

# Gwynn J. Elfring

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CONTACT INFORMATION	Department of Mechanical Engineering The University of British Columbia 2054-6250 Applied Science Ln, Vancouver, BC, V6T 1Z4	Phone: (604) 822-1287 E-mail: <a href="mailto:gelfring@mech.ubc.ca">gelfring@mech.ubc.ca</a> Webpage: <a href="http://mech.ubc.ca/gwynn-elfring/">mech.ubc.ca/gwynn-elfring/</a>
ACADEMIC POSITIONS	<b>University of British Columbia</b> , Vancouver, BC <i>Assistant Professor, Dept. of Mechanical Engineering</i>	<b>Sept 2013 - Present</b>
	<b>University of California, Santa Barbara</b> , Santa Barbara, CA <i>Postdoctoral Researcher, Dept. of Chemical Engineering</i>	<b>Sept 2012 - Sept 2013</b>
	<ul style="list-style-type: none"><li>Advisors: Todd M. Squires &amp; L. Gary Leal</li></ul>	
EDUCATION	<b>University of California, San Diego</b> , La Jolla, CA <i>Ph.D., Engineering Sciences</i>	<b>Sept 2008 - Sept 2012</b>
	<ul style="list-style-type: none"><li>Advisor: Eric Lauga (<i>now at DAMTP</i>)</li></ul>	
	<b>University of Victoria</b> , Victoria, BC <i>M.A.Sc., B.Eng, Mechanical Engineering / m. Mathematics, with distinction</i>	<b>October 2007</b>
AWARDS AND DISTINCTIONS	<ul style="list-style-type: none"><li>UBC Applied Science Dean's Award for Excellence in Service (2017)</li><li>Peking University Globex Faculty Fellow Award (2016)</li><li>University of California San Diego Graduate Summer Teaching Fellowship (2012)</li><li>University of California San Diego Dissertation Year Fellowship (2012)</li><li>NSERC Postgraduate Scholarship D-3 (2009)</li><li>Institute for Integrated Energy Systems Graduate Scholarship (2006)</li><li>Smith Graduate Scholarship (2006)</li><li>University of Victoria M.A.Sc. Fellowship (2005)</li></ul>	
INDUSTRIAL EMPLOYMENT	<b>Enbridge Pipelines Inc.</b> , Edmonton, AB <i>Project Engineer, Major Projects</i>	<b>Nov 2007 - Aug 2008</b>
	<ul style="list-style-type: none"><li>Project management and technical analysis of pipeline design for Southern Lights pipeline project.</li></ul>	
TEACHING	<b>University of British Columbia</b> , Vancouver, BC <i>Instructor, Dept. of Mechanical Engineering</i>	
	<ul style="list-style-type: none"><li>Mech 410/550 – Microfluidics (<i>enrollment ~ 10</i>)</li><li>Mech 380 – Fluid Dynamics (<i>enrollment ~ 100</i>)</li><li>Mech 358 – Engineering Analysis (<i>enrollment ~ 100</i>)</li></ul>	Fall 2014, 2016 Spring 2014, 2015, 2016, 2017 Spring 2016, 2017
	<b>Peking University</b> , Beijing, China <i>Instructor, Globex Julmester Summer School</i>	
	<ul style="list-style-type: none"><li>Microfluidics and Biological Fluid Dynamics (<i>enrollment ~ 30</i>)</li></ul>	Summer 2016
	<b>University of California, San Diego</b> , La Jolla, CA <i>Instructor, Dept. of Mechanical &amp; Aerospace Engineering</i>	
	<ul style="list-style-type: none"><li>MAE 107 – Computational Methods for Engineers (<i>enrollment ~ 100</i>)</li></ul>	Summer 2012

**Journal Publications**

20. Z. Peng, Y. Ding, K. Pietrzyk, **G.J. Elfring**, O.S. Pak\*, *Propulsion via flexible flapping in granular media*, Submitted (2017).
19. G. Goyal, **G.J. Elfring**, I.A. Frigaard\* *Rheology and flow studies of drag reducing gravel packing fluids*, Submitted (2016).

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18. C. Datt, G. Natale, S.G. Hatzikiriakos, **G.J. Elfring\***, *An active particle in a complex fluid*, Journal of Fluid Mechanics, 823 (2017) 675-688.
17. B. Nasouri, A. Khot, **G.J. Elfring\***, *An elastic two-sphere swimmer in Stokes flow*, Physical Review Fluids, 2 (2017) 043101.
16. Z. Peng, **G.J. Elfring\***, O.S. Pak\*, *Maximizing propulsive thrust of a driven filament at low Reynolds number via variable flexibility*, Soft Matter, 13 (2017) 2339-2347.
15. **G.J. Elfring\***, G. Goyal, *The effect of gait on swimming in viscoelastic fluids*, Journal of Non-Newtonian Fluid Mechanics, 234 (2016) 8-14.
14. B. Nasouri, **G.J. Elfring\***, *Hydrodynamic interactions of cilia attached to a spherical body*, Physical Review E, 93 (2016) 033111.
13. Z. Peng, O.S. Pak\*, **G.J. Elfring\***, *Characteristics of undulatory locomotion in granular media*, Physics of Fluids, 28 (2016) 031901.
12. **G.J. Elfring**, L.G. Leal, T.M. Squires\*, *Surface viscosity and Marangoni stresses at surfactant laden interfaces*, Journal of Fluid Mechanics, 792 (2016) 712-739.
11. C. Datt, L.L. Zhu, **G.J. Elfring\***, O.S. Pak\*, *Squirming through shear-thinning fluids*, Journal of Fluid Mechanics Rapids, 784 (2015) R1.
10. **G.J. Elfring\***, *A note on the reciprocal theorem for the swimming of simple bodies*, Physics of Fluids, 27 (2015) 023101.
9. **G.J. Elfring**, E. Lauga\*, *Buckling instability of squeezed droplets*, Physics of Fluids, 24 (2012) 072102.
8. M. Sauzade, **G.J. Elfring**, E. Lauga\*, *Taylor's swimming sheet: Analysis and improvement of the perturbation series*, Physica D, 240 (2011) 1567-1573.
7. **G.J. Elfring**, E. Lauga\*, *Synchronization of flexible sheets*, Journal of Fluid Mechanics, 674 (2011) 163-173.
6. **G.J. Elfring**, E. Lauga\*, *Passive hydrodynamic synchronization of two-dimensional swimming cells*, Physics of Fluids, 23 (2011) 011902
5. **G.J. Elfring**, O.S. Pak, E. Lauga\*, *Two-dimensional flagellar synchronization in viscoelastic fluids*, Journal of Fluid Mechanics, 646 (2010) 505-515.
4. **G.J. Elfring**, E. Lauga\*, *Hydrodynamic phase locking of swimming microorganisms*, Physical Review Letters, 103 (2009) 088101. (\*Editors' Suggestion)
3. **G.J. Elfring**, H. Struchtrup\*, *Thermodynamics of pore wetting and swelling in Nafion*, Journal of Membrane Science, 315 (2008) 125-132.
2. H. Struchtrup\*, **G.J. Elfring**, *External losses in high-bypass turbo fan air engines*, Int. Journal of Exergy, 5 (2008) 400-412.
1. **G.J. Elfring**, H. Struchtrup\*, *Thermodynamic considerations on the stability of water in Nafion*, Journal of Membrane Science, 297 (2007) 190-198.

**Book Chapters**

1. **G.J. Elfring\***, E. Lauga\*, *Theory of locomotion through complex fluids*, Complex Fluids in Biological Systems, (2014) Saverio E. Spagnolie (ed.) Springer, New York

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<sup>1</sup> \* denotes corresponding author(s), underline denotes member of Elfring group.

## Invited Talks &amp; Seminars

- **G.J. Elfring**, *Theory of locomotion through complex fluids*, Complex Fluids & Flows in Industry & Nature III, University of British Columbia, June 2017.
- **G.J. Elfring** *An active particle in a complex fluid*, Modeling Complex Fluids & Gels for Biological Applications, University of Utah, May 2017.
- **G.J. Elfring** *An active particle in a complex fluid*, MechSE Fluid Mechanics Seminar, University of Illinois, Urbana-Champaign, October 2016.
- **G.J. Elfring** *An active particle in a complex fluid*, Fluids Seminar, Purdue University, West Lafayette, IN, October 2016.
- **G.J. Elfring** *An active particle in a complex fluid*, Applied Math Seminar, University of Wisconsin, Madison, October 2016.
- **G.J. Elfring** *Modeling locomotion in complex fluids*, 10th Int. Conference on Scientific Computing and Applications, Toronto, ON, June 2016.
- **G.J. Elfring** *Bio-locomotion and fluid-body interactions at small scales*, Applied Math Seminar, Simon Fraser University, April 2016.
- **G.J. Elfring** *Bio-locomotion and fluid-body interactions at small scales*, Okinawa Institute of Science and Technology, Japan, Dec 2015.
- **G.J. Elfring** *Bio-locomotion and fluid-body interactions at small scales*, Dept. of Mechanical Engineering, University of Victoria, Nov 2013.
- **G.J. Elfring**, *Interfacial dilatational rheology*, Complex Fluids & Flows in Industry & Nature II, University of British Columbia, July 2013.
- **G.J. Elfring** *Bio-locomotion and hydrodynamic interactions at small scales*, Dept. of Chemical Engineering, University of California, Santa Barbara, Apr 2012.
- **G.J. Elfring** *Bio-locomotion and fluid structure interactions at small scales*, Dept. of Mechanical Engineering, University of British Columbia, Vancouver, Mar 2012.
- **G.J. Elfring** *Symmetry breaking and synchronization at small scales*, Dept. of Aerospace & Mechanical Engineering, University of Southern California, Dec 2011.

## Conference Proceedings &amp; Abstracts

- **B. Nasouri**, **G.J. Elfring**, *An elastic two-sphere swimmer in Stokes flow*, 67th Meeting of the APS-DFD, Portland, OR, November 2016.
- **Z. Peng**, **G.J. Elfring**, **O.S. Pak**, *Propulsive thrust of a driven filament at low Reynolds number with non-uniform flexibility*, 67th Meeting of the APS-DFD, Portland, OR, November 2016.
- **C. Datt**, **G. Natale**, **S.G. Hatzikiriakos**, **G.J. Elfring**, *An active particle in a complex fluid*, 67th Meeting of the APS-DFD, Portland, OR, November 2016.
- **G. Natale**, **C. Datt**, **G.J. Elfring**, **S.G. Hatzikiriakos**, *Self-propelling Janus Particles in Weakly Viscoelastic Fluids*, 66th Canadian Chemical Engineering Conference, Quebec, October 2016.
- **Z. Peng**, **G.J. Elfring**, **O.S. Pak**, *Propulsive thrust of a driven filament at low Reynolds number with non-uniform flexibility*, ICTAM 2016, Montreal, QC, August 2016.
- **B. Nasouri**, **G.J. Elfring**, *Hydrodynamic interactions of cilia attached to a spherical body*, 66th Meeting of the APS-DFD, Boston, MA, November 2015.
- **Z. Peng**, **O.S. Pak**, **G.J. Elfring**, *Characteristics of undulatory locomotion in granular media*, 66th Meeting of the APS-DFD, Boston, MA, November 2015.
- **C. Datt**, **L.L. Zhu**, **G.J. Elfring**, **O.S. Pak**, *Squirming through shear-thinning fluids*, 66th Meeting of the APS-DFD, Boston, MA, November 2015.
- **G.J. Elfring**, **E. Lauga**, *Theory of locomotion in complex fluids*, 65th Meeting of the APS-DFD, San Francisco, CA, November 2014.
- **G.J. Elfring**, **E. Lauga**, *Theory of locomotion in complex fluids*, 86th Annual Meeting of the Society of Rheology, Philadelphia, PA, October 2014.
- **G.J. Elfring**, **E. Lauga**, *Theory of locomotion in complex fluids*, Canadian Applied and Industrial Mathematics Society 2014 Annual Meeting, Saskatoon, SK, June 2014.

- **G.J. Elfring**, L.G. Leal, T.M. Squires, *Marangoni forces in interfacial dilatational rheology*, 64th Meeting of the APS-DFD, Pittsburgh, PA, November 2013.
- **G.J. Elfring**, L.G. Leal, T.M. Squires, *Interfacial dilatational rheology*, 85th Annual Meeting of the Society of Rheology, Montreal, QC, October 2013.
- **G.J. Elfring**, E. Lauga, *Elastic effects on the synchronization of swimming microorganisms*, Fluid and Elasticity 2012, La Jolla, CA, November 2012.
- **G.J. Elfring**, E. Lauga, *Symmetry breaking and synchronization at small scales*, Sixth Southern California Symposium on Flow Physics, University of California, Santa Barbara, CA, April 2012.
- **G.J. Elfring**, E. Lauga, *Synchronization of swimming microorganisms*, Annual Meeting of the Biophysical Society, San Diego, CA, February 2012.
- **G.J. Elfring**, E. Lauga, *Buckling instability of a pinned droplet*, 64th Meeting of the APS-DFD, Baltimore, MD, November 2011.
- **G.J. Elfring**, E. Lauga, *Synchronization of swimming microorganisms*, Boulder School for Condensed Matter Physics, University of Colorado, Boulder, CO, July 2011.
- **G.J. Elfring**, E. Lauga, *Buckling instability of a droplet*, Fifth Southern California Symposium on Flow Physics, University of Southern California, Los Angeles, CA, April 2011.
- **G.J. Elfring**, E. Lauga, *Elastic symmetry-breaking in synchronizing cells*, 63rd Meeting of the APS-DFD, Long Beach, CA, November 2010.
- **G.J. Elfring**, E. Lauga, *Flow due to the remodeling of tubule networks*, Fourth Southern California Symposium on Flow Physics, University of California Irvine, Irvine, CA, April 2010
- **G.J. Elfring**, E. Lauga *Synchronization of swimming microorganisms*, 62nd Meeting of the APS-DFD, Minneapolis, MN, November 2009.
- **G.J. Elfring**, E. Lauga, *On the phase locking of swimming microorganisms*, Softflow 2009: Complex and bio fluids, Institut d'Etudes Scientifique de Cargese, Cargese, France, June 2009.
- **G.J. Elfring**, E. Lauga, *Geometric conditions for the apparent phase locking of swimming microorganisms*, Third Southern California Symposium on Flow Physics, University of California San Diego, La Jolla, CA, April 2009.

PEER REVIEW

Acta Mechanica, Canadian Journal of Chemical Engineering, Computers and Fluids, IMA Journal of Applied Mathematics, International Journal of Heat and Mass Transfer, Journal of Fluid Mechanics, Journal of Fluids and Structures, Meccanica, Physical Review E, Physical Review Fluids, Physics of Fluids, Proceedings of the Royal Society, Soft Matter

MEMBERSHIP

American Physical Society, Association of Professional Engineers of British Columbia, Canadian Applied and Industrial Mathematics Society, Canadian Society of Mechanical Engineers, Mexican-American Society of Engineers and Scientists, Society of Industrial and Applied Mathematics, Society of Rheology.

LANGUAGES

English (native), Spanish (native)

CITIZENSHIP

Canadian

STUDENTS

**Graduate Students**

SUPERVISED

Babak Nasouri, Ph.D. Student (Sept. 2014 - Present)  
Charu Datt, Ph.D. Student (Jan. 2015 - Present)  
Gaurav Goyal, M.A.Sc. Student (Sept. 2014 - Dec. 2016)  
Zhiwei Peng, M.A.Sc. Student (Sept. 2014 - April 2016)

**Undergraduate Students**

Sophie Ramsden, Mech 493 student (Sept. 2016 - April 2017)  
Roxie Xueke Yu, Mech 493 student (Sept. 2016 - April 2017)  
Silvia Odaya, Mech 493 student (Sept. 2015 - April 2016)  
Aditi Khot, Mitacs summer student (Summer 2014)