

# Curriculum Vitae

**Name:** Vakhtang Putkaradze

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## Education

- 1997 PhD, Physics University of Copenhagen (Denmark)  
Scientific Advisor: Prof. T. Bohr.
- 1993 M.Sc., Applied Mathematics Moscow Physico-Technical Institute (Russia)

## Postdoctoral positions

- Aug. 1998–Aug. 1999 L. E. Dickson instructor, Mathematics, University of Chicago  
Advisors: Profs. P. Constantin and L. Kadanoff
- Aug. 1997– Aug.1998 Postdoctoral Research Associate, University of Chicago  
Advisors: Profs. P. Constantin and L. Kadanoff

## Academic/industry positions

- Dec 2020 – current Member, Board of Directors,  
Pacific Institute for Mathematical Sciences (PIMS)
- Sept 2020 – June 2022 Vice President, Transformation, Science & Technology  
ATCO/Canadian Utilities
- July 2019 – August 2020 Senior Director, Science & Technology  
ATCO/Canadian Utilities
- July 2012 – current Professor (tenured), Mathematics,  
University of Alberta (on leave to ATCO July 2019-2022 )
- Aug 2010–June 2012 Professor of Biomedical Engineering,  
Colorado State University
- Aug 2010–June 2012 Full Professor (tenured), Mathematics,  
Colorado State University
- Aug. 2005–Aug 2010 Associate Professor (tenured), Mathematics,  
Colorado State University
- July 2004–Aug. 2005 Associate Professor (tenured), Mathematics,  
University of New Mexico
- Aug. 1999–Aug.2004 Assistant Professor, Mathematics,  
University of New Mexico

## Other positions

- 2012-2019 Adjunct faculty, Chemical Engineering, University of Alberta
- 2007-2012 Adjunct faculty, Mechanical engineering, University of New Mexico
- 2002 Visiting Professor, University of Aix-Marseille

## Honors and Awards

|      |                                    |                                      |         |
|------|------------------------------------|--------------------------------------|---------|
| 2020 | CAIMS-Fields Industrial Math Prize | CAIMS/Fields                         | Canada  |
| 2018 | Innovation award                   | University of Alberta                | Canada  |
| 2018 | Flaherty Visiting Professorship    | Ireland-Canada University Foundation | Ireland |
| 2018 | Instructor of the month            | University of Alberta                | Canada  |
| 2018 | Great Supervisor Award             | University of Alberta                | Canada  |
| 2018 | Senior JSPS award                  | Japan Soc. for Promotion of Sciences | Japan   |
| 2012 | Centennial Professor               | University of Alberta                | Canada  |
| 2006 | Humboldt Fellowship                | Humboldt Foundation                  | Germany |
| 2003 | NSF/JSPS                           | Japan Soc. for Promotion of Sciences | Japan   |

## Executive positions in industry

Vice President, Transformation, Science and Technology, *ATCO*

ATCO is a \$22 Billion multi-national corporation with 6,500 employees, having headquarters in Calgary and a global footprint. ATCO's interests are diverse, spanning utilities (electric and gas transmission and distribution), construction, shipping, logistics, renewable energy and many others. I oversaw the scientific and technical part of ATCO's transformation team, with special focus on AI, Machine Learning, Data Analytics, Modeling and Analysis, and other fields relevant for ATCO's business. I also organize *ATCO Speaker Series* and am building an internship talent pipeline to ATCO after my return to academia.

**Board membership** *Pacific Institute for Mathematical Sciences* (PIMS), 2020-current.

## Administrative positions in academia

1. (2015-2019) Site director for the Pacific Institute for Mathematical Sciences (PIMS)
2. (2017-2019) Science Internship program committee
3. (2015-2019) Member of Executive Committee for the Department of Mathematics and Statistics, University of Alberta,
4. (2016-2019) Student Internship Program Committee, Faculty of Sciences
5. (2017-2019) Faculty of Graduate Studies and Research (FGSR): Graduate Scholarship Committee (All-University, by nomination)
6. (2014-2019) Department colloquium committee
7. (2015, 2016) Faculty of Sciences: Graduate Supervisor award committee
8. (2013, 2015, 2016) Hiring Committee, Department of Mathematical and Statistical Sciences

## Recent research interests

- Geometric and variational methods in continuous media: fluid, elastica and fluid-structure interactions

- Sensor applications based on mechanical resonators with application to environmental monitoring and law enforcement
- Renewable energy: energy harvesting and solar

## Research Support

1. PI, Microcredential Program in PINNs (Physics Inspired Neural Networks), in Alberta 2030: Building skills for jobs, \$100,000 (2023-2024).
2. PI, Natural Sciences and Engineering Research Council (NSERC) Discovery grant, PI, 2018-2023 \$100,000 (on hold from 2020 due to move to industry).
3. PI, PIMS Conference grant \$15,000, PI, 2017-2018, Mathematics in renewable energy
4. PI, PIMS Conference grant \$15,000, PI, 2017-2018, Geometric approach to computer graphics.
5. PI, University of Alberta Centennial Fund, \$140,000, PI, 2012-2019
6. PI, Natural Sciences and Engineering Research Council (NSERC) Discovery grant, PI, 2013-2018 \$115,000
7. NSERC Engage, PI, \$25,000 (2016)
8. Defense Threat Reduction Agency (DTRA), US DoD: Single molecule detectors based on extreme ultra-violet holography of Intrinsic Localized Modes in nanopillar arrays \$1,500,000, 2010-2013; co-PI (with M. Marconi, ECE, CSU and G. Balakrishnan, CHTM, UNM) 2009-2013
9. NSF Applied Mathematics, Geometric Dynamics of Charged Ribbons, \$240,000, PI, 2009-2013
10. NSF GK-12: A Multi-Disciplinary Research and Teaching Program in Biomedical Engineering for Discovery and Understanding of Cell Communications, co-Investigator (PI: T. Chen, ECE CSU; coPIs: Michael DeMiranda; Stuart Tobet, Biomedical Engineering), total funding: \$2,665,273.
11. PI, Geometric Dynamics of Charged Ribbons, NSF DMS, \$ 244,100, Sept 1 2009 - Aug.31 2012.
12. PI, (co-PI: D. D. Holm, Imperial College), Mathematical models of particle self-assembly at the nano-scales, NSF DMS, \$ 220,000 , September 2005-August 2009.
13. PI (co-PI: P. Vorobieff, UNM engineering), Experimental and numerical investigations in Jeffery-Hamel flows, DOE, 2003-2007, \$ 495,000.
14. PI (co-PI: P. Vorobieff, UNM Engineering), Flows in expanding channels, Petroleum Research Foundation, \$ 80,000 , 2003-2006.
15. PI, Analytical investigation of Jeffery-Hamel flows and their stability, Sandia National Laboratory, \$ 70,000, 2000-2002.

## Supervision and training of Highly Qualified Personnel

### Graduate students supervised

1. (**current**) Maryna Svytko, started Sept 2022

2. (**current**) Sophia Huraka, started Sept 2022
3. Meghan Rhodes, PhD, 2022 (co-supervised with Prof. T. Hillen), currently at the University of Montana
4. Tagir Farkhutdinov, PhD, 2021, Private Employment.
5. Stuart Rogers, PhD August 2017; Awards: SIAM travel fellowship; IGR prize; The Cseuz Gold Medal and 10,000 Prize, now Radar Algorithms Development Engineer at Aptiv.
6. Mitchell Canham, MSc 2017 Awards: NSERC Fellowship; Mitacs Fellowship, private employment
7. Michael Chi, MSc Summer 2014 (completed), now at Red Deer College
8. Danielle A. Brake, MSc 2008, PhD Fall 2012, now Assistant Prof. at the University of Wisconsin Eau-Claire
9. Melody Dodd (Alsaker), MSc Spring 2012. Now Assistant Prof at Gonzaga University.
10. Steve Benoit, PhD Spring 2011 (Sponsored 100 % of the time by ECE GK-12 project, collaboration with S. Tobet), now special research professor/teaching coordinator at CSU.
11. Keith Mertens, PhD Spring 2008, now entrepreneur at Silicon Valley developing geometric algorithms for augmented reality: CEO of Reification, Inc.
12. Byongsoo Kim, M.Sc. 2008, PhD Fall 2010, now private employment
13. John Trujillo, MSc 2005, now private employment

#### **Postdocs supervised/sponsored at UofA**

1. Sergio M. Valdovinos (2018), now faculty at the Autonomous University of Zacatecas, Mexico.
2. Jordan Roszmann (2016), currently at Mechanical Engineering, University of Victoria.

#### **Undergraduate students supervised, last 7 years only**

1. Adam Smith, University of Alberta, Private employment
2. Noel Murasko, University of Alberta, Now MSc Student at UofA
3. Vaughn Gzenda, University of Alberta, Now MSc Student at Carleton University, Awards: USRA
4. Seth Taylor, University of Alberta, Now MSc Student at McGill University, Awards: USRA
5. Mykhailo Flax, University of Alberta, Now PhD Student.
6. Yanran Wang, University of Alberta; Students awards: USRA, MEXT scholarship for graduate studies in the Kyoto University

7. Houssam Yassin, University of Alberta, now graduate student, Princeton University
8. Rochelle Nieuwenhuis, University of Alberta, Students awards: USRA. Private employment
9. Isaacs Ogrins, University of Alberta, private employment
10. Mitchell Canham, University of Alberta, now private employment after completing MSc with me (see above)

### PhD/MSc Committees, last 3 years of my academic employment

1. Victor Olobatuyi, Math, PhD
2. Nitin Chidambaram, Math, PhD
3. Curtis Wendlandt, Math, PhD
4. Anna Glayzina, Math, PhD
5. Jinkun Cheng, Physics, PhD (completed 2017)
6. Amirresa Sohrabi, Chemical Engineering, PhD (completed 2017)
7. Andrew Bishop, Math, MSc (completed 2017)
8. Xue Li, Chemistry, PhD (completed 2016)
9. Mohamed Abdelghani, Math, PhD (completed 2016)

### List of Refereed Publications

1. V. Putkaradze, *The Dictator Equation: The Distortion of Information Flow in Autocratic Regimes and Its Consequences*, Humanities and Social Sciences Communications, under consideration (2022).
2. D. Georgievskii and V. Putkaradze, *Energy-Based Stability Estimates for Incompressible Media with Tensor-Nonlinear Constitutive Relations*, Continuous Mechanics and Thermodynamics (CMAT), in press (2022).
3. M. Rhodes and V. Putkaradze, *Trajectory tracing in figure skating*, Nonlinear Dynamics, in press, (2022)
4. M. Rhodes, T. Hillen, V. Putkaradze, *Comparing the effects of linear and one-term Ogden elasticity in a model of glioblastoma invasion*, Brain Multiphysics, in press, (2022)
5. F. Gay-Balmaz and V. Putkaradze, *Variational geometric approach to the thermodynamics of porous media*, ZAMM, in press (2022).
6. T. Farkhutdinov, F. Gay-Balmaz and V. Putkaradze, *Actively deforming porous media in an incompressible fluid: a variational approach*, Physica D, **426**, 132984 (2021), 42 pages.
7. T. Farkhutdinov, F. Gay-Balmaz and V. Putkaradze, *Geometric variational approach to the dynamics of porous media filled with incompressible fluid*, Acta Mechanica, **231**, pp. 3897-3924 (2020).

8. V. Putkaradze and S. Rogers, *Numerical Simulations of a Rolling Ball Robot Actuated by Internal Point Masses*, Numerical Algebra, Control and Optimization (NACO) 10.3934/naco.2020021 ; arXiv:1904.13027 (2020).
9. V. Putkaradze and S. Rogers, *On the Optimal Control of a Rolling Ball Robot Actuated by Internal Point Masses*, Journal of Dynamical Systems, Measurement and Control, **142** (5): 051002 (22 pages) (2020); arXiv:1708.03829
10. R. Ivanov and V. Putkaradze, *Swirling fluid flow in flexible, expandable elastic tubes: variational approach, reductions and integrability*, Physica D, **401**, 132172 (2020); arXiv:1905.04600
11. V. Gzenda and V. Putkaradze, *Integrability and Chaos in Figure Skating*, J. of Nonlinear Sciences, **30**, pages 831–850 (2020), <https://doi.org/10.1007/s00332-019-09593-w>.
12. V. Putkaradze and S. M. Rogers, *On the Normal Force and Static Friction Acting on a Rolling Ball Actuated by Internal Point Masses*, Regular and Chaotic Dynamics, Vol. 24, No. 2, pp. 145-170 (2019).
13. V. Putkaradze and S. M. Rogers, *On the Dynamics of a Rolling Ball Actuated by Internal Point Masses*, Meccanica **53**, pp. 3839-3868 (2018).
14. F. Gay-Balmaz and V. Putkaradze, *Geometric theory of flexible and expandable tubes conveying fluid: equations, solutions and shock waves*, Journal of Nonlinear Sciences, **29**, pp. 377–414 (2019).
15. R. Nieuwenhuis, M. Kubota, M.R. Flynn, M. Kimura, T. Hikiyara, V. Putkaradze, *Dynamics regularization with tree-like structures*, Applied Math Modeling, **55**, pp. 205-223 (2018).
16. F. Gay-Balmaz, D. Georgievskii and V. Putkaradze, *Stability of helical tubes conveying fluid*, J. Fluids and Structures, **78**, pp 146-174, (2018).
17. D. D. Holm and V. Putkaradze, *Dynamics of non-holonomic systems with stochastic transport*, Proc. R. Soc. A **474** 20170479; DOI: 10.1098/rspa.2017.0479 (2018).
18. V. Putkaradze and S. Rogers, *Constraint Control of Nonholonomic Mechanical Systems*, J. Nonlinear Science, DOI 10.1007/s00332-017-9406-1, 42 pages, (2017).
19. D. V. Georgievskii, V. Putkaradze and G. S. Tluystangelov, *Three-dimensional perturbations of radially spinning source of viscous cylindrical layer*, Doklady Russian Acad. Sciences, Vol. 473 (6) pp 655-658 (2017).
20. A. Phani, V. Putkaradze, J. E. Hawk, K. Prashanthi and T. Thundat, *A nanostructured surface increases friction exponentially at the solid-gas interface*, Nature Scientific Reports, 6:32996, DOI: 10.1038/srep32996 (2016).
21. F. Gay-Balmaz and V. Putkaradze. *Variational discretizations for the dynamics of flexible tubes conveying fluid* Comptes Rendus Mecanique, **344**, pp 769-775, (2016)  
On the list of Most Downloaded Articles for *CR Mecanique*, Nov-Dec 2016.
22. F. Gay-Balmaz, V. Putkaradze, *On Noisy Extensions of Nonholonomic Constraints*, J. Nonlinear Science, **26**, pp. 1571-1613, doi:10.1007/s00332-016-9313-x (2016).
23. P. Kevrikidis, V. Putkaradze and Z. Rapti, *Non-holonomic constraints and their impact on discretizations of Klein-Gordon lattice dynamical models*, Proceedings of AIMS, (2015).

24. F. Gay-Balmaz, V. Putkaradze, *On flexible tubes conveying fluid: geometric non-linear theory, stability and dynamics*, J. Nonlinear Science, **25**, Issue 4 , pp 889-936 (2015).
25. F. Gay-Balmaz, V. Putkaradze, *Dynamics of elastic strands with rolling contact*, Physica D, **294**, 6-23 (2015).
26. M. Chi, F. Gay-Balmaz, V. Putkaradze and P. Vorobieff, *Dynamics and control of flexible solar updraft towers*, Proc. Roy. Soc A, **471**, 20140539 (2014).
27. M. Kubota, V. Putkaradze and T. Hikihara, *Energy absorption at synchronization in phase between coupled Duffing systems*, Intl. J. Dynamics and Control, **3**, 2 , 189-194 (2014).
28. N.C. Monserud, E.B. Malm, P. W. Wachulak, V. Putkaradze, G. Balakrishnan, W. Chao, E. Anderson, D. Carlton, and M. C. Marconi, *Recording oscillations of sub-micron size cantilevers by extreme ultraviolet Fourier transform holography*, Optics Express, **22**, pp. 4161-4167 (2014).  
Reprinted in *Virtual Journal for Biomedical Optics (VJBO)*.
29. F. Gay-Balmaz and V. Putkaradze, *Exact geometric theory for flexible, fluid-conducting tubes*, Comptes Rendus Mécanique, **342**, pp. 79-84 (2014).
30. V. Putkaradze, P. Vorobieff, A. Mammoli and N. Fahti, *Inflatable Free-Standing Solar Towers*, Solar Energy **98**, pp. 85-98 (2013).
31. D. D. Holm, V. Putkaradze and C. Tronci, *Collisionless kinetic theory of rolling molecules*, Kinetic and related models, **6**, pp. 429-458 (2013).
32. F. Gay-Balmaz and V. Putkaradze, *Dynamics of Elastic Rods in Perfect Friction Contact*, Phys. Rev. Lett. **109**, 244303 (2012).
33. D. Brake, H. Xu, A. Hollowell, G. Balakrishnan, C. Hains, E. Malm, M. Marconi and V. Putkaradze, *Intrinsic localized modes in two-dimensional vibrations of crystalline pillars and their application for sensing*, J. Appl. Physics, **112** 104326 (2012).
34. D. D. Holm, F. Gay-Balmaz, V. Putkaradze and T. S. Ratiu (2012), *Exact geometric theory of dendronized polymer dynamics*, *Advances in Applied Math.*, **48**, pp. 535-574. ArXiv: 1005.2701. Selected as *Top 25 hottest articles, Jan-March 2012*.
35. S. Benoit, D. D. Holm and V. Putkaradze (2011), *Helical states of nonlocally interacting molecules and their linear stability: geometric approach*, J. Phys. A: Math Theor. **44**, 055201 (IOP select article).
36. B. Kim and V. Putkaradze (2010), *Ordered and disordered dynamics in monolayers of rolling particles*, Phys. Rev. Lett. **105**, 244302.
37. D.C.P.Ellis, F. Gay-Balmaz, D. D. Holm, V. Putkaradze and T. S. Ratiu (2010) *Symmetry reduced dynamics of charged molecular strands*, Arch. Ratl. Mech. Anal, **197** pp. 811-902.
38. D. D. Holm, V. Putkaradze and C. Tronci (2010), *Double-bracket dissipation in kinetic theory for particles with anisotropic interactions*, Proc. Roy. Soc. A, online DOI: 10.1098/rspa.2010.0043.
39. S. Ponomarev, V. Putkaradze and T. Bishop (2009), *Relaxation Dynamics of Nucleosomal DNA*, Physical Chemistry Chemical Physics, **11**, pp. 10633-10643.

40. B. Kim, V. Putkaradze and T. Hikihara, (2009) *Manipulation of single atoms by atomic force microscopy as a resonance effect*, Phys. Rev. Lett. **102**, 215502.
41. D. D. Holm and V. Putkaradze, (2009) *Nonlocal orientation-dependent dynamics of molecular strands*, C. R. Acad. Sci. Paris, **347**, pp. 1093-1098 ArXiv:0803.1702.
42. B. Birnir, K. Mertens, V. Putkaradze and P. Vorobieff, (2008) *Meandering of streams on hydrophobic surfaces as a noise-driven effect*, Phys. Rev. Lett, **101**, 114501.
43. D. D. Holm, V. Putkaradze and C. Tronci, (2008) *Geometric gradient-flow dynamics with singular solutions*, Physica D, **237** (22), pp. 2952-2965; arXiv:0704.2369.
44. B. Birnir, K. Mertens, V. Putkaradze and P. Vorobieff (2008), *Morphology of a stream on a hydrophobic surface. Part II: Meandering*, J. Fluid Mech, **607**, pp. 401-417.
45. D. D. Holm, V. Putkaradze and C. Tronci, (2008) *Kinetic models of heterogeneous dissipation*, J. Phys. A: Math. Theor. **41**, 344010; arXiv:0712.0397.
46. D. D. Holm, V. Putkaradze and C. Tronci,(2007) *Geometric dissipation in kinetic equations*, C. R. Acad. Sci. Paris , **345**, pp. 297-302; arXiv:0705.0765.
47. D. D. Holm, V. Putkaradze, (2007), *Formation and Evolution of Singularities in Anisotropic Geometric Continua* Physica D, **235**, pp.33-47, arXiv:nlin/0608054.
48. S. Watanabe and V. Putkaradze. *A simple model for description of flows in symmetric channel expansions*, Phys. Lett A, **370**, pp.58-63.
49. V. Putkaradze and P. Vorobieff (2006), *Bifurcation, hysteresis and multiple solutions in expanding channel flows*, Phys. Rev. Lett, **97**, 144502.
50. M. Nitsche, D. D. Holm and V. Putkaradze (2006), *Euler-alpha and vortex blob regularization of vortex filament and vortex sheet motion*, J. Fluid Mech., **555**, 149-176.
51. D. D. Holm and V. Putkaradze (2006), *Formation of clumps and patches in self-aggregation of finite size particles*, Physica D, **220** (2), 183-196. ArXiv: nlin.PS/050620.
52. K. Mertens, V. Putkaradze, D. Xia and S. Brueck (2005), *Theory and Experiment for Directed Self-Assembly of Nano-Particles*, J. Applied Physics, **98**, 094309.
53. D. D. Holm and V. Putkaradze (2005), *Aggregation of finite sized particles with variable mobility* , Physical Review Letters, **95**, 225105.  
Selected for the December 1, 2005 issue of Virtual Journal of Biological Physics Research at [www.vjbio.org](http://www.vjbio.org). Reprinted yet again in the December 5, 2005 issue of Virtual Journal of Nanoscale Science & Technology at [www.vjnano.org](http://www.vjnano.org).
54. K. Mertens, V. Putkaradze and P. Vorobieff (2005), *Morphology of a stream flowing down an inclined plane. Part 1: Braiding*, J. Fluid Mechanics, **531**, pp. 49-58.
55. K. Mertens, V. Putkaradze and P. Vorobieff (2004), *Braiding Patterns on an inclined plane*, Nature, **430**, 165.
56. D. D. Holm, V. Putkaradze and S. Stechmann (2004), *Rotating Cocentric Circular Peakons*, Nonlinearity, **17**, pp. 1-24.
57. D. D. Holm, V. Putkaradze, P. D. Weidman, B. Wingate (2003) *Boundary effects on exact solutions of the Lagrangian-averaged Navier-Stokes- $\alpha$  equations*, J. Stat. Phys., **113**, (5/6), pp.841-854.

58. S. Watanabe, V. Putkaradze, T. Bohr (2003), *Integral Methods for Shallow Free Surface Flows with Separation*, J. Fluid Mech, **480**, pp. 233-265.
59. P. Weidman, V. Putkaradze (2003), *Axisymmetric stagnation flow obliquely impinging on a circular cylinder*, Eur. J. of Mech B, **22**, pp. 123-131 (2003).
60. V. Putkaradze and P. Weidman (2003) *Turbulent wake solutions for the Prandtl- $\alpha$  equations*, Physical Review E, **67**, 036304.
61. V. Putkaradze (2003) *Radial Flow of Two Immiscible Fluids: Analytical Solutions and Bifurcations*, J. Fluid Mech, **477**, pp. 635-648.
62. H. Fogedby and V. Putkaradze (2002) *Power Laws and Stretched Exponentials in a Noisy Finite-time Singularity model*, Physical Review E, **66** 021103.
63. P. Constantin, C. Hallstrom, V. Putkaradze (2001) *Logarithmic Bounds for Infinite Prandtl Number Rotating Convection*, J. Math. Phys, **42**, pp. 773-790.
64. V. Putkaradze, P. Dimon (2000) *Non-uniform two-dimensional flow from a point source*, Phys. Fluids, **12**, pp. 66-70.
65. P. Constantin, C. Hallstrom, V. Putkaradze (1999) *Heat transport in rotating convection* Physica D **125** 3-4 pp. 275-284.
66. T. Bohr, C. Ellegaard, A. E. Hansen, K. Hansen, A. Haaning, V. Putkaradze, S. Watanabe (1998) *Separation and pattern formation in hydraulic jumps*, Physica A, **249**, 111-119.
67. F. Christiansen, P. Cvitanović and V. Putkaradze, (1997) *Spatiotemporal Chaos in terms of unstable recurrent patterns*, Nonlinearity **10**, pp.55-70.
68. V. Putkaradze, T. Bohr and J. Krug, (1997) *Global Estimates and Shocks for the Noiseless Conserved KPZ equation*, Nonlinearity **10**, pp. 823-847 (1997).
69. T. Bohr, V. Putkaradze, & S. Watanabe (1997) *Averaging theory for the structure of hydraulic jumps and separation in laminar free surface flows*, Phys. Rev. Lett. **79**, 6, R1038.
70. T. Bohr, P. Dimon, and V. Putkaradze (1993) *Shallow-water approach to the circular hydraulic jump*, J. Fluid Mech. **254**, pp. 635-648 (1993).

## Refereed conference proceedings

1. R. Niewenhius, M. R. Flynn, M. Kubota, T. Hikiyara, M. Kimura, V. Putkaradze, *Dynamics regularization with tree-like structures*, Proceedings of NOLTA 2017 conference, Cancun, Mexico (2017).
2. F. Gay-Balmaz and V. Putkaradze, *Geometric analysis of noisy perturbations to nonholonomic constraints*, Proceedings of Bernoulli Center, EPFL, (2016).
3. V. Putkaradze (2007) *Double bracket dissipation and its application to separation of particles using AFM tips*, Proceedings of NOLTA 2007 conference, September 2007.
4. B. Kim, T. Hikiyara and V. Putkaradze (2007) *Numerical Study of Atom Interchange on Material Surface under Periodic Force*, Proceedings of NOLTA 2007 conference, September 2007.

5. D. D. Holm, V. Putkaradze and C. Tronci, (2006) *Double bracket dissipation in kinetic theory for particles with anisotropic interactions*, Proceedings of the Summer School and Conference on Poisson Geometry (SMR1665, ICTP, Trieste, Italy, 04-22 July 2005), arXiv:0707.4204
6. V. Putkaradze (2006) *A fast method for computing forces between floating particles*, Proceedings of *NOLTA 2006* conference, September 2006.
7. V. Putkaradze (2005) *Forces between floating particles*, Proceedings of *NOLTA 2005* conference, October 2005.

### Conference organization (last 5 years)

1. Special Session Organizer (with D. Zenkov) at SIAM DS21 ('Virtual Snowbird'), 12 speakers, May 2021.
2. Scientific committee, Conference in Applied Mathematics, Modeling and Computational Science (AMMCS-2019), Waterloo, Canada
3. Organizer, Workshop, *Geometric numerical methods for computer graphics*, sponsored by PIMS, fall 2018.
4. Organizer, Workshop, *Mathematics for Alternative Energy*, co-sponsored by PIMS and NSERC, Summer 2018, Victoria, Canada.
5. Workshop organizer, *Recent Progress in Nonlinear Quantum Mechanics: Theory, Simulations and Experiment* (April 9 - 13, 2018), Fields Institute, Toronto (2018)
6. Special Session Organizer, NOLTA 2017 (Pacific Rim Mathematics Association)
7. Special Session Organizer, PRIMA (Pacific Rim Mathematics Association)
8. Special Session Organizer (with Manuele Santoprete) AMMCS-2017
9. Scientific committee, Conference in Applied Mathematics, Modeling and Computational Science (AMMCS-2017), Waterloo, Canada
10. CMS special session co-organizer (with D. Zenkov), Edmonton AB, Canada (2016)
11. Canadian Math Society main meeting co-organizer, Edmonton AB, Canada (2016)
12. AMS SouthEast Regional meeting special session organizer, Raleigh, NC (2016)
13. SIAM Snowbird special session organizer: 2015, 2017 (with D. Zenkov)
14. Main organizer (with T. Hikiyama, Kyoto) of the *NOLTA 2013* conference in Santa Fe, New Mexico (2013) (about 200 participants)

### Editorial activities

1. Associate Editor, Nonlinear theory and applications, Research Disciplines: Applied Mathematics, 2012-current
2. Associate Editor, Discontinuity, Nonlinearity and Complexity, 2018-current.
3. Chair, Marsden Memorial Lectures (MML) selection committee, 2017-current

### Reviewer, last 5 years:

**Funding agencies:** National Research, Science and Engineering Council of Canada (NSERC), Banff International Research Station (BIRS)

**Journals:** Physics Letters A, Journal of Nonlinear Science, NOLTA, Experiments in Fluids, Journal of Fluid Mechanics, Physics of Fluids, Nanotechnology, Nonlinear Dynamics, SIAM Control, Europhysics Letters, Journal of Fluid Engineering, Journal of Computational and Nonlinear Dynamics, and others.

### **International Collaborations, last 5 years**

1. Dr. F. Gay-Balmaz, CNRS/Ecole Normale Supérieure, Paris
2. Prof D. D. Holm, Imperial College, London
3. Prof. T. Hikiyama, Kyoto University, Japan
4. Prof. T. Ratiu, EPFL, Switzerland
5. Dr. M. Kimura, Kyoto University, Japan
6. Dr. C. Tronci, University of Surrey at Guildford, UK
7. Prof. P. Vorobieff, Mechanical Engineering, University of New Mexico

### **Other committee service, last 5 years**

1. Faculty of Graduate Science (FGSR) award committee, 2017 - 2019
2. Executive Committee, Department of Mathematical and Statistical Sciences, University of Alberta, 2016-2019
3. Hiring committee, Department of Mathematical and Statistical Sciences, University of Alberta, 2013 & 2016
4. Colloquium committee, Department of Mathematical and Statistical Sciences, University of Alberta, 2013 & 2016
5. Graduate supervision prize committee, Faculty of Science, 2014 & 2015

### **Intellectual property**

1. Inflatable, Free-Standing Solar Updraft Tower with Optimal Geometry and Active Control. US Patent 10,006,443, Issued June 26, 2018  
*Inventors:* Peter V. Vorobieff (UNM) Vakhtang Putkaradze (UofAB) Nima Fathi (UNM) Seyed Sobhan Aleyasin (Univ. of Manitoba) Andrea A. Mammoli (UNM) Michael Chi (University of Alberta) Francois Gay-Balmaz (CNRS) This patent describes the design and active optimal control of free-standing, inflatable solar tower
2. PCT: Sensor including mechanical resonator with nano-structured interface. Patent Status: US Utility application; Pending  
*Inventors:* A. Phani V. Putkaradze T. Thundat K. Prashanthi Developed purely mechanical sensor based on dissipation of a resonator with active nanostructures
3. Sensor including mechanical resonator with nano-structured interface. Canadian Patent. Patent Status: Pending
4. Enhancement of energy harvesting using tree-like structures. Japan. 2016/04/20. Patent Status: Granted/Issued  
*Inventors:* T. Hikiyama, M. Kimura, M. Kubota (Kyoto U) M. R. Flynn, R. Niewerhius, V. Putkaradze (U of AB) This technology shows a radical enhancement of energy harvesting from irregular (broadband) sources from tree-like structures as compared to regular resonators.

5. Method For Simplifying Autonomous Spacecraft Rendezvous With a Non-Functioning Satellite, US Provisional Patent Application Serial No. 62,686,808, Filed June 22, 2018.

Inventors: Vakhtang Putkaradze, Seth Taylor (UofA, Math). This technology shows a way to align satellites for docking and repair using dissipation and geometric mechanics, if one of the satellites is tumbling uncontrollably. The method simplifies the most difficult part of the docking, namely, the alignment of the angular velocities and axes of the mutual rotation.

## Other activities/Accomplishments – Outside recognition

1. M. Rhodes, V. Gzenda and V. Putkaradze, *Control and Integrability in Figure Skating*, SIAM News, April 2021, <https://sinews.siam.org/Details-Page/control-and-integrability-in-figure-skating>
2. University write-up on integrability of figure skating: *Mathematicians reveal the science behind figure skating*, reprinted in several news sites (2020).
3. Write-up on my "Instructor of the Month for April 2019" teaching award, <https://www.ualberta.ca/science/research-and-teaching/exceptional-instructors/2019/april/vakhtang-putkaradze.html>
4. ATCO write-up on my CAIMS-Fields industrial math award, <https://www.atco.com/en-ca/about-us/stories/atco-scientist-recognized-for-contribution-to-canadian-m.html>
5. University write-up on the sensor technology: *Making friction count* <https://www.ualberta.ca/science/news/2016/september/scientists-create-nanoscale-resonator-to-de.html> Reprinted by *Financial Express*, *Phys.org* and other international scientific news sites (2016).
6. Write-up on solar towers, University of Alberta, (2013).
7. Write-up on the award of Centennial Professorship, University of Alberta, (2012).
8. COSMOS (Australian science magazine) article about fractal structure formation in heated egg whites (2011).
9. CSU news write-up on my work with B. Kim and T. Hikihara on atom trapping by AFM tips (June 2009); that news release was reprinted in *Nanotechnology news archive* <http://www.azonano.com/news.asp?newsID=12021> and *NanoWerk* <http://www.nanowerk.com/news/newsid=11135.php> and *Nano-news* <http://www.nanost.net/?32556/mode-reply.html>
10. Write-up in *Albuquerque Journal* on stream meandering (October 2008).
11. CSU news write-up on my work on self-organization and nano-sensors (2007).
12. My work with D. D. Holm on self-organization has been reported on the DOE Discovery page July 2007, see <http://ascr-discovery.science.doe.gov/kernels/holm1.shtml>

13. CSU news write-up on the Humboldt award, February 2006.
14. My work on water braiding has been cited in *American Physical Society: Events for the year 2004*. Bulletin of APS, February 2005. See [www.aps.org/publications/apsnews/physicsnews/upload/physnews04.pdf](http://www.aps.org/publications/apsnews/physicsnews/upload/physnews04.pdf)
15. *Physics News Update* (American Institute of Physics Weekly News), 692, July 2004.
16. Albuquerque Journal: *Experiments Show Math Formulas Hold Water*, July 9 2004.
17. Santa Fe New Mexican: *Braiding Water Attracts UNM Professor*, July 11 2004.
18. Complexity Digest, Issue 2004.28.

## Student Awards

A lot of my graduate and undergraduate students have received awards for their research projects in my group. Here is a short list summarizing the last 5 years only.

1. Yanran Wang, BSc 2018: Yanran has won the MEXT award to do a PhD in Kyoto University. The competition is worldwide and is open to all disciplines.
2. Stuart Rogers, PhD August 2017: Several national and international awards, including Anton A. Cseuz Gold Medal in Mathematics, and an article '*Solution Seeker*' about his rolling robots research in Science Contours.
3. Mitchell Canham, MSc 2016: MITACS/JSPS award. Mitchell won this award in a worldwide competition among all disciplines, and used it to do research in Kyoto University.

## Outreach programs

I have always been interested in educational outreach initiatives. Examples of several recent programs that have been actively run are:

1. (2017-2018) I have co-designed and run (with G. Peschke, UA Math) an outreach program to local high schools, where students were working on real-life research topics, with math in its core. The projects included were: interpreting American Sign Language using the Leap Motion device, building a controlled multi-arm robots and others.
2. (2018-2019) The *CanCode* project (\$1,5 mill CAD, funded by the Federal Government) was focused on designing Jupyter notebooks to bring computational thinking in classrooms. We have designed notebooks for math, stats, natural and social sciences, for a variety of classes in K-12 program. I have participated in this project as PIMS Site Director at the University of Alberta.