, May 1989.

"Stabilizability of nonholonomic control systems," IFAC Symposium on Nonlinear Control Systems Design, Capri, Italy, June 1989.

"Constrained dynamical systems in identification and control," 9th MTNS Symposium, Amsterdam, The Netherlands, June 1989.

"Gradient flows associated with the Toda lattice," Workshop on Hamiltonian Systems, Transformation Groups and Spectral Transform Methods, Montreal, Canada, October 1989.

"Control of mechanical systems with classical nonholonomic constraints," The 28th IEEE Conference on Decision and Control, Tampa, December, 1989.

"Control and stabilization of systems with homoclinic orbits," The 28th IEEE Conference on Decision and Control, Tampa, December, 1989.

"The weak dispersion limit of the Toda lattice equations," AMS Summer Conference on Inverse Scattering on the Line, Amherst, June 1990.

"Stabilization and control of the rigid body equations with internal torques," Mathematical Problems in Nonlinear Elasticity, Oberwolfach, Germany, June 1990.

"Inertial manifolds for rotating elastic beams," New Trends in Systems Theory, Genoa, Italy, July 1990.

"Steepest descent problems and the Toda lattice," Second SIAM Conference on Linear Algebra in Signals, Systems and Control, San Fransisco, November 1990 (one hour invited talk).

"Stability and control of nonlinear systems with constraints," 97th Annual Meeting of the AMS, San Fransisco, January 1991.

"Asymptotic stability, instability, and stabilization of relative equilibria," 1991 American Control Conference, Boston, June 1991.

"Dispersive regularization of the Whitham equation for the Toda lattice," Nato Advanced Research Workshop on Singular Limits of Dispersive Waves, Lyon, July 1991.

"Control of systems with nonintegrable constraints," AFOSR Workshop on Nonlinear Control, St. Louis, August, 1991.

"Nonholonomic Control Systems," Fields Institute Workshop on Falling Cats, The Fields Institute, Waterloo, Ontario, March, 1992.

"Convexity and Integrability," Fields Institute Workshop on Gradient and Hamiltonian Flows, Algorithms and Control, The Fields Institute, Waterloo, Ontario, April, 1992.

"The Geometry of Nonholonomic Control Systems," NSF Workshop on Nonlinear Control, St. Louis, May, 1992.

"On the Dynamics and Control of Nonholonomic Systems on Riemannian Manifolds," IFAC Nonlinear Control Systems Symposium, Bordeaux, France, June, 1992.

"The Geometry of Nonholonomic Systems on Riemannian Manifolds," SIAM Conference on Control, Minneapolis, September, 1992.

"Control of Systems with Homoclinic and Heteroclinic Orbits," SIAM Conference on Dynamical Systems, Salt Lake City, October, 1992.

"Integrable Differential Equations and Convexity," The 876th Meeting of the American Mathematical Society, Dayton, October, 1992.

"Controllability of Nonholonomic Systems on Riemannian Manifolds," The 31st IEEE Conference on Decision and Control, Tucson, December, 1992.

" On the Geometry of Saddle Point Algorithms," The 31st IEEE Conference on Decision and Control, Tucson, December, 1992.

"The Dynamics of Gradient and Hamiltonian Flows and Convexity," Dynamics Days, Tempe, Arizona, January, 1993.

"The Dynamics of Generalized Rigid Bodies," Workshop on Robotics, The Institute for Mathematics and its Applications, Minnesota, January, 1993.

"The Dynamics of the Toda Lattice in Finite and Infinite Dimensions," Workshop on Geometric Mechanics, Rio de Janeiro, March, 1993.

"Gradient and Hamiltonian Flows in Infinite Dimensions," Geometric, Analytic, and Computational Aspects of Mechanics, Oberwolfach, July, 1993.

"Hamiltonian Flows in Networks and Control," The International Symposium on the Mathematical Theory of Networks and Control 93, Regensburg, August, 1993.

"Optimal Control and Vakonomic Mechanics," The Joint American Mathematical Society – Canadian Mathematical Society Summer Meeting, Vancouver, August, 1993.

"The Geometry of Nonholonomic and Vakonomic Control Systems," The Workshop on Mechanics, Holonomy and Control, San Antonio, December, 1993.

"Convexity, Group Theory and the Dispersionless Toda Flow," Cornelius Lanczos International Centenary Conference, Raleigh, December, 1993.

"Symmetry, Constraints and Dissipation," MSRI Workshop on Exterior Differential Systems, Submanifolds and Control Theory, MSRI, Berkeley, March, 1994.

"An Infinite-dimensional Optimization Problem," IMACS World Congress, Atlanta, July 1994.

"Examples in Nonholonomic Mechanics," Workshop on Geometric Mechanics and Nonholonomic Systems, Berkeley, August, 1994.

" Stabilization of a Nonholonomic System via Sliding Modes," The 33rd IEEE Conference on Decision and Control, Orlando, December, 1994.

"Dynamics of the Toda Lattice and Convexity", hour talk given at the Midwest Dynamical Systems Meeting, Minneapolis, March, 1995.

"Lagrangian and Hamiltonian Formulations of Constrained Variational Problems," The Meeting on Geometric Mechanics, Dynamical Systems and Control, Fayetteville, April, 1995.

"Optimal Control and the Lagrange Problem," Third SIAM Conference on Control and its Applications, St. Louis, April, 1995.

"Constrained Variational Principles and Optimal Control," The Third International Congress on Industrial and Applied Mathematics, Hamburg, Germany, July, 1995.

"The Geometry of Nonholonomic Mechanical Systems with Symmetry," The Third International Congress on Industrial and Applied Mathematics, Hamburg, Germany, July, 1995.

"Multiple Brackets and Optimal Control," ARO-NASA Workshop on Exterior Differential Systems and Hybrid Control, Bozeman, Montana, July, 1995.

"Discrete Computation and Smooth Hamiltonian and Gradient Flows," Workshop on New Connections between Mathematics and Computer Science, The Newton Institute, Cambridge, November, 1995.

"On the Geometry of Optimal Control and Geodesic Flows," The 34th IEEE Conference on Decision and Control, New Orleans, December, 1995.

"Integrable Geodesic Flows on Homogeneous Spaces," Joint Mathematics Meeting, Orlando, January, 1996.

"Stabilization of Nonlinear Control Systems," The AFSOR Contractors/Grantees Meeting, Pasadena, March, 1996.

"Control and Optimal Control on Lie Algebras," The University of Notre Dame Symposium on Current and Future Directions in Applied Mathematics," Notre Dame, April, 1996.

"Control and Orbital Control of Constrained Nonlinear Systems," First International Conference in Aviation and Aerospace, Daytona Beach Florida, May, 1996.

"Integrable Optimal Flows," Mathematical Theory of Networks and Systems, MTNS 96, St. Louis, June, 1996.

"Integrable Systems –Theory and Applications," Plenary Address, SIAM National Meeting, Kansas City, July, 1996.

"Use of Linear Feedback for the Supression of Chaos in a Metal Passivation Model," IEEE International Conference on Control Applications, Dearborn, September, 1996).

"Geometry and Control of Systems with Nonholonomic Constraints," Colloqium of the Center for Intelligent Control Systems and the Division of Engineering and Applied Sciences, Harvard University, Cambridge, October, 1996.

"Symplectic Structures on Homogeneous Spaces and Integrability," 914th Meeting of the American Mathematical Society, October, 1996.

"Optimization and Dynamical Systems," Applied Mathematics Colloqium, Princeton University, Feb, 1997.

"Nonholonomic Mechanics" Series of 5 Invited Lectures given as Guest Professor, The Technical University of Vienna, Vienna, 14-19 April, 1997.

"The Dispersionless Toda Lattice and Infinite Dimensional Lie Algebras," 922nd Meeting of the American Mathematical Society, Detroit, May, 1997.

"Mechanics of Nonholonomic Systems and Control,", invited hour talk, 1997 AMS Summer Research Institute on Differential Geometry and Control, Boulder, June/July 1997.

"Hamiltonian Methods in the Control of Mechanical Systems," invited hour talk, 1997 AMS Summer Research Institute on Differential Geometry and Control, Boulder, June/July 1997.

"Stabilization of Mechanical Systems by Energy Methods," 17th IFIP Conference on Systems Modelling and Identification, Detroit, July, 1997.

"Optimal Control and the Full Toda Flow," The 36th IEEE Conference on Decision and Control, San Diego, December, 1997.

"A Serret- Andoyer Transformation Analysis for the Controlled Rigid Body," The 36th IEEE Conference on Decision and Control, San Diego, December, 1997.

"Integrable Systems, Rigid Body Mechanics and Optimal Control,", Caltech Workshop on Mechanics, Dynamics and Control, Pasadena, December, 1997.

"Geodesic Flows and Integrability", Winter Meeting of the American Mathematical Society, Baltimore, January 1998.

"Geometric Aspects of the Full Toda Flows," 934th Meeting of the American Mathematical Society, Davis, California, April 1998.

"Nonholonomic Stabilization and Isospectral Flows," Plenary talk, IMA Workshop on Nonlinear Identification and Control, Minneapolis, April, 1998.

"Integrable Systems and the Geometry of Gradient Flows," Workshop on Symplectic Geometry," Warwick University, U.K., July, 1998.

"Double Bracket Equations in Optimzation, Mechanics and Controls," Conference on Perspectives in Control, Harvard University, October, 1998 (Plenary Address).

"Mechanical Feedback Control Systems," 37th IEEE Conference on Decision and Control, Tampa, December, 1998.

"Discrete Rigid Body Dynamics and Optimal Control," 37th IEEE Conference on Decision and Control, Tampa, December, 1998.

"Nonholonomic stabilization and isopectral flows," 37th IEEE Conference on Decision and Control, Tampa, December, 1998.

"Noncommutative integrability of generalized rigid body equations," 941st meeting of the American Mathematical Society, Urbana, March, 1999.

"Stabilization by the method of controlled Lagrangians," UC Santa Barbara, April 1999.

"Stabilization of the pendulum on a rotor arm," International Conference on Robotics and Automation, Detroit, May 1999.

"Reduction of constrained and interconnected mechanical systems," Fourth International Conference on Industrial and Applied Mathematics, Edinburgh, U.K., July, 1999.

"Symmetric rigid body equations," Foundations of Computational Mathematics, Oxford, U.K., July 1999.

"Asymptotic stability in energy preserving systems," 38th IEEE Conference on Decision and Control, December 1999.

"Matching and Asymptotic Stability for Euler-Poincaré Mechanical Systems," IFAC Workshop on Lagrangian and Hamiltonian for Nonlinear Control", Princeton, March 2000.

Series of three invited lectures in IIIe Cycle Romand de Mathematiques, "Séminaire sure les distribution non-intgrables", Les Diablerets, Switzerland, March 2000.

"Poisson Structures, Asymptotic Stability and Integrable Systems" Invited Session, Sectional Meeting of the AMS, Notre Dame, April 2000.

"The Interactions of Classical and Quantum Oscillators with Fields," Hour invited lecture, IMA Workshop on Dispersive Corrections to Transport Equations, Minneapolis, May 2000.

"Control of Squeezed States", American Control Conference, Chicago, June, 2000.

"Nonlinear Control and Nonholonomic Mechanics," Bell Laboratories, Murray Hill, New Jersey, July 2000.

"The Symplectic Structure and Integration of the Symmetric Rigid Body Equations," London Mathematical Symposium Durham Symposium on Geometric Integration, Durham, England, July 2000.

"Symplectic Structures on Cross Products of Lie Groups," 957th Meeting of the American Mathematical Society, Toronto, September, 2000.

"Discrete Optimal Control and the Dynamics of Rigid Bodies," 964th Meeting of the American Mathematical Society, Lawrence, Kansas, March, 2001.

"Dissipation and Stability for Classical and Quantum Oscillators Interacting with a Wave Field," IMACS 2001, Athens, Georgia, April, 2001.

"Almost Poisson Systems and Constrained Dynamics," SIAM Conference on Applications of Dynamical Systems, May, 2001.

"Nonholonomic Systems and Control," SIAM Conference on Control and its Applications, June, 2001.

"Asymptotically Stable Equilibria in Coupled Conservative Mechanical Systems," SIAM Conference on Control and its Applications, June, 2001.

"Nonlinear Control Systems and Nonholonomic Mechanics," National Academey of Science Frontiers in Science Symposium, The Beckman Center, Irvine, California, November, 2001.

"Geometric Mechanics of the Symmetric Rigid Equations," December Meeting of the Canadian Mathematical Society, Toronto, December, 2001.

"Optimal Control and the Symmetric Rigid Body Equations," 4th International Conference on Dynamical Systems and Differential Equations, Wilmington, May 2002.

"Dissipative Dynamics and Instabilities in coupled Hamiltonian systems," Warwick Symposium on Mechanics and Symmetry, July 2002.

"Dissipative Dynamics in Conservative Classical and Quantum Systems," Plenary Talk, 15th International Symposium on the MathematicalTheory of Networks and Systems, Notre Dame, August, 2002.

"Discrete Variational Problems, the Maximum Principle, and Rigid Body Dynamics," Midwest Optimization Workshop, Ann Arbor, September, 2002.

"Dissipative Dynamics in Conservative Mechanical Systems," Colloqium, Wayne State University, Detroit, March, 2003.

"Oscillators, Spin Squeezing and Interactions with the Environment", Plenary Talk, IFAC Meeting on Lagrangian and Hamiltonian Control Systems, Seville, Spain, April, 2003.

"The Geometry and Dynamics of Generalized Double Bracket Equations," SIAM Conference on Dynamical Systems, Snowbird, Utah, May 2003.

"Generalized Double Bracket Flows", Workshop on Group Theory and Numerical Analysis, Montreal, May 2003.

"Nonholonomic Mechanics," Mittag Leffler Institute, May 2003.

Mittag Leffler Institute, Semester on Systems Theory and Control, long term visit, May, 2003.

"The Michigan Doctoral Program," Carnegie Institute on the Doctorate, Palo Alto, July 2003.

"Nonholonomic Mechanics and Control," Chi Epsilon Engineering Honor Society, University of Michigan, October 2003.

" Dynamics and Control of Oscillators and Spins Interacting with their Environment," Dynamics and Control Colloqium, Caltech, Pasadena, November 2003.

"Dynamics and Control of Oscillator and Spin Systems" Conference on New Direction and Applications in Control, Lubbock, Texas, November 2003.

"Optimality and Generalized Double Bracket Flows," 42nd IEEE Conference on Decision and Control, December, 2003.

"Geometry and Dynamics of Generalized Double Bracket Flows," 995th Meeting of the American Mathematical Society, Athens, Ohio, March 2004.

"Nonholonomic Mechanics – a Generalization of Hamiltonian Mechanics," Midwest Dynamical Systems Meeting, Ann Arbor, Michigan, April 2004.

" Nonholonomic flows on Lie groups," Conference on Lie Group Methods and Control Theory, International Center for Mathematical Sciences, Edinburgh, July 2004.

Five Lectures on Nonholonomic Mechanics, Summer School, Milan, Italy, July 2004.

"Dynamics and Control of Oscillator Spin Systems," Workshop on Quantum Control and Information, Caltech, Pasadena, August 2004.

"Geometry of Oscillator Spin Systems," Arizona State University, November 2004.

"Geometric Aspects of Isospectral Flows on Symmetric Matrices," AMS National Meeeting, Atlanta, January 2005.

"Quantum Control", CRM, Barcelona, Spain, February, 2005.

Visitor, CRM Semester on Control, Geometrry and Engineering, Barcelona, Spain, February 2005.

Arizona workshop in honor of Hermann Flaschka's 60th birthday, Tucson, March, 2005.

High Degree of Freedom Workshop, Washington, April 2005

"Orbital Dynamics in Extended Mass Distributions," SIAM Conference on Dynamical Systems, Snowbird, May 2005.

High Degree of Freedom Workshop, Boston, July 2005

"Mechanics and Control," Summer school on quantum control, Caltech, Pasadena, August 2005.

"A geodesic flow on the symplectic group" AMS National Meeeting, San Antonio, January 2006.

"Geodesic Flows and their Discretizations' Oberwolfach Workshop on Geometric Numerical Integration, March 2006.

"Representations of Geodesic Flows" Sectional Meeting of the AMS, Notre Dame, Indiana, April 2006.

"Nonholonomic mechanics and control," Distinguished Speaker Series, Michigan State University, April 2006.

"Integrable geodesic flows on manifolds", Conference on Integrable Systems, Random Matrices and Applications, in honor of Percy Deift's 60th Birthday, New York University, May 2006.

"Integrable flows and optimal control," Geometric Analysis and its Applications, University of Illinois, July, 2006.

"Problems in Quantum Control," PRACQSYS 06, Harvard Unversity, Cambridge, August, 2006.

"Smooth and disrete integrable systems and optimal control," XV International Workshop on Geometry and Physics, Satellite Conference of the ICM, plenary speaker, Pto. de la Cruz, Tenerife, Spain, September, 2006.

"Nonholonomic mechanics and control," Colloqium, University of Maryland, Baltimore County, October, 2006.

"Connections between nonholonomic mechanics and control," BIRS workshop, Banff, Canada, January, 2007.

"Dynamics and control of quantum systems" MSRI workshop on Stochastic Dynamical Systems and Control, hour talk, Berkely, March 2007.

"Geometry of integrable systems and optimal control," 6th International Congress on Industrial and Applied Mathematics, Zurich, July 2007.

"Geometric aspects of integrable systems and optimal control," D2HFest 2007, Lausanne, July 2007.

"Classical and quantum systems interacting with their environement," Control, Constraints and Quanta, Bedlewo, Poland, October, 2007.

"Integrable flows on the symmetric and skew symmetric matrices," Midwest Dynamical Systems Seminar, Ann Arbor, October 2007.

"Nonholonomic Systems, Dissipation and Quantization," American Institute of Mathematical Sciences Meeting, Dallas, May 2008.

"Classical and Quantum Systems Interacting with their Environment", Control of Physical Systems and PDE's, Institute Henri Poincare, Paris, June 2008.

"Variational aspects of nonholonomic systems" Oberwolfach meeting, Oberwolfach, July 2008.

"Variational and dissipative aspects of nonholonomic systems" Invited Plenary Lecture, AMS meeting, Huntsville, Alabama, October, 2008.

"Variational princples and in nonholonomic systems" Applied Mathematics Colloquium, University of Waterloo, Ontario, November, 2008.

"Variational princples and in nonholonomic systems" Applied Mathematics Colloquium, University of Waterloo, Ontario, November, 2008.

"Dissipative aspects of nonholonomic systems," Workshop in honor of Roger Brockett's 70th Birthday, 45th CDC, Cancun, December, 2008.

"Nonholonomic and quantum dynamics," workshop on Electrical and Mechatronical Systems, Bernoullie Center, Ecole Polytechnique de Lausanne, Switzerland, February 2009.

"Dissipative dynamics in quantum and nonholonomic systems," workshop on Coherence. Control and Dissipation, Institute for Mathematics and its Applications, Minneapolis March 2009.

"Finite control of infinite quantum systems" workshop on Coherent Control," Kavli Instititue for Theoretical Physics, Santa Barbara, May 2009.

"Geometric control theory and nonholonomic mechanics," invited series of 6 lectures, International Summer School on Geometry, Mechanics and Control, Amettla Del Mar, Spain, June, 2009.

"Dissipative dynamics in nonholonomic quantum systems," workshop on Fundamental Aspects of Deterministic Thermostat, CECAM-EPFL, Lausanne Switzerland. July, 2009

"Control Theory and integrable systems." Invited talk, A Celebration of the Field of Systems and Control, Royal Institute of Technology, Stockholm, Sweden, September, 2009.

"Dynamics of gradient flows, Hamiltonian Flows and Thermostats," Fall sectional meeting of the American Mathematical Society, Penn State University, October, 2009.

"The rolling sphere and quantum spin," SIAM-SEAS meeting, Raleigh, North Carolina, March, 2010

"Rolling motion and quantum dynamics," Workshop on Synergies and Interplay of Nonlinear Dynamics and Control, Ann Arbor, May, 2010.

"Integrable flows and asymptotic stability," Plenary speaker, Symmetry plus Integrability 2010, South Padre Island, Texas, June 2010

"Geometry of Integrable Systems," Workshop on Geometry, Mechanics and Dynamics, Luminy, France, July 2010

"Nonholonomic mechanics and quantum dynamics," Plenary speaker, CAIMS (Canadian Applied Mathematics meeting) 2010, Newfoundland, Canada, July 2010.

"Rolling motion and quantum mechanics," Workshop in Honor of Chris Byrnes, Lubbock, September 2010.

"Rolling motion and quantum dynamics," Invited speaker, Workshop on Geometric and Topological Method in Robotics and Control, Miraflores, Spain, October 2010.

"Products of random matrices and the randomly forced Hill's equation," special session on Statistical Properties of Dynamical Systems, American Mathematical Society, Richmond Virginia, November 2010.

"Orbit problems in astrophysics and products of random matrices," Plenary talk, Second IberoAmerican Meeting on Geometric Mechanics and Control, Bariloche, Argentina, January 2011.

"The geometry of nonholonomic systems," Texas Geometry and Toplogy Seminar, Lubbock, Texas, February 2011.

"Quantum spin and nonholonomic dynamics," ICIAM international conference, Vancouver, July 1011.

"Future direction in control panel," SIAM conference on control and its applications, Baltimore, July 2011.

Oberwolfach meeting on Applied Dynamics and Geometric Mechanics, coorganizer, Oberwolfach Germany, August 2011.

"Geometry and Dynamics", Senior Fellow Colloqium, University of Michigan Biological Station, September 2011.

"Geometry in nonholonomic mechanics and optimal control and the work of Peter Crouch" Workshop in honor of the work of Peter Crouch, Conference on Decision and Control, Orlando, Florida, December, 2011

"Products of random matrices and Hill's equations" Recent Trends in Dynamical Systems, Munich, January, 2012.

"Integrable systems, gradient flows, and dissipation", invited session, AMS sectional meeting, Honolulu, March, 2012.

"The geometry of integrable and gradient flows and dissipation", special session on Geometric Mechanics, The 9th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Orlando, July, 2012

"Continuous and Discrete Embedded Optimal Control Problems", Focus Program on Geometry, Mechanics and Dynamics, Fields Institute, Toronto, July 2012.

"The geometry of integrable and gradient flows and dissipation", Focus Program on Geometry, Mechanics and Dynamics, Fields Institute, Toronto, July 2012.

"Nonlinear control, quantum control and networks", ICMAT meeting on Stochastic Systems Simulation and Control, Madrid, Spain, November 2012.

"Course of three lectures on nonholonomic mechanics and control", NZMRI meeting on Geometric Mechanics and Shape, Ohope Beach, New Zealand, January 2013.

"Optimal control of discrete systems", SIAM Conference on Control and its Applications, San Diego, July 2013.

"Integrable Systems and Dissipative Dynamics," Workshop on Integrable Systems and Semiclassical Analysis, EPFL Lausanne, July 2013.

"Action Principles, Optimal Control and Mechanics," Workshop on Control and Obervation of Nonlinear Systems with Applications to Medicine," Hawaii, September, 2013.

"Double Bracket Flows, Toda Flows and Rigid Body Toda." 51st Annual Allerton Conference on Communication, Control and Computing, Allerton, Illinois, October 2013

"Knife edge dynamics, optics and Hamiltonization," Workshop in honor of Manuel de Leon, ICMAT, Madrid, Spain, November 2013.

"Asymptotics of nonholonomic flows," Ibero-American Meeting on Geometric Mechanics and Control, Rio de Janiero, Brazil, April, 2014

"Smooth and discrete integrable systems and optimal control," INDAM workshop on Analysis and Geometry in Optimal Control, Rome, Italy, June, 2014

"Dynamics and geometry of smooth and discrete optimal control problems", USNCTAM 2014, East Lansing, June 2014

"Rolling and quantum spin", Workshop on quantum control engineering, The Newton Institute, Cambrdige, UK, July/Aug 2014

"Nonholonomic dynamics, optics, and the least time", Workshop on Nonholonomic Mechanics and subRiemannian Geometry, Institut Henri Poincare, Paris, November 2014.

"Geometry of integrable systems," Colloqium, UC San Diego, February 2015.

"Topics in control of mechanical systems", Mechanics Seminar, UC San Diego, February 2015

"Dynamics of the Genome," DARPA workshop, Washington DC, March 1015.

"Toda flows and the generalized Flaschka map," SIAM meeting on Dynamical Systems, Snowbird, May, 2015.

"Stability of the coupled Hill equations and the Lorentz Oscillator," Oberwolfach workshop on Quantum Many Body Systems, Oberwolfach, Germany, June 2015.

"Geometry of the Flaschka Map and Dispersionless Toda lattice flows"Conference on Waves, Spectral Theory and Applications, Princeton, September 2015

Simons Foundation Annual Meeting on Mathematics and Physical Sciences, October, 2015

"Toda flows, gradient flows and the generalized Flaschka map," Plenary speaker, Texas Analysis and Mathematical Physics Symposium, Dallas, November 2015.

Visitor, Institute for Mathematics and Applications, Minneapolis, November 2015

"Control of quantum systems with Lindblad dissipation," Quantum and Nano Control Workshop, Institute for Mathematics and Applications, Minneapolis, April, 2016.

"The symmetric rigid Body, flows on symmetric matrices and optimal control" Ascona Workshop on Integrable Systems, Ascona, Switzerland, June 2016.

"The Clebsch representation in optimal control and low rank integrable systems" The Abel Symposium, Barony Rasenthal, Norway, August 2016.

"Control of quantum systems with Lindblad dissipation," Colloquium, Dept. of Mechanical Engineering, Syracuse University, November, 2016.

"Quantum control and the geometry of flag manifolds," SIAM conference on Dynamical Systems, Snowbird, Utah, 2017.

"Hamel's formalisim for contrained field theories," SIAM conference on Dynamical Systems, Snowbird, Utah, 2017

"Hybrid Dynamics", Workshop on Verification and Syhthesis of Hybrid Systems, U. of Texas, Austin, June, 2017.

"Control of quantum systems with Lindblad dissipation,", Dynamical Systems and Geometric Mechanics, An international conference in honor of Jurgen Scheurle, Munich, Germany, June 2017.

"The Clebsch representation in optimal control, integrable systems and discrete dynamics," semiplenary lecture, Foundation of Computational Mathematics, Barcelona, Spain, 2017

"Dynamics and control of cellular reprogramming", Classic and Stochastic Approaches to Mathematical Programming, Imperial College, London, October, 2018.

"Control, geometry and optimality of quantum systems with Lindblad dissipation," Quantum control and feedback: foundations and applications, Institut Henri Poincare, June, 2018

"Control and geometry of quantum systems with Lindblad dissipation," Symposium on Optimal Stopping in Honor of Larry Shepp, Rice University, June, 2018.

"Optimal control and integrable systems," Conference on Geometric Mechanics and Control, Beijing Institute of Technology, Beijing, 2018.

"Quantum control and Lindblad dissipation," Conference on Geometric Mechanics and Control, Beijing Institute of Technology, Beijing, 2018.

"Control, geometry and optimality of quantum systems with Lindblad dissipation," Colloquium, Queen's University, Ontario, September, 2018.

"Stem Cell and tensor control," AFOSR Annual Workshop, Washington D.C., September 2018.

"Integrable systems and optimal control," Workshop on Hamiltonian systems from topology to applications through analysis, MSRI, Berkeley, October 2018.

"Reprogramming on demand," Dod Basic Research Forum, Arlington, Virginia, March, 2019

"Time-minimum control of quantum purity for 2-level Lindblad equationss" (poster), workshop on UM quantum theory, computation and algorithms, Ann Arbor, 2019.

"Study of a periodic cyclic system," Snowbird, May 2019

"Optimal control and integrable systems", Newton Institute, Cambridge, UK. August 2019

"Dynamics of nonholonomic systems", Baillieul Distinguished Lecture, University of Massachusetts Amherst, October 2019

"The geometry of integrable systems and optimal control", Baillieul Distinguished Lecture, University of Massachusetts at Amherst, October 2019

"Periodic Orbits in hybrid, robotic and biological systems", Grasp Seminar Series, University of Pennsylvania, November 2019

"Classical integrable Hamiltonian systems, Poisson structures and some generalizations", AMS Special Session on Hamiltonian Systems, Denver, January 2020

"The Mathematics of Time", Smale 90th Birthday Celebration, Ann Arbor, June 2020

"Controllability of Hypergraphs", AFSOR Review, Washington DC, June 2020

"Geometry and Dynamics of Circulant Systems", AMS Special Session on Geometric Dynamics, Penn State University, October 2020

"Nonlinear Dynamics of Circulant Systems", Plenary lecture, 2020 International Symposium on Nonlinear Analysis and Simulation, Jilin University, Changchun, China, December 2020

"Control of Quantum Systems on Flag Manifolds", Heraeus seminar on Koopman Methods in Classical and Quantum Mechanics, Hanau, Germany, April, 2021.

"Dynamics of Circulant Systems", GDM Seminar on Geometric Mechanics, global event, April 2021.

"Variational Methods for Mechanical Systems with Impacts" SIAM Conference on Dynamical Systems, Portland, May 2021.

"Dynamics of Circulant Systems", National Conference of the Portguese Mathematical Society, ENSPM, July 2021.

"Variational and nonholonomic systems with impacts," Geometry, Mechanics and Control Seminar, ICMAT, Spain, September 2021

"Total positivity, gradient and Hamiltonian flows,"Northern California Symplectic Geometry Seminar (NC-SGS), Berkeley, December 2021.

"Geometry of Mechanical Systems with Constraints and Impacts," Geometry Seminar, Coimbra, Portugal, May, 2022

"Smooth and Hybrid Systems," Workshop in honor of Dan Koditschek, Philadelphia, May 2022.

"Nonholonomic systems with impacts," Focused research group on Geometric Structures and their application. ICMAT, Madrid, June 2022.

"Total positivity, gradient and Hamiltonian flows," Smale Birthday conference, Ann Arbor, July 2022.

" Lecture Series on Mechanics," XXX International Fall Workshop on Geometry and Physics, series of 4 invited lectures, Madrid, Spain, September 2022,

Crystal Ball Workshop, AFOSR, Panelist, West Lafayette, October, 2022.

"Toda Flows, Gradient Flows and Total Positivity," NOLTA (Int. Symposium on Nonlinear Theory and its Applications), Dec. 2022.

"Geometry of Integrable Hamiltonian and Gradient Flows and Total Positivity," 30th Annual Owens Lecture, Wayne State University. April 2023

Banff Workshop on Control, organizer and panelist, Banff, Canada, June 2023

"Hamiltonian and Gradient Flows and Total Positivity," ICMAT Colloquium and Blochfest. Spain, July 2023

"Energy Momentum and stability," MCTP Workshop on Mathematical Astrophysics, Ann Arbor, MI, August 2023

Journal Publications

A completely integrable Hamiltonian system associated with line fitting in complex vector spaces, *Bull. Amer. Math. Soc.* 12 (1985), 250–254.

Estimation, principal components and Hamiltonian systems, *Systems and Control Letters* 6 (1985), 103–108.

An infinite-dimensional classical integrable system and the Heisenberg and Schrodinger representations, *Physics Letters* 116A (1986), 353–355.

An infinite-dimensional Hamiltonian system on projective Hilbert space, *Trans. Amer. Math. Soc.* 302 (1987), 787–796.

Lax-type flows on Grassmann manifolds, *Contemporary Mathematics*, A.M.S. 68 (1987), 39–50.

Identification and estimation of dynamic errors-in-variables models, *Journal of Econometrics* 41 (1989), 145–158.

Stability analysis of a rotating flexible system, *Acta Applicandae Mathematicae* 15 No. 3 (1989), 211–234.

Stability and stiffening of driven and free planar rotating beams, *Contemporary Mathematics*, A.M.S. 97 (1989), 11–25 (with R. R. Ryan).

Controlling homoclinic orbits, *Theoretical and Computational Fluid Dynamics* 1 (1989), 179–190 (with J. E. Marsden).

Steepest descent, linear programming and Hamiltonian flows, *Contemporary Mathematics*, A.M.S. 114 (1990), 77-88.

A new formulation of the generalized Toda lattice equations and their Fixed Point Analysis via the Moment Map, *Bull. of the Amer. Math. Soc.* 23 No.2 (1990), 477-486 (with R. W. Brockett and T. S. Ratiu).

Stabilization of the rigid body equations and the Energy–Casimir method, *Systems and Controls Letters* 14 (1990), 341-346 (with J. E. Marsden).

A convexity theorem for isospectral manifolds of Jacobi matrices in a compact Lie algebra, *Duke Mathematical Journal* 61 No. 1 (1990), 41-66 (with H. Flaschka and T. S. Ratiu).

Completely integrable gradient flows, *Communications in Mathematical Physics* 147 (1992), 57-74 (with R. W. Brockett and T. S. Ratiu).

Stabilizability of nonholonomic control systems, *Automatica*, 28 No. 2 (1992), 431-435.

Stabilization of rigid body dynamics by internal and external torques, *Automatica*, 28 No. 4 (1992), 745-756 (with P. S. Krishnaprasad, J. E. Marsden and G. Sanchez de Alvarez).

Control and stabilization of nonholonomic dynamic systems, *The IEEE Transactions on Automatic Control* 37 No.11 (1992), 1746-1757 (with N. H. McClamroch and M. Reyhanoglu).

Dispersive regularization of the Whitham equation for the Toda lattice, *The SIAM Journal on Applied Mathematics* 52 No. 4 (1992), 909-928 (with Y. Kodama).

Nonholonomic and vakonomic control systems on Riemannian manifolds, *Fields Institute Communications* 1, (1993) 25-52 (with P. E. Crouch).

A Schur-Horn-Kostant convexity theorem for the diffeomorphism group of the annulus, *Inventiones Mathematicae* 113, 511-529 (1993) (with H. Flaschka and T. S. Ratiu).

La structure symplectique de l'espace de phase de l'equation de Korteweg de Vries, *C. R. Acad. Sci* **317**, 1019-1022 (1993) (with D. Bättig, J. C. Guillot, and T. Kappeler).

Dissipation induced instabilities, *Annales de l'Institut Henri Poincaré, Analyse Non Linéaire* 11, 37-90 (1994) (with P. S. Krishnaprasad, J. E. Marsden, and T. S. Ratiu).

Sub-Riemannian optimal control problems and the sub-Riemannian rigid body, *Fields Institute Communications* 3, (1994), 35-48 (with P. E. Crouch and T. S. Ratiu).

Nonholonomic control systems on Riemannian manifolds, *The SIAM Journal on Control and Optimization* **37** No. 1, (1995), 126-148 (with P. Crouch).

On the symplectic structure of the phase space for the periodic KdV, Toda and defocusing NLS, *Duke Mathematical Journal* **79** (1995), 549-604. (with D. Bättig, J. C. Guillot, and T. Kappeler).

The Toda PDE and the Geometry of the Diffeomorphism Group of the Annulus, *Fields Institute Communications* **7** (1996), 57-92, (with H. Flaschka and T. S. Ratiu).

The Euler-Poincaré equations and double bracket dissipation, *Communications in Mathematical Physics* **175**, 1-42 (1996)(with P. S. Krishnaprasad, J. E. Marsden, and T. S. Ratiu).

Control of nonholonomic systems with extended base space dynamics, *The International Journal on Robust and Nonlinear Control* **5** (1996), 325-330 (with N. H. McClamroch and M. Reyhanoglu).

Nonholonomic mechanical systems with symmetry, *Archive for Rational Mechanics and Analysis* **136**, (1996), 21-99 (with P. S. Krishnaprasad, J. E. Marsden and R. Murray).

Optimal control and geodesic flows, *Systems and Control Letters* **28** (1996), 65-72 (with P. Crouch).

Use of linear feedback to control relaxation oscillations in a metal-passivation model, *Modelling and Simulation in Materials Science and Engineering* **4** (1996), 641-653 (with Alan Markworth).

Stabilization and tracking in the nonholonomic integrator via sliding modes, *Systems and Control Letters* **29** (1996), 91-99 (with S. Drakunov).

Double bracket equations and geodesic flows on symmetric spaces, *Communications in Mathematical Physics* **187** (1997), 357-373 (with R. Brockett and P. Crouch).

The energy momentum method for the stability of nonholonomic systems, *Dynamics and Stability of Systems* **13** No. 2 (1998), 123-166 (with D. Zenkov and J. Marsden).

Hamiltonian and gradient structures in the Toda flows, *The Journal of Geometry and Physics* **27** nos. 3-4, (1998) 230-248 (with M. Gekhtman).

Newton's law and integrability of nonholonomic systems, *SIAM J. on Control and Optimization* **36** N0. 6, (1998) 2020-2039 (with P. Crouch).

Representation of Dirac structures on vector space and nonlinear L-C circuits, *Proc. Symp. on Appl. Math.*, **66** 103-118. AMS (1998) (with P. Crouch).

The generalized Serret-Andoyer transformation and applications for the controlled rigid body, *The Journal of Dynamics and Control* **9** No. 1 (1999), 39-66 (with K. Lum).

Control strategies for the improvement of corrosion resistance, *Mater. Sci. Eng. A* (with A. Gupta, A. Markworth, R. Rollins, and J. Saunders) **270** (1999), 254-259.

Stabilization of nonholonomic systems using isospectral flows, *SIAM Journal of Control and Optimization*, **38** (2000), 855-874 (with S. Drakunov and M. Kinyon).

Dynamics of the n-dimensional Suslov problem, *J. of Geometry and Physics*, **34** (2000), 121-136 (with D. Zenkov).

Controlled Lagrangians and the stabilization of mechanical systems I: the first matching theorem, *The IEEE Transactions on Automatic Control* **45** (2000), 2253-2270(with N. Leonard and J. Marsden).

Asymptotic Hamiltonian Dynamics: the Toda lattice, the three-wave interaction and the nonholonomic Chaplygin sleigh, *Physica D* **141** (2000), 297-315 .

Controlled Lagrangians and the stabilization of Euler-Poincaré Mechanical Systems, *International Journal of Robust and Nonlinear Control* **11**, (2001) 191-214 (with N. Leonard and J. Marsden).

Controlled Lagrangians and the stabilization of mechanical systems II: potential shaping and tracking, *The IEEE Transactions on Automatic Control* **46** (2001), 1556-1571 (with D.- E. Chang, N. Leonard and J. Marsden).

The Lyapunov-Malkin theorem and stabilization of the unicycle with rider (with J. Marsden and D. Zenkov), *Systems and Control Letters* **46**, (2002) 293-302.

The equivalence of controlled Lagrangian and controlled Hamiltonian systems, *ESAIM: Control, Optimization and Calculus of Variations* **8** (2002), 393-422 (with D.-E. Chang, N.E. Leonard, J.E. Marsden and C.A. Woolsey.

The symmetric representation of the rigid body equations and their discretization, *Nonlinearity* **15** (2002), 1309-1341 (with P.E. Crouch, J.E. Marsden and T.S. Ratiu).

Dispersionless Toda and Toeplitz operators, *Duke Mathematical Journal* **117** (2003), 157-196 (with F. Golse, T. Paul and A. Uribe).

Invariant Measures of Nonholonomic Flows with Internal Degrees of Freedom, *Nonlinearity* **16** (2003) , 1793-1807 (with D. Zenkov).

Local equilibrium controllability of multibody systems controlled via shape change, *The IEEE Transactions on Automatic Control* **49**, no. 4 (2004), 506-520 (with J.-L. Shen and N.H. McClamroch).

Gyroscopically stabilized oscillators and heat baths, *Journal of Statistical Physics* **115** No. 314 (2004) 1073-1100 (with P. Hagerty, A. Rojo and M. Weinstein).

Control of Trapped-Ion Quantum State with Optical Pulses, *Physical Review Letters* **92** (2004), 113004 (with C. Rangan, C. Monroe and P. Bucksbaum).

Control of squeezed phonon and spin states, *European Journal of Control* **10**, 469-477 (2004) (with A. Rojo).

Radiation Induced Instability, *SIAM J. Applied. Math.* **64** (2004), 484-524 (with P. Hagerty and M. Weinstein).

Qualitative behavior of non-abelian Toda-like flows, *Physica D* **199** (2004), 317-338 (with M. Koelling and M. Gekhtman).

Dynamics of multibody systems in planar motion in a central gravitational field, *Dynamical Systems* **19**, 303-344 (2004) (with A. Sanyal and N.H. McClamroch).

On the optimality of double bracket flows, *The International Journal of Mathematics and Mathematical Sciences* **62**), 3301-3319 (2004) (with A. Iserles).

Controlled Lagrangian systems with gyroscopic forcing and dissipation, *European Journal of Control*, **10**, 478-496 (2004) (with C. Woolsey, C.K. Reddy, D. Chang, N. Leonard and J. Marsden).

Stability and stabilization of relative equilibria of a dumbbell satellite in central gravity, to appear the *Journal of American Institute of Aeronautics and Astronautics* (with A. Sanyal, J. Shen and N.H. McClamroch).

Aspects of generalized double bracket flows, *Proc. Centre de Recherche Montreal, AMS*, Group Theory and Numerical Analysis, **39**, (2005) 65-76 (with A. Iserles)

Control of finite-dimensional quantum systems: application to a spin-1/2 particle couple with a finite quantum harmonic oscillator, *Journal of Mathematical Physics* **46**, 032106 (2005) (with C. Rangan).

Nonholonomic dynamics, *Notices of the American Mathematical Society* **52**, 324-333 (2005) (with J.E. Marsden and D. Zenkov).

Orbits in extended mass distributions: general results and the spirographic approximation,*The Astrophysical Journal* **629** 62038 (2005) p204-218 (with F. Adams).
On an isospectral Lie-Poisson system and its Lie algebra, *Foundations of Computational Mathematics* **6** (2006), 121-144. (with A. Iserles).

Commutators of skew-symmetric matrices, in Modeling and Computations in Dynamical Systems (E.Doedel, G. Domokas and I.Kevrekidis eds.) *World Scientific Series on Nonlinear Science* Series B **13**, (2006) 97-106. (with A. Iserles).

Baryonic collapse within dark matter halos and the formation of gaseous galactic disks,*The Astrophysical Journal* **653** (2006), 65561, p905 (with F. Adams).

A variational problem on Stiefel manifolds, in *Nonlinearity* **19**, (2006) 2247-2276 (with P.E. Crouch and A. Sanyal).

Dynamic coverage optimal control for multiple spacecraft interferometric imaging, *Journal of Dynamics and Control* **13** (2007), 69-93 (with I.Hussein).

Orbital Instabilities in a Triaxial Cusp Potential *Astrophysical Journal* **670**, 1027-1047, (2007) (with F. Adams, S. Butler, S, Druce and J. Ketchum).

Lie algebraic aspects of the finite nonperiodic Toda flows, *Journal of Computational and Applied Mathematics* **202**, (2007), 3-25 (with M. Gekhtman).

Analysis of the effects of firing rate and synchronization on spike-triggered averaging of multidirectional motor unit torque, *Journal of Computational Neuroscience* **22**, (2007), 347-361 (with J. Kutch, N. Suresh and W. Rymer).

Optimal motion planning for dual spacecraft interferometry *IEEE Transactions on Aerospace and Electronic Systems* **43**, 723-737 (2007) (with I. Hussein, D. Hyland and D.Scheeres and N.H. McClamroch).

Optimal Control of Underactuated Nonholonomic Mechanical Systems, *The IEEE Transactions on Automatic Control* **53**, (2008) 668-682 (with I. Hussein).

Hill's equation with random forcing terms, *SIAM J. on Applied Mathematics* **68** (2008), 947-980 (with F. Adams).

Quantization of a nonholonomic system, *Phys Rev. Letters* **101** (2008) 030404 (with A. Rojo).

Controllability and motion planning of a multibody Chaplygin's sphere and Chaplygin top, *The International Journal of Robust and Nonlinear Control* **18**, (2008) 905-945 (with J. Shen and D.Schneider)

Optimal Control and Geodesics on Quadratic Matrix Lie Groups, *Foundations of Computational Mathematics* **8**, (2008), 469-500 with P. Crouch, J. Marsden and A. Sanyal.

Endpoint force fluctuations reveal flexible rather than synergystic patterns of muscle cooperation, *Journal of Neurophysiology* **100**, (2008), 2455-2471(with J. Kutch, A. Kuo and W. Rymer).

The eccentric frame decomposition of central force fields, *Journal of Celestial Mechanics and Dynamical Astronomy* **100** (2008), 43-62)(J. Maruskin, D. Scheeres and F. Adams).

Equivalence of the dynamics of nonholonomic and variational nonholonomic systems for certain initial data, *J. Phys. A.* **41**, 344005 (2008) (with O. Fernandez).

Turbulence in extrasolar planetary systems implies that mean motion resonances are rare, in *The Astrophsyical Journal* **658**, 1117-1128 (2008) (with F. Adams and G. Laughlin).

Global optimal feedback control of the underactuated Heisenberg system by generating functions, *IEEE Trans. Aut. Control* **53**, 2368-2642 (2008) (with C. Park, D.Scheeres and V. Guibout).

Mean motion resonances in extrasolar planetary systems with turbulence, interactions, and damping, *The Astrophysical Journal* **629**, (2009) 659-676 (with D. Lecoanet and F. Adams)).

Dynamics of symplectic subvolumes, *The SIAM Journal of Applied Dynamical Systems*, **8**, 180-210 (2009), with J. Maruskin and D. Scheeres.

Hamiltonization of Nonholonomic Systems and the Inverse Problem of the Calculus of Variations, *Reports on Mathematical Physics* **63**, 225-249 (2009) (with O. Fernandez and T. Mestdag).

Geometric structure-preserving optimal control of the rigid body, *Journal of Dynamics and Control Systems* **15**, 307-330 (2009) (with I. Hussein, M. Leok and A. Sanyal).

Quasivelocities and Symmetries in Nonholonomic Systems, *Dynamical Systems* **24**, 187-222 (2009) (with J. Marsden and D. Zenkov).

A class of integrable flows on the space of symmetric matrices, *Communications in Mathematical Physics* **290**, 399-435 (2009) (with V. Brinzanescu, A.Iserles, J.E. Marsden and T.S. Ratiu).

General analysis of type I planetary migration with stochastic perturbations, **701**, 1381-1397 (2009) *The Astrophsyical Journal* (with F. Adams).

Nonholonomic double bracket equations and the Gauss Thermostat, *Phys.Rev. E* **80**, 025601 (2009), (with A. Rojo).

Hill's equation with random forcing terms parameters: the limit of delta function barriers *Journal of Mathematical Physics*, **50**, 073501 (2009)(with F. Adams).

A generalization of Chaplygin's reducibility theorem, *Regular and Chaotic Dynamics* **14** (2009), 635-655 (with O. Fernandez and T. Mestdag).

The nonholonomic Hamilton Jacobi theorem and integrability, *The Journal of Geometric Mechanics* **1**, 389-416 (2009) (with T. Ohsawa).

Hill's equation with random forcing terms parameters: determination of growth rates through random matrices *J. Statistical Physics* **139**, 139-158 (2010) (with F. Adams).

Finite controllability of infinite quantum systems, *IEEE Transactions on Automatic Control*, **55**, 1797-1805 (2010) (with R. Brockett and C. Rangan).

The rolling sphere, the quantum spin and a simple view of the Landau-Zener problem *The American Journal of Physics* **78** (10), 1012-1022 (2010) (with A. Rojo).

Controlled Lagrangians and stabilization of discrete mechanical systems, *Discrete and Continuous Dynamical Systems* **3**, 19-36 (2010) (with M. Leok, J. Marsden and D. Zenkov).

The Weitzenbock connection and time reparameterization in nonholonomic mechanics, *Journal of Mathematical Physics*, **52**, 012901 (2011) (with O. Fernandez).

Nonholonomic Hamilton-Jacobi theory via Chaplygin Hamiltonization, *Journal of Geometry and Physics* **61**, 1263-1291 (2011) (with T. Ohsawa, O. Fernandez and D. Zenkov).

The Boltzmann-Hamel Equations for the Optimal Control of Mechanical Systems with Nonholonomic Constraints, *The International Journal of Robust and Nonlinear Control* DOI: 10.1002/rnc.1598, (2010) (with J. Maruskin).

Kinematics of the rolling sphere and quantum spin, *Communication in Information and Systems* **10**, 221-238 (2010)(with A. Rojo).

Embedded geodesic problems for matrix Lie groups, *J. Geometric Mechanics* **3**, 197-223 (2011) (with P. Crouch, N. Nordkvist and A. Sanyal).

Discrete Hamilton-Jacobi theory, *The SIAM Journal of Control and Optimization* **49**, 1829-1856, 2011 (with T. Ohsawa and M. Leok).

Effects of turbulence, eccentricity damping and migration rate on the capture of planets into mean motion resonance, *The Astrophysical Journal*, **726**, 1-18, 2011 (with J. Ketchum and F. Adams).

Accretion of rocky planets by hot Jupiters, *The Astrophysical Journal Letters* **741**, L2-L7 (2011) (with J. Ketchum and F. Adams).

Variational Integrators for Hamiltonizable Nonholonomic Systems, *The Journal of Geometric Mechanics* **4**, 137-163 (2012) (with O. Fernandez and P. Olver).

A fiber bundle approach to the transpositional relations in nonholonomic mechanics, in the *J. Nonlinear Science* **22**, 2012, 431-461 (with J.Maruskin, J. Marsden and D.Zenkov).

Hill's equations with small fluctuations: cycle to cycle variations and stochastic processes, *Journal of Mathematical Physics* **54**, 033511, 2013 (with F. Adams).

Mean motion resonance in exoplanet systems: an investigation into nodding behavior, *The Astrophysical Journal* **762**, 1-19 (2013). (with J. Ketchum and F. Adams).

Continuous and discrete embedded optimal control problems and their applications to the analysis of Clebsch optimal control problems and mechanical systems, *J. Geometric Mechanics* **5**, No 1. March 2013, 1-38 (with P. Crouch and N. Nordkvist).

The evolution of planetary systems with time-dependent stellar mass loss rates, in the *Monthly Notices of the Royal Astronomical Society* **432**, 438, 2013 (with Fred Adams and Kassandra Anderson).

Evolution of planetary orbits with stellar mass loss and tidal dissipation, *Astrophysical Journal* **777**, L30, 2013 (with F. Adams)

Optical mechanical analogy and Hamiltonization of a nonholonomic system, *Phys.Rev. E* **88**, 013204 (2013), (with A. Rojo).

Random Hill's equations, Random Walks and Products of Random Matrices, in *Recent Trends in Dynamical Systems* (eds. A. Johan., P. Kruse, F. Rupp and S. Schmitz) Springer Proceedings in Mathematics and Statistics **35**, 447-470, 2013 (with F. Adams and J. Lagarias).

Gradient flows in the normal and Kahler metrics and triple bracket generated metriplectic flows, in *Recent Trends in Dynamical Systems* (eds. A. Johan., P. Kruse, F. Rupp and S. Schmitz) Springer Proceedings in Mathematics and Statistics **35**, 371-415, 2013 (with P. Morrison and T.S. Ratiu).

An infinite matrix product, *American Mathematics Monthly*, **120** problem 11739 (2013) (with F. Adams and J. Lagarias).

The geometry and integrability of the Suslov problem, *The Journal of Mathematical Physics* **55**, 4901754 (2014) (with O. Fernandez and D. Zenkov).

On the stability of extrasolar planetary systems and other closely orbiting pairs, *Monthly Notices of the Royal Astronomical Society* **446**, 3676-3686 (2015) (with F. Adams).

Hamel's Formalism and Variational Integrators on a Sphere, to appear (with D.V. Zenkov and Melvin Leok).

Helmholtz conditions and the method of controlled Lagrangians, in D.V. Zenkov (ed.), *The Inverse Problem of the Calculus of Variations*, Atlantis Studies in Variational Geometry, 1-29, Atlantis Press, 2015 (with D. Krupka and D. Zenkov).

A geometric approach to the optimal control of nonholonomic mechanical systems, in *Analysis and Geometry in Control Theory and its Applications*, Bettiol et. al. eds, (with L. Colombo, R. Gupta and D. Martin de Diego), Springer-INDAM. 2015

Planets in Other Universes: Habitability constraints on density fluctuations and galactic structure, *Journal of Cosmology and Astroparticle Physics*, **42**, 1-25 (2016) with F. Adams and K. Coppess

The optical mechanical analogy and nonlinear nonholonomic systems, *Phys. Rev. E.* **93**, 023005 (2016) (with A. Rojo).

Stability of coupled Hill's equations and the Lorentz oscillator model, *SIAM Journal of Dynamical Systems* **15**, 1104–1123 (2016) with F. Adams, R. Gupta and H. Razavi).

Symmetry in legged locomotion: A new method for designing stable periodic gaits, *Journal of Autonomous Robots*, doi:10.1007/s10514-016-9593-x, (2016) 1-24 (with Razavi, H. C. Chevallereau, and J. W. Grizzle.

The Stability of Tidal Equilibrium for Hierarchical Star-Planet-Moon Systems, *Monthly Notices of the Royal Astronomical Society* **462**, 2527-2541 (2016) (with Fred Adams).

Neighboring extremal optimal control for mechanical systems on Riemannian manifolds, *Journal of Geometric Mechanics* **8** (2016), 257-272 (with R. Gupta and I. Kolmonovsky).

Flag-based Control of Quantum Purity for n = 2 Systems, *Phys. Rev. A* **93** (2016), 063424 (with P. Rooney and C. Rangan)

Combined Homotopy and neighboring extremal control, *Optimal Control Applications and Methods* bf 38 (2017), 459-469 (with R. Gupta and I. Kolmonovsky).

The geometric nature of the Flaschka transformation, in *Communications in Mathematical Physics* **352** (2017), 457-517, with F. Gay-Balmaz and T.S. Ratiu.

Coadjoint orbits in dual of Lie algebras with admissable ideals, *Math. Sbornik*, **208** (2017), 1421 -1427 (with F. Gay-Balmaz and T.S. Ratiu.

Hamel's formalism for infinite-dimensional nonholonomic systems, *Journal of Nonlinear Science* **27** (2017), 241-283 (with D. Shi, Y. Berchenko-Kogan, and D. Zenkov).

Algorithm for cellular programming, in *Proceedings of the National Academy of Sciences* **114** (45) 11832-11837 (2017) (with S. Ronquist, G. Patterson, L/ Muir, S.Lindsly, H. Chen, M. Brown M. Wicha, R. Brockett and I. Rajapakse)

MPC on manifolds with an application to the control of spacecraft attitude on SO(3), *Automatica* **26**, (2017), 283-300 (with U. Kalabic, R. Gupta S. Di Cairano and I Kolmonovsky).

Geometric mechanics based nonlinear model preditive spacecraft attitude control with reaction wheels *Journal of Guidance, Control and Dynamics* **40** (2017), 309-319 (with D. Y. Lee, R. Gupta, U. Kalabic, S. De Cairano, J. Cutler and I Kolmonovsky).

Optimal control problems with symmetry breaking cost functions, *SIAM Journal on Applied Algebra and Geometry* **1** (2017), 626-646 (with L. Colombo, R. Gupta and T. Ohsawa)

Steering the eigenvalues of the density operator in Hamiltonian-controlled quantum Lindblad systems, in *IEEE Trans. Aut. Control* **63** 672-681 (2018) (with P. Rooney and C. Rangan)

New matching conditions from the Helmholtz conditions, *The Journal of Nonlinear Science* **29** (2019), 345-376 (with M. Farre Puiggali)

Time-minimum control of quantum purity for 2-level Lindblad equations, *Journal of Discrete and Continuous Dynamical Systems-Series S* **13** (2020) 1061-1073, (with W. Clark. L. Colombo and P. Rooney).

A Poincare-Bendixson theorem for hybrid systems, *Mathematical Control and Related Fields* **10**, 27-45 (2020)(with W. Clark and L. Colombo)

Energy Optimization in Extrasolar Planetary Systems: The Transition from Peas-in-a-Pod to Runaway Growth, *The Monthly Notices of the Royal Astronomical Society* **493**, 5520-5531 (2020) (with F. Adams and K. Batygin and G. Laughlin).

Energy Optimization in Binary Star Systems: Explanation for Equal Mass Members in Close Orbits, (**494**, 2289-2298 (2020) *The Monthly Notices of the Royal Astronomical Society* (with F. Adams and K.Batygin).

Dynamic interpolation for obstacle avoidance on Riemannian manifolds, *The International Journal of Control* **94**, 588-600 (2021) (with M. Camarinha and L. Colombo)

The variational discretization of the constrained higher-order Lagrange-Poincaré equations, *Discrete and Continuous Dynamical Systems A* **39**, 309-344, 2019 (with L. Columbo and F. Jimenez)

A Poincare-Bendixson theorem for hybrid systems on directed graphs, *Mathematics of Control, Signals and Systems* **32**, 1-18 (2020) (with W. Clark).

Families of periodic orbits: closed 1-forms and global continuability, *The Journal of Differential Equations* **285**, 211-257 (2021) (with M. Kvalheim).

Multilinear control systems theory, *The SIAM J. of Control and Optimization* 59, 749-776 (2021) (with Chen, C., Surana, A. and Rajapakse, I.)

Controllability on Hypergraphs, in *The IEEE Transactions on Network Science and Engineering* 10.109/ TNSE.2021 .3068203 (2021) (with Chen, C., Surana, A. and Rajapakse, I.)

Variational point- obstacle avoidance on Riemannian manifolds, in *Mathematics of Control, Signals and Systems* **33** (1 109-121 (2021) (with M. Camarinha and L. Colombo)

Nonparametric continuous sensor registration, in *Journal of Machine Learning Research* **22**, 1-50 (2021) (with W. Clark and M. Ghaffari).

Existence of invariant volumes in nonholonomic systems, to appear in *The Journal of Geometric Mechanics* (with W. Clark).

Invariant forms in hybrid and impact systems and a taming of Zeno, in *Archive for Rational Mechanics and Analysis* **247** 13 (2023) (with W. Clark).

Gradient flows, adjoint orbits, and the topology of totally nonnegative flag varieties, *Comm. Math. Phys.* **398**, 1213-1289 (2023) (with S. Karp).

On two notions of total positivity for partial flag varieties, in *Advances in Mathematics*, **414** 108853 (2023) (with S. Karp).

Architectures of compact multi-planet systems: diversity and uniformity, to appear (with Lauren Weiss, Sarah Milholland, Eric Petigura, Fred Adams. Constantin Batygin, and Christopher Mordasini).

Virtual nonholonomic constraints: a geometric approach, to appear (with A. Simoes, E. Strataglu and L. Colombo).

Symmetric Toda, gradient flows, and tridiaongalization, *Physica D* **450** 133766 (2023) (with S. Karp).

Proceedings and other publications, mostly refereed.

Robustness in Multivariable Control System Design, M.Phil. Thesis, Cambridge University, 1981. Printed as Cambridge University Technical Report CUED:F-CAMS:TR-215 (1981) (with I. Postlethwaite).

Completely Integrable Hamiltonian Systems and Total Least Squares Estimation, Ph.D. Thesis, Harvard University, 1985.

An infinite-dimensional variational problem arising in estimation theory, in *Algebraic and Geometric Methods in Nonlinear Control Theory* (M. Fliess and M. Hazewinkel, eds.) D. Reidel Publishing Co. (1986), 487-498 (with C. I. Byrnes).

Total least squares estimation in infinite dimensions and completely integrable Hamiltonian systems, in *Theory and Applications of Nonlinear Control Systems* (C.I. Byrnes and A. Lindquist, eds.), North-Holland Publishing Co., 1986, 241-246.

Left invariant control systems on infinite-dimensional homogeneous spaces, *Proceedings of the 24th IEEE Conference on Decision and Control*, IEEE (1986), 1027–1030.

Stability and equilibria of deformable systems, *Proceedings of the 26th IEEE Conference on Decision and Control*, IEEE (1987), 1443–1444.

Control of constrained Hamiltonian systems and applications to control of constrained robots, in *Dynamical Systems Approaches to Nonlinear Problems in Systems and Circuits* (F. Salam and M. Levi, eds.), SIAM, 1988, 394-403 (with N.H. McClamroch).

A geometrical approach to errors-in-variables models, in *Linear Algebra in Signals, Systems and Control* (B.N. Datta et. al., eds.), SIAM, 1988, 481-492.

Stabilization of Hamiltonian systems with constraints, in *Analysis and Control of Nonlinear Systems* (C. I. Byrnes, C. F. Martin and R. E. Saeks, eds.), Elsevier Science Publishers, 1988, 385-392 (with N. H. McClamroch).

The dynamics of a free flexible body, in *Analysis and Control of Nonlinear Systems* (C. I. Byrnes, C. F. Martin and R. E. Saeks, eds.) Elsevier Science Publishers, 1988, 281-288.

Approximate models of rotating beams, *Proceedings of the 27th IEEE Conference on Decision and Control,* IEEE (1988), 1230–1235 (with R. R. Ryan).

Book review: Variational and Hamiltonian Control Systems, by P. E. Crouch and A. J. van der Schaft, *SIAM Review* 31 No. 2 (1989), 334–336.

Control of mechanical systems with classical nonholonomic constraints, *Proceedings of the 28th IEEE Conference on Decision and Control,* IEEE (1989), 201–205 (with N. H. McClamroch).

Control and stabilization of systems with homoclinic orbits, *Proceedings of the 28th IEEE Conference on Decision and Control,* IEEE (1989), 2238–2242 (with J. E. Marsden).

The Kahler structure of the Total Least Squares problem, Brockett's steepest descent equations and constrained flows, in *Realization and Modelling in Systems Theory* (M. A. Kaashoek, J. H. van Schuppen and A.C. M. Ran, eds.), Birkhauser, 1990, 83-88.

Sorting with the dispersionless limit of the Toda lattice, in the *Proceedings of the CRM Workshop on Hamiltonian Systems, Transformation Groups and Spectral Transform Methods* (J. Harnad and J. E. Marsden, eds.), Publications CRM, Montreal, 1990, 103-112 (with R. W. Brockett).

Spectral equations for the long wave limit of the Toda lattice equations, in the *Proceedings of the CRM Workshop on Hamiltonian Systems, Transformation Groups and Spectral Transform Methods* (J. Harnad and J.E. Marsden, eds.), Publications CRM, Montreal, 1990, 97-102 (with R. W. Brockett, Y. Kodama and T. S. Ratiu).

Controllability and stabilizability properties of a nonholonomic control system, *Proceedings of the 29th IEEE Conf. on Decision and Control*, IEEE (1990), 1312-1314 (with N. H. McClamroch and M. Reyhanoglu).

On the dynamics of rotating elastic beams, in *New Trends in Systems Theory* (G. Conte, A. Perdon and B. Wyman, eds.), Birkhauser, 1991, 128-135 (with E. Titi).

Book review: Nonlinear Dynamical Control Systems, by H. Nijmeijer and A. J. van der Schaft, *SIAM Review* 33 No. 2 (1991), 292-296.

Convexity and integrability, in *Symplectic Geometry and Mathematical Physics* (P. Donato, J. Elhadad, C. Duval and M. Tuynman eds.), Birkhauser, 1991, 48-79 (with T. S. Ratiu).

Control and stabilization of nonholonomic Caplygin systems, *Proceedings of the 30th IEEE Conference on Decision and Control*, IEEE (1991), 1127-1132 (with N. H. McClamroch and M. Reyhanoglu).

Asymptotic stability, instability and stabilization of relative equilibria, *Proceedings of the 1991 American Control Conference*, IEEE (1991), 1120–1125 (with P. S. Krishnaprasad, J. E. Marsden and T. S. Ratiu).

On the dynamics and control of nonholonomic systems on Riemannian manifolds, *Proceedings of the IFAC Nonlinear Control Symposium, 1992* (with P. E. Crouch).

Controllability of nonholonomic systems on Riemannian manifolds, *The Proceedings of the 31st IEEE Conference on Decision and Control*, IEEE (1992), 1594-1596 (with P. E. Crouch).

On the geometry of saddle point algorithms, *The Proceedings of the 31st IEEE Conference on Decision and Control*, IEEE(1992), 1482-1487 (with R. W. Brockett and T. S. Ratiu).

Motion planning for nonholonomic dynamic systems, in *Nonholonomic Motion Planning* (Z. Li and J. F. Canny eds.), Kluwer, 1993, 210-234 (with N. H. McClamroch and M. Reyhanoglu).

Control and stabilization of a general class of nonholonomic dynamic systems, *The Proceedings of the 32nd IEEE Conference on Decision and Control*, IEEE (1993) (with N. H. McClamroch and M. Reyhanoglu).

The Whitham equation and shocks in the Toda lattice, in *Singular Limits of Dispersive Waves* (N. Ercolani, I. Gabitov, C. Levermore and D. Serre eds.), Plenum Press, 1994, 1-19 (with Y. Kodama).

Control and optimal control of a class of infinite-dimensional systems, in *Proceedings of the IMACS World Congress on Computational and Applied Mathematics* (ed. W. F. Ames), 51-55, Georgia Institute of Technology, 1994.

Stabilization of a nonholonomic system via sliding modes, in *The Proceedings of the 33rd IEEE Conference on Decision and Control*, 2961-2964, IEEE (1994) (with S. Drakunov).

Reduction of Euler Lagrange problems for constrained variational problems and relation with optimal control problems, in *The Proceedings of the 33rd IEEE Conference on Decision and Control*, 2584-2590, IEEE (1994) (with P. Crouch).

Another view of nonholonomic mechanical control systems, in *The Proceedings of the 34th IEEE Conference on Decision and Control*, v1066-1071, IEEE (1995) (with P. Crouch).

Tracking in nonholonomic dynamic systems via sliding modes, in *The Proceedings of the 34th IEEE Conference on Decision and Control*, 2103-2106, IEEE (1995) (with S. Drakunov).

Optimal control on adjoint orbits and symmetric spaces, in *The Proceedings of the 34th IEEE Conference on Decision and Control*, 3283-3288, IEEE (1995) (with P. Crouch).

Use of linear feedback for the supression of chaos in a metal-passivation model, *The Proceedings of the 1996 IEEE International Conference on Control Applications*, 852-858 (with A. Markworth).

On the equivalence of higher order variational problems and optimal control, *The Proceedings of the 35th IEEE Conference on Decision and Control*, IEEE (1996) (with P. Crouch).

Maximal tori of some symplectomorphism groups and applications to convexity, in *Deformation Theory and Symplectic Geometry. Proceedings of the Ascona Meeting, June, 1996* (D. Sternheimer, J. Rawnsley and S. Gutt eds.), Kluwer Academic Publishers (1997), 210-222 (with H. Flaschka, M. El Hadrami and T. Ratiu).

Stabilization of relative equilibria of mechanical systems with symmetry, in *Current and Future Directions in Applied Mathematics* (M. Alber, B. Hu and J. Rosenthal eds.), Birkhauser, 1997, 43-64 (with J. Marsden and G. Sanchez de Alvarez).

Stabilization of mechanical systems using controlled Lagrangians, *Proceedings of the 36th CDC*, IEEE (1997), 2356-2361 (with J. Marsden and N. Leonard).

Optimal control and the full Toda flow, *Proceedings of the 36th CDC*, IEEE (1997), 1736-1740 (with P. Crouch).

Stabilization of Brockett's canonical driftless system, *Proceedings of the 36th CDC*, IEEE (1997), 4260-4265 (with S. Drakunov and M. Kinyon).

A Serret-Andoyer transformation analysis for the controlled rigid body, *Proceedings of the 36th CDC*, IEEE (1997), 3497-3502 (with K. Lum).

Three dimensional reorientation of a spacecraft containing a single reaction wheel and a single movable appendage, *Proceedings of the 36th CDC*, IEEE (1997), 4844-4849 (with C. Rui and N. H. McClamroch).

Discontinuous stabilization of Brockett's canonical driftless system, in *Essays on Mathematical Robotics* (J. Baillieul, S. S. Sastry and H. J. Sussmann eds.), 169-184, IMA, Springer, 1998 (with S. Drakunov).

Optimal control, optimization and analytical mechanics, in *Mathematical Control Theory* (J. Baillieul and J. Willems eds.), 268-321, Springer, 1998 (with P. Crouch).

Nonholonomic stabilization and isospectral flows, *Proceedings of the 37th CDC*, IEEE (1998), 3581-3586 (with S. Drakunov and M. Kinyon).

Matching, stabilizability and stabilization by the method of controlled Lagrangians, *Proceedings of the 37th CDC*, IEEE (1998), 1446-1451 (with J. Marsden and N. Leonard).

Discrete rigid body dynamics and optimal control, *Proceedings of the 37th CDC*, IEEE (1998), 2249-2254 (with P. Crouch, J. Marsden and T. Ratiu).

Newton's law and nonholonomic systems, *Proceedings of the 37th CDC*, IEEE (1998), 3569-3574 (with P. Crouch).

Stabilization of the pendulum on a rotor arm *Proceedings of the 1999 International Conference on Robotics and Automation*, IEEE (1999), 500–505 (with N. Leonard and J. Marsden).

Asymptotic stability in energy-preserving systems, *Proceedings of the 38th CDC*, IEEE (1999), 2524–2526.

Potential shaping and the method of controlled Lagrangians *Proceedings of the 38th CDC*, IEEE (1999) 1652–1657, (with N. Leonard and J. Marsden).

Stabilization of the unicycle with rider, *Proceedings of the 38th CDC*, IEEE (1999), 3470–3471 (with J. Marsden and D. Zenkov).

Constrained variational principles on manifolds, *Proceedings of the 38th CDC*, IEEE (1999), 1–6 (with P. Crouch).

Radiation induced instability in interconnected systems, *Proceedings of the 38th CDC*, IEEE (1999), 651–656 (with P. Hagerty and M. Weinstein).

An almost Poisson structure for the generalized rigid body equations, *Lagrangian and Hamiltonian Methods for Nonlinear Control*, Proc. IFAC Workshop (2000), (N. Leonard and R. Ortega eds.) 87-92, Pergamon (with P. Crouch, J. Marsden and T. Ratiu).

Asymptotic stabilization for Euler-Poincaré mechanical systems, *Lagrangian and Hamiltonian Methods for Nonlinear Control*, Proc. IFAC Workshop (2000) 51-56 (with D.-E. Chang, N. Leonard, J. Marsden and C. Woolsey).

Matching and stabilization for the unicycle with rider, *Lagrangian and Hamiltonian Methods for Nonlinear Control*, Proc. IFAC Workshop (2000), 177-178 (with Z. Zenkov, N. Leonard and J. Marsden).

Control of squeezed states, *Proc. American Control Conference*, (2000) (with A. Rojo).

An optimal control formulation for inviscid, incompressible ideal fluid flow, *Proc. 39th CDC*, (2000), 1273-1278, IEEE (with P. Crouch, D. Holm and J. Marsden).

Matching and stabilization of low-dimensional nonholonomic systems, *Proc. 39th CDC*, (2000), 1289-1294, IEEE (with D. Zenkov, N. Leonard and J. Marsden).

Regulation problems with symmetry, *Proc. 19th Chinese Control Conference*, Hong Kong (2000), 97-101 (with K.-Y. Lum).

Physical dissipation and the method of controlled Lagrangians, *Proceedings of the European Control Conference*, (2001), 2570-2575 (with C.A. Woolsey, N.E. Leonard and J.E. Marsden).

Development of air spindle amd triaxial air bearing testbeds for spacecraft dynamics and control experiments, *Proceedings of the ACC* (2001) (with D. Bernstein and N. H. McClamroch).

Gyroscopically stabilized classical and quantum oscillators and heat baths, *Proceedings of the 40th CDC* (2001), (with P. Hagerty, A. Rojo and M. Weinstein).

Dissipation and controlled Euler-Poincaré systems, *Proceedings of the 40th CDC* (2001), (with C. Woolsey, N. Leonard and J. Marsden).

Symmetries, conservation laws and control, the Fields Institute Proceedings in honor of Jerry Marsden's 60th Birthday (with N. Leonard).

Flat nonholonomic matching, *Proc. ACC*, (2002), 2812-2817 (with D. Zenkov and J. Marsden).

Whitham equations Supplement III, *Encyclopaedia of Mathematics*, Managing Editor: M. Hazewinkel, Kluwer Academic Publishers, 434-439, 2002 (with R. Carroll).

Local controllability of the triaxial control test bed, *Proc. CDC* (2002) (with J. Shen and N. H. McClamroch).

Control of squeezed phonon and spin states, in *Proc. 2nd IFAC Workshop on Lagrangian and Hamiltonian Methods for Nonlinear Control, IFAC (2003), 37-44.* (with A. Rojo).

Dissipative dynamics in classical and quantum conservative systems, in *Mathematical Systems Theory in Biology, Communications, Computation and Finance* (J. Rosenthal and D. Gilliam eds.), (2003) 121-156, IMA,Springer Verlag.

Controllability and motion planning for multibody systems with nonholonomic constraints, in the *Proc 42nd CDC*, IEEE (2003), 4369-4375 (with J.-L Shen and D. Schneider).

Controlled Lagrangian methods and tracking of accelerated motions, in the *Proc 42nd CDC* IEEE (2003), 533-538 (with D. Zenkov and J.E. Marsden).

Optimality of double bracket and generalized double bracket flows, in the *Proc 42nd CDC* IEEE (2003), 528-532 (with A. Iserles).

The controllability of infinite quantum systems, in the *Proc 42nd CDC* IEEE (2003), 428-433 (with R. Brockett and C. Rangan).)

Dynamic interpolation on Riemannian manifolds: an application to interferometric imaging (with I. Hussein), *Proc. ACC* (2004).

A discrete maximum principle for solving optimal control problems, *Proc. 43rd CDC*, IEEE, 1806-1811 (2004) (with V. Guibout).

Two connected bodies in a central gravitational field, *Proc 43rd CDC*, IEEE, 3966-3973 (2004) (with A.Sanyal).

Dynamic coverage optimal control for interferometric imaging spacecraft formations, *Proc. 43rd CDC* IEEE, 1962-1967 (2004) (with I. Hussein).

Optimal control on Riemannian manifolds with potential fields, *Proc. 43rd CDC* IEEE, 1812-1817 (2004) (with I. Hussein).

Optimal control of under-actuated systems with applications to Lie groups, in *Proc. ACC, 2005* (with I. Hussein).

Dynamics coverage optimal control for interferometric imaging spacecraft formations (Part II): the nonlinear case, in *Proc. ACC, 2005* (with I. Hussein).

Optimal fuel-image motion planning for a class of dual spacecraft formations, in *Proc. ACC, 2005* (with I. Hussein, D.J. Scheeres and N.H. McClamroch).

Controlled Lagrangians and stabilization of discrete mechanical systems, in *Proc. 44th CDC-ECC* (2005) (with M. Leok, J.E. Marsden and D. Zenkov).

Constrained optimal trajectory tracking on the group of rigid body motions, in *Proc. 44th CDC-ECC* (2005) (with I. Hussein).

Control of mechanical systems with cyclic coordinates using higher order averaging,in *Proc. 44th CDC-ECC* (2005) (with A. Sanyal and N. H. McClamroch).

Quantum subRiemannian dynamics, in it New Directions and Applications in Control Theory, ed. W.P. Dayawansa, A. Lindquist and Y. Zhou, Springer Lecture Notes in Control and Information Sciences, 2005 (with R. Brockett and A. Rojo)

Optimal control of underactuated nonholonomic mechanical systems, in *Proc. ACC, 2006* (with I. Hussein)

Global stabilization of a fully actuated mechanical system on a Riemmnian manifold, in *Proc. ACC, 2006* (with N. Chaturvedi and N.H. McClamroch).

Global stabilization of a fully actuated mechanical system on a RiemmAnian manifold including saturation effects, in *Proc 45th CDC* (2006) (with N. Chaturvedi and N.H. McClamroch).

Controlled Lagrangians and potential shaping for stabilization of discrete mechanical systems, in *Proc 45th CDC* (2006) (with M. Leok, J.E. Marsden and D. Zenkov).

Global solution for the optimal feedback control of the underactuated Heisenberg system, in *Proc 45th CDC* (2006) (with C. Park, D.Scheeres and V. Guibout).

Identifying the force controlled by single human motor neurons, in *Proc 45th CDC* (2006) (with J. Kutch, N. Suresh, A. Kuo and W. Rymer).

A discrete variational integrator for optimal control problems in SO(3), in *Proc 45th CDC* (2006)(with I. Hussein, M. Leok and A. Sanyal).

Optimal control and the aircraft radar evasion problem, *Proc. ACC 2007* (with I. Hussein and F. Zeitz).

Dynamics of symplectic subvolumes, *Proc 46th CDC* (2007) (with J. Maruskin and D, Scheeres).

The Boltzman-Hamel equations for optimal control, *Proc 46th CDC* (2007) (with J. Maruskin).

The Pontryagin Maximum Principle applied to nonholonomic mechanics, *Proc. 47th CDC*, 4306-4311 (2008) (with O. Fernandez and T. Mestdag).

Nonholonomic mechanics, dissipation and quantization, in *Advances in the Theory of Control, Signals and Systems Modeling* (Jean Levine and Philippe Mulhaupt eds.) Lecture Notes in Control and Information Science, Springer Verlag, 141-152 (2011).

Discrete Hamilton-Jacobi theory and discrete optimal control, *Proc. 49th CDC*, 5438-5444 (2010) (with T. Ohsawa and M. Leok).

Embedded optimal control problems, in *The Proceedings of the 50th CDC* (with P. Crouch, N. Nordkvist and A. Sanyal), 2011.

Stability and control of a two craft magnetic constellation, *Proc. AAS meeting*, (with I. Hussein) to appear.

Control of noholonomic and underactuated systems, in *The Control Systems Handbook, Control System Advanced Methods, Second Edition.* Taylor and Francis. 2011 (with K. Lynch, S. Drakunov, M. Reyhanoglu and D. Zenkov)

Variational structures for Hamel's equations and stabilization, in the Proceedings of the IFAC workshop on Lagrangian and Hamiltonian Systems 2012, IFAC, 178-183 (with K. Ball and D. Zenkov).

Discrete embedded optimal control, in the *Proc. 51st CDC*, IEEE, 2012, 6424-6429 (with P. Crouch and N. Nordkvist).

Controlled Lagrangians and stabilization of the discrete spacecraft with rotor, in the *Proc. 51st CDC*, IEEE, 2012, 1285-1289 (with Y. Peng, S. Huynh and D. Zenkov).

Hamel's formalism and variational integrators on a sphere, in the *Proc. 51st CDC*, IEEE, 2012, 7504-7510 (with D. Zenkov and M. Leok).

Double bracket flows, Toda flows and Rigid Body Toda, in *Proc. Allerton Conference, 2013* with F. Gay-Balmaz and T. Ratiu.

Optimal control of manifold filling during VDE Mode Transitions, *Proc. 51st CDC*, IEEE, 2013. with R. Gupta, J. Hudson and I. Kolmonovsky

Purification of low-dimensional quantum systems subject to Lindblad dissipation, in *Mathematical System Theory; Festschrift in Honor of Uwe Helmke*, K. Huper and J. Trumpf eds., 345-352, 2013, Createspace publishing. (with P. Rooney)

Dynamics and geometry and discrete and smooth optimal control problems, extended abstract D-08-541,2014 *Proc. 17th U.S. National Congress on Theoretical and Applied Mechanics*, 2014 (with P. Crouch and N. Nordkvist).

Methods of Model Predictive Control on SO(3), *Proc. of the ACC, 2014*, (with U. Kalabic, R. Gupta, S. Di Cairano and I Kolmanovsky).

Optimal control and mechanics, in *Encylopaedia of Systems and Control*(eds. J. Baillieul and T. Samad), Springer, 747-950, 2015

Geometric Optimal Control, Section Editor, *Encylopaedia of Systems and Control*(eds. J. Baillieul and T. Samad), Springer. 2015

Constrained spacecraft attitude control on SO(3) using fast nonlinear Model Predictive Control,in the *Proc. of the ACC, 2015*, (with U. Kalabic, R. Gupta, S. Di Cairano and I Kolmanovsky).

Restricted discrete invariance and self-synchronization for stable walking of bipedal robots, in the *Proc. of the ACC, 2015*, (with H. Razavi, C. Chevallereau and J. W. Grizzle).

Higher-order constrained variational problems on principal bundles with applications to optimal control of underactuated systems, *Proceedings of the 5th IFAC Workshop on Lagrangian and Hamiltonian Methods for Non Linear Control*, 87-92, 2015 (with L. Colombo and R. Gupta).

Variational discretization for optimal control problems of nonholonomic mechanical systems, *Proc. CDC*, 2015 (with L. Colombo, R. Gupta and D. Martin de Diego).

Coupled Hill's equations and the Lorentz oscillator model. to appear in *Oberwolfach Reports* (with F. Adams, R. Gupta and H. Razavi).

Constrained attitude manouvering of a spacecraft with reaction wheel assembly by nonlinear model predictive control, *Proc. ACC 2016*, (with D. Young Lee, R. Gupta, U Kalabic, J. Cutler and I. Kolmonovksky).

MPC on manifolds with an application to SE(3), *Proc. ACC 2016* (with U. Kalabic, R. Gupta and I Kolmonovsky).

Symmetric Virtual Constraints for Periodic Walking of Legged Robots, *Proc CDC*, 2016 (with Hamed Razavi, Xingye Da and A. Ijspeert).

The Clebsch representation in optimal control and low rank integrable systems, in the *Computation and Combinatorics in Dynamics, Stochastics and Control, Proceedings of the Abel Symposium, 2016* E.Celedoni, G. Di Nunno, G. Ebrahimi-Fard and K. Munthe-Kaas eds., Springer 2018 (with Francois Gay-Balmaz and Tudor Ratiu).

Quasivelocities and Symmetries in Simple Hybrid Systems, *Proc. CDC*, 2017 (with L. Colombo and W. Clark).

Variational Obstacle Avoidance Problem on Riemannian Manifolds, *Proc. CDC*, 2017 (with L. Colombo and M. Camarinha).

Optimal Control of Quantum Purity for N=2 Systems, *Proc. CDC*, 2017 (with W. Clark, L. Colombo and P. Rooney).

Optimal Time reversal symmetries and zero dynamics for simple hybird Hamiltonian control systems, *Proc. ACC*, 2018 (with L. Colombo and W. Clark).

Variational collision avoidance problems on Riemannian manifolds, *Proc. CDC 2018* (with Mishal Assif, Ravi Banavar, Margarida Camarinha and Leonardo Colombo).

Stable orbits for a simple passive walker experiencing foot slip, *Proc. CDC 2018* (with William Clark).

Multilinear time invariant systems theory, *Proc. 2019 SIAM Conference on Control and its Applications* (with Chen, C., Surana, A. and Rajapakse, I.)

Continuous Direct Sparse Visual Odometry from RGB-D Images *Proceedings 2019 Robotics, Science and Systems* (with M. Ghaffari Jadidi, W. Clark, R. Eustice and J.W. Grizzle (2019)

The bouncing penny and nonholonomic impacts, in *Proc. CDC 2019* (with William Clark).

Reduction of symmetries of simple hybrid mechanical systems, to appear in *Proc. 7th IFAC workshop on Lagrangian and Hamiltonian methods for Nonlinear Control* (with L. Colombo and M. Eyrea)

Input influence matrix design for MIMO discrete-time ultra-local model, in Proc. ACC 2022, 2730-2735 (with Sangli Teng, Amit Sanyal, Ram Vasudevan and Maani Ghaffari)

Lie algebraic cost function design for control on Lie groups, in *Proc. CDC 2022*, 1867-1874 (with Sangli Teng, William Clark, Ram Vasudevan and Maani Ghaffari)

Discrete mechanics and optimal control for passive walking with foot slippage, to appear (with Alexander Simoes, Asier Lopez-Gordon and Leo Colombo)

Toda Flows, gradient flows and total positivity, in *Proc. NOLTA 2022* (2022) (with S. Karp)

Books

Hamiltonian and gradient flows, algorithms and control, Fields Institute Communications, AMS, 1994 (editor of book).

Nonholonomic Mechanics and Control, Springer Graduate Text, 2003 (with the colloboration of J.Baillieul, P.E. Crouch and J.E. Marsden and D. Zenkov), 2nd Edition 2015

The Principle of Least Action, History and Physics, Cambridge University Press, 2018 (with A. Rojo)