

## Biographical Information for L. Mahadevan – Jan. 2012

### Principal Fields of Interest

Applied mathematics. Macroscopic physics. Biological dynamics.

We use a combination of observations, experiments, theory and computation to study physical and biological phenomena quantitatively on scales ranging from the molecular to the planetary. A particular theme is the world at the human scale, where phenomena are robust and easy to observe, yet not always easy to explain as they involve many different effects that need to be teased apart. A goal is to tease out general principles, if there be such, from specific instances: and to look for “the sublime in the mundane”, which remains ever elusive !

### Experience

Harvard University Cambridge, MA, USA	England de Valpine Prof. of Applied Mathematics, School of Engineering and Applied Sciences, Professor of Organismic and Evolutionary Biology	2003  2009  2010	-present  -present  -present
University of Oxford Oxford, UK	Schlumberger Visiting Professor in Applied Mathematics	2004	-present
University of Cambridge, Cambridge, UK	Schlumberger Professor of Complex Physical Systems, Dept of Applied Mathematics and Theoretical Physics	2001	-2003
Trinity College, Cambridge UK	Professorial Fellow in Natural Sciences	2001	-2003
Massachusetts Institute of Technology, Cambridge MA, USA	Assistant, then (tenured) Tassel Associate Professor Department of Mechanical Engineering	1996	-2000

### Visiting positions

Woods Hole Oceanographic Institution, Woods Hole, USA	Faculty	summer 2003,2004,2008,2009	
Marine Biological Laboratories Woods Hole, USA	Faculty	summer 2003, 2004	
École Supérieure de Physique et de Chimie Industrielles, Paris, France	Professeur Associé Lab. de Physique et Méc. de Milieux Hétérogènes	June 1998 May 2001	July 1998 June 2001
Université de Provence Marseille, France	Professeur Invité IUSTI	March 1998	March 1998
École Normale Supérieure Paris, France.	Professeur Invité Dept. de Physique	June, 1997 Feb 2001	July, 1997 April 2001
University of Chicago	Research Associate, Mathematics and Physics (mentor: L. Kadanoff, Physics)	Oct., 1995	Aug., 1996
Université de Nice, Nice, France	CNRS Poste Rose, Inst. Non-Linéaire de Nice	July, 1995	Aug., 1995
Univ. of Cambridge, U. K.	EPSRC Visiting Scientist	July, 1994	Aug., 1994

Appl. Math. & Theor. Phys. U. Illinois at Urbana-Champaign Theor. & Appl. Mech.	Visiting Asst. Prof.	Aug., 1993	May, 1995
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**Education**

Indian Inst. of Technology, Madras	B. Tech., Engineering	1986
University of Texas at Austin	M. S., Mechanics	1987
Stanford University	M.S., Mathematics	1992
Stanford University	Ph.D. (Advisor: J.B. Keller, Mathematics)	1995

**Awards and Honors**

Karl van Tassel Career Development Chair, M.I.T.	1998 --2001
Inaugural SIGEST award – Society for Industrial and Applied Mathematics (for the best paper in SIAM J. Applied Mathematics)	1999
Young Investigator medal, Society for Engineering Science (inaugural recipient)	1999-2000
ONR Young Investigator Award	2000-2003
Edgerton Award, MIT (highest award given to untenured faculty for achievement in teaching and research at MIT)	2000
Chaire Condorcet, Ecole Normale Superieure	Jan-April 2001
Chaire Paris Sciences, Ecole Superieure de Physique et de Chimie, Paris, France	May – Jun 2001
Inaugural holder of the (endowed) Schlumberger Chair in Complex Physical Systems, Cambridge University, UK	2001 - 2003
Schlumberger Visiting Professor in Mathematics, Oxford University, UK	2004-present
ASME Young Investigator Award in Applied Mechanics	2005
John Simon Guggenheim Memorial Fellowship	2006
Francois Frenkiel Prize, American Physical Society (for the best paper in Physics of Fluids)	2006
George Ledlie Prize, Harvard University (awarded biennially to someone “who has by research, discovery or otherwise made the most valuable contribution to science, or in any way for the benefit of mankind”)	2006
Visiting Miller Professor, Departments of Integrative Biology, Chemistry,	2007

and Mathematics, University of California, Berkeley, CA

Distinguished Visiting Professor,  
National Center for Biological Sciences – TIFR,  
Bangalore, India 2007-present

Distinguished Alumnus Award  
IIT-Madras, India 2009

MacArthur Fellow 2009-14

**Named /Plenary Lectures (selected list)**

G I Taylor Lecturer, Cambridge Philosophical Society  
Cambridge, UK 2001

Alan Tayler Lecturer, Smith Institute and Oxford University, UK 2003

SIAM Plenary Lecture, SIAM Annual Meeting 2005

Midwest Mechanics Lecturer 2006-07

Statphys Invited Lecturer, Genoa, Italy 2007

Penner Lecturer  
Engineering, University of California, San Diego 2008

Laufer Lecturer  
Engineering, University of Southern California 2010

Super-plenary Lecture  
British Mathematics Colloquium and British Applied  
Mathematics Colloquium 2010

Singleton Lectures  
Brain and Cognitive Science, M.I.T. 2010

Amick Lectures  
Mathematics, University of Chicago 2011

Boeing Lecturer  
Applied Mathematics, University of Washington 2011

Brown University Commencement Speaker 2011

**Professional Service**

Editorial boards:

*Proceedings of the Royal Society of London (A)*  
*Mathematical, Physical and Engineering Sciences* 2004 - 2009

<i>Chaos (published by the American Institute of Physics)</i>	2004 – 2009.
<i>Nonlinearity (published jointly by the London Mathematical Society and the Institute of Physics, UK)</i>	2008 - present
<i>American Journal of Physics</i>	2009 - 2011
Advisory boards:	
<i>Schlumberger Private Ltd. Technology Committee</i>	<i>January 2001 – present</i>
<i>OCCAM: Oxford Centre for Collaborative Applied Mathematics</i>	<i>July 2008 – present</i>
<i>Max Planck Institute for Complex Physical Systems Dresden, Germany;</i>	<i>June 2010 – present</i>
<i>NSF Mathematical Biosciences Institute, Columbus, OH</i>	<i>Jan 2010 - present</i>
Conferences/symposia:	
Organizer: <i>Society for Engineering Science:</i> <b>Symposium on Singularity and Similarity in Mechanics to honor G.I. Barenblatt</b>	Oct. 1999
Co-organizer: Workshop on <i>Statistical Dynamics of Continua</i> at <b>Aspen Center for Physics</b>	June-July 2000
Co-organizer and main lecturer: Workshop on <i>Materials in Motion</i> , <b>James Franck Institute, University of Chicago,</b>	July 2001
Organizer: Continuum Seminar at MIT and Cambridge University A weekly seminar on Applied Mathematics/Mechanics broadly interpreted	Oct 1996 – July 2003
Co-organizer: Mathematics and materials; soft matter <b>Max Planck Gessellschaft, Castle Ringberg, Germany.</b>	Oct 2002
Co-organizer: Workshop on <i>Extreme mechanics of fluids and continua</i> <b>Aspen Center for Physics</b>	Aug 2006
Co-organizer: Geometrical singularities and singular geometries <b>Institute for Mathematics and its Applications, Minneapolis, MN</b>	Jul 2008

Referee for approx. 30 papers per year in Mathematics, Physics, Biology, Engineering journals e.g. *Nature*, *Science*, *Proceedings of the Royal Society of London (A)*, *Comptes Rendus de l'Academie des Sciences Paris, Series II*, *Physical Review Letters*, *Physics of Fluids*, *Journal of Cell Biology*, *Nature- Cell Biology*, *Current Biology*, *Physical Review E*, *SIAM Journal on Applied Mathematics*, *Proceedings of the US National Academy of Science*, *Europhysics Letters*, *Biochemistry*, *American Journal of Botany*, *Journal of Fluid Mechanics*, *PLoS*, etc.

## Teaching Experience

### Stanford University

Numerical Analysis

### Univ. Of Illinois, Urbana-Champaign

Advanced Dynamics  
Perturbation Methods

### Massachusetts Institute of Technology

Dynamics (2 years)  
Molecular, cell and tissue biomechanics (4 years)  
Experimental and theoretical molecular biophysics (graduate seminar)  
Mechanics and materials I (2 years)  
Applied elasticity (jointly with Harvard's "Solid Mechanics I") (2 years)  
Physics of sliding friction (graduate seminar)

### Cambridge University

Molecular and cellular biomechanics (2 years)  
Introduction to physics (1 year)  
Mathematical methods for natural sciences (2 years)

### Harvard University

Science of everyday life – freshman seminar (2005)  
Physics and physiology of the senses – freshman seminar (2007)  
Sustainable energy and climate change – freshman seminar (2009)  
Chance – freshman seminar (2012)  
Mathematical methods in the sciences AM21a - undergraduate  
Complex and Fourier analysis AM105a– undergraduate  
Mathematical modeling AM115- undergraduate (4 years)  
Systems cell biology BPS242– graduate  
Physical mathematics I AM201– graduate (3 years)  
Physical mathematics II AM202– graduate  
Biological dynamics ES216/ AP263 – graduate (3 years)

### Summer/Winter Schools etc.

June 95

Lectures on Classical Mechanics & Elasticity

June 97	Institut Non-Linéaire de Nice, France Lectures on Elasticity – Workshop on Elasticity and Viscoelasticity, Cargese, France
Dec 97	Lectures on Mechanics of Granular Matter International Conference on Instabilities and Non equilibrium Systems, Valparaiso, Chile
March 98	Lectures on the Mechanics of Granular Materials, Univ. de Provence, France
June 99	Director, Summer Graduate Program, <b>Geometry and Dynamics of Low Dimensional Continua</b> , Mathematical Sciences Research Institute, Berkeley, California.
Dec 99	Lectures on Molecular and Cellular Biomechanics University of Santiago, Chile
June 01	Lectures on Fluid-Structure Interaction, Summer School on Nonlinear Physics, Peyresq, France
July 01	Lectures on Structural Elasticity, Workshop on Materials In Motion, MRSEC, University of Chicago
Sep 02	Lectures on biomechanics; from molecules to morphogenesis Peyresq, France.
Mar 04	Lectures on cell mechanics, International winter school, Les Houches, France.
July 04	Faculty, Physiology Program, Marine Biological Laboratory, Woods Hole, USA.
Jan 05	Shape, flow and motion. Lectures at MIT's Center for Theoretical Physics Retreat, New Hampshire, USA
July 06	Faculty, Boulder School on Condensed Matter Physics Boulder, Co, USA.
July 09	Lecturer, London Mathematical Society School on Mathematics and Materials Science, Oxford, UK.

### Outreach activities

- Lectured at various Middle Schools and High Schools in the Boston and Berkeley areas on "Everyday Science"
- Harvard Museum of Natural History Public Lectures – 2006, 2008, on "Nature of Shape and Shape of Nature"
- Invited Lecturer to Edinburgh Mathematical Society's "Meet the Mathematician Series" for High School Students, 2010.
- Featured on National Public Radio often in the context of science in an everyday context.

### **Publications**

1. "The shape of a Möbius band," Mahadevan, L., and J.B. Keller, *Proceedings of the Royal Society of London, Series A*, **1440**, no. **409**, pp. 149-162, 1993.

2. Comment on "Behavior of a falling paper," Mahadevan, L., H. Aref, and S.W. Jones, *Physical Review Letters*, **75**, p. 1420, 1995.

3. "Periodic folding of thin sheets," Mahadevan, L., and J.B. Keller, *SIAM Journal on Applied Mathematics*, **55**, no. 6, pp. 1609-1624, 1995.

See also: *SIAM Review*, 41, no. 1, pp. 113-31, 1999, where this article is reprinted as the inaugural SIGEST article on the basis of "exceptional quality and potential significance to the entire SIAM community.")

4. "Coiling of flexible ropes," Mahadevan, L., and J.B. Keller, *Proceedings of the Royal Society of London, Series A*, **1452**, no. 1950, pp. 1679-1694, 1996.

5. "Shark-teeth patterns in coating flow inside a horizontally-rotating cylinder," Thoroddsen, S.T., and L. Mahadevan, *Physics of Fluids*, **8**, no. 9, p. S10, 1996.

6. "Tumbling of a falling card," Mahadevan, L., *Comptes Rendus de l'Academie des Sciences, Paris, Series II*, t. **323**, pp. 729-736, 1996.

7. "Experimental study of instabilities in a partially-filled horizontally-rotating cylinder," Thoroddsen, S.T., and L. Mahadevan, *Experiments in Fluids*, **23**, pp. 1-13, 1997.

8. "Colliding waves in an excitable medium: preservation, annihilation and bifurcation," Argentina, M., P. Couillet, and L. Mahadevan, *Physical Review Letters*, **79**, pp. 2803-07, 1997.

9. "Fluid rope trick investigated," Mahadevan, L., W. Ryu, and A.D.T. Samuel, *Nature*, v. **391**, no. 6672, p. 140, 1998. Corrigendum; *ibid.*, v. 403, p. 502, 2000.

Commentaries and press reports: *The Daily Telegraph*, London, March 12, 1998; *Le Figaro*, Paris, March 24, 1998; *The New York Times*, New York, April 7, 1998; interview on "Sounds Like Science," National Public Radio, March 14, 1998; *Pour la Science*, Paris, September, 1998; CHEMTALK (published by the American Chemical Society), September 1998, etc.

10. "Conical surfaces and crescent singularities in crumpled sheets," Cerda, E., and L. Mahadevan, *Physical Review Letters*, **80**, pp. 2358-61, 1998.

Commentary: *Physics World*, July, 1998, p.19-20.

11. "Tumbling cards," Mahadevan, L., W. Ryu, and A.D.T. Samuel, *Physics of Fluids*, **11**, pp. 1-3, 1999.

Commentary: *Science News*, Oct. 31, 1998, pp. 285-7.

12. "Axial instability of a free-surface front in a partially-filled horizontal rotating cylinder," Hosoi, A.E., and L. Mahadevan, *Physics of Fluids*, **11**, pp. 97-106, 1999.

13. "Propagating fronts on sandpile surfaces," Mahadevan, L. and Y. Pomeau, *Europhysics Letters*, **46**, pp. 595-601, 1999.

14. "Rolling droplets," Mahadevan, L., and Y. Pomeau, *Physics of Fluids*, **11**, pp. 2449-53, 1999.

15. "Conical dislocations in crumpling," Cerda, E., S. Chaieb, F. Melo and L. Mahadevan, *Nature*, **401**, pp. 46-49, 1999.

Commentary and press reports: *Dallas Morning News*, Sep. 6, 1999; *The Daily Telegraph* (London), Sep. 15, 1999; *Bild der Wissenschaft* (Germany), Mar. 2000; *Facts* (Switzerland), Nov. 1999; American Mathematical Society *What's new in mathematics*, Nov. 1999 etc.

16. "Elastic model of a DNA loop in the lac operon," Balaeff, A., L. Mahadevan, and K. Schulten, *Physical Review Letters*, **83**, pp. 4900-03, 1999
17. "Rippling instability of a collapsing bubble" da Silveira, R., S. Chaieb and L. Mahadevan, *Science*, **287**, pp. 1468-71, 2000.  
Commentary and press reports: *Canadian Discovery Channel*, Feb 25, 2000; *New Scientist*, March 2000; *Physics World*, March 2000.
18. "Motility driven by macromolecular springs and ratchets," Mahadevan, L. and P. Matsudaira, *Science*, **288**, pp. 95-99, 2000.  
Commentary and press reports: Featured on "Mysteries of the Universe," MSNBC, May 2000. [http://www.msnbc.com/news/myst\\_front.asp](http://www.msnbc.com/news/myst_front.asp)
19. "Chaotic dripping from a faucet," Coulet, P., L. Mahadevan and C. Riera, *Progress in Theoretical Physics Supplement*, **139**, pp. 507-516, 2000.
20. "Folding of viscous filaments and sheets," Skorobogatiy, M., and L. Mahadevan, *Europhysics Letters*, **52**, pp. 532-38, 2000.
21. "Non-stick water," Mahadevan, L., *Nature*, **411**, pp. 895-96, 2001.
22. "Shocks in sand flowing in a silo," Samadani, A., L. Mahadevan and A. Kudrolli, *Journal of Fluid Mechanics*, **452**, pp. 293-301, 2002.
23. "Four-phase merging in compound drops," Mahadevan, L., M. Adda Bedia and Y. Pomeau, *Journal of Fluid Mechanics*, **451**, pp. 411-20, 2002.
24. "How aphids lose their marbles," Pike, N., D. Richard, W. Foster and L. Mahadevan, *Proceedings of the Royal Society of London, Series (B), Biological Sciences*, **269**, pp. 1211-15, 2002.  
Commentary and press reports "Science: random samples", June 21, 2002, article in *American Natural History magazine*, July 2002.
25. "Wrinkling of a stretched elastic sheet," Cerda, E., K. Ravi-Chandar and L. Mahadevan, *Nature*, **419**, pp. 146-7, 2002.
26. "The viscous catenary," Teichman, J. and L. Mahadevan, *Journal of Fluid Mechanics*, **478**, pp. 71-80, 2003.
27. "Geometry and physics of wrinkling," Cerda, E. and L. Mahadevan, *Physical Review Letters*, **90** (7) 074302, 2003 (Physical Review Focus Article).  
Commentary in the following: Perspective article in *Science*, **300**, p. 441, 2003, *Nature Physics Online*, *Science Online*, *New Scientist*, *Naturwissenschaft*, *Frankfurter Allgemeine Zeitung*, *Discover magazine*, *Allure magazine*, Interview with German radio, Korean Broadcasting Service etc.
28. "The force-velocity relationship for the actin-based motility of *Listeria-Monocytogenes*," McGrath, J., J. Eungdamrong, C. Fisher, F. Peng, L. Mahadevan, T. Mitchison and S. Kuo, *Current Biology*, **13** (1-20), 1-6, 2003.
29. "Rings, rackets and kinks in filamentous assemblies," Cohen, A. and L. Mahadevan, *Proceedings of the National Academy of Sciences (USA)*, **100**, 12141-46, 2003.

30. "Confined elastic developable surfaces: cylinders, cones and the elastica," Cerda, E. and L. Mahadevan, *Proceedings of the Royal Society of London (A)*, **461**, 671-700, 2005.
31. "Stored elastic energy powers the 60-micron extension of the *Limulus polyphemus* sperm actin bundle," Shin, J., L. Mahadevan, G. Waller, K. Langsmo and P. Matsudaira, *Journal of Cell Biology*, **162(7)**, 1183-88, 2003.
32. "Dynamics of poroelastic filaments," Skotheim, J. and L. Mahadevan, *Proceedings of the Royal Society of London (A)*, **460**, 1995-2020 (2004).
33. "Multiscale methods for modeling protein-DNA complexes," Villa, E., Balaeff, A., L. Mahadevan and K. Schulten, *SIAM Multiscale Modeling and Simulation*, **2**, 527-553 (2004).
34. "Structural model for cooperative DNA binding by CAP and *Lac* repressor," L. Mahadevan and K. Schulten, *Structure*, **12**, 123-32, 2004.
35. "Biomimetic ratcheting motion of lubricated hydrogel filaments," Mahadevan, L., S. Daniel and M. Chaudhury, *Proceedings of the National Academy of Sciences (USA)*, **101**, 23-26, 2004.  
Commentary in the following: Science – random samples, Science News, MIT - Technology Review, Technology Research News, Frankfurter Allgemeine Zeitung, Scientific American etc.
36. "Popliteal instability of bent multi-walled elastic tubes," Mahadevan, L., J. Bico and G. McKinley, *Europhysics Letters*, **65** (3), 323-29, 2004.
37. "Elements of Draping," Cerda, E., L. Mahadevan and J. Passini, *Proceedings of the National Academy of Sciences (USA)*, **101** (7), 1806-10, 2004.  
Commentary in: Nature – physics portal.
38. "Crack street: the cycloidal wake of a cylinder ripping through a thin solid sheet," Ghatak, A. and L. Mahadevan, *Physical Review Letters*. **91**, 215507, 2003. Erratum, 2005.  
Commentary in: Nature – physics portal.
39. "Modeling DNA loops using continuum and statistical mechanics," Balaeff, A., C. Koudella, L. Mahadevan and K. Schulten, *Philosophical Transactions of the Royal Society of London (A)*, **362**, 1355-71, 2004.  
Invited paper as part of a theme on DNA mechanics.
40. "Bending stiffness of a crystalline actin bundle," Shin, J., L. Mahadevan, P.T. So and P. Matsudaira, *Journal of Molecular Biology*, **337**, 255-61, 2004.
41. "Capillarity-induced zippering of a flexible train floating on an air-water interface," Vella, D., H-Y. Kim and L. Mahadevan, *Journal of Fluid Mechanics*, **502**, 89-98, 2004.
42. "Photo-induced deformation of beams, plates and films," Warner, M. and L. Mahadevan, *Physical Review Letters*, **92**, 134302, 2004.
43. "Elastic behavior of cross-linked and bundled networks," Gardel, M., J. Shin, F. Mackintosh, L. Mahadevan, P. Matsudaira and D. Weitz, *Science*, **304**, 1301-5, 2004.  
Commentary in: The Scientist.

44. "Relating microstructure to rheology of a bundled and cross-linked F-actin network in-vitro," Shin, J., M. Gardel, L. Mahadevan, P. Matsudaira and D. Weitz, *Proceedings of the National Academy of Sciences (USA)*, **101 (26)**, 9636-41, 2004.
45. "Peeling from a patterned thin elastic film," Ghatak, A., L. Mahadevan, J. Yun, M. Chaudhury and V. Shenoy, *Proceedings of the Royal Society of London (A)*, **460**, 2725-35, 2004.
46. "Hydrodynamical models of the dripping faucet," L. Mahadevan and C. Riera, *Journal of Fluid Mechanics*, **526**, 1-17, 2005.
47. "Scaling of F-actin rheology to probe single filament elasticity and dynamics," Gardel, M., J. Shin, F. Mackintosh, L. Mahadevan, P. Matsudaira and D. Weitz, *Physical Review Letters*, **93 (18)**, 188102, 2004.  
Featured and reprinted in *Virtual J. Biological Physics*, 2004.
48. "Fluid-flow induced flutter of a flag," Argentina, M. and L. Mahadevan, *Proceedings of the National Academy of Sciences (USA)*, **102**, 1829-34, 2005.  
Press coverage in *Guardian (UK)*, *Die Zeit (Germany)*, ...
49. "Soft lubrication," Skotheim, J. and L. Mahadevan, *Physical Review Letters*, **92 (24)**, 245509, 2004.
50. "Elasticity of interfacial particle rafts," Vella, D., P. Aussillous and L. Mahadevan, *Europhysics Letters*, **68 (2)**, 212-18, 2004.
51. "How the Venus flytrap snaps," Forterre, Y., J. Skotheim, J. Dumais and L. Mahadevan, *Nature*, **433**, 421-25, 2005.  
Press coverage in : National Public Radio (Morning Edition, Jan 27, 2005), Canadian Broadcasting Corporation (As it happens, Jan 30, 2005), Boston Globe, *Guardian (UK)*, *Daily Telegraph (UK)*, *International Herald Tribune* .....
52. "Peeling, healing and bursting in lubricated elastic sheets," Hosoi, A. and L. Mahadevan, *Physical Review Letters*, **93**, 137802, 2004.  
Featured and reprinted in *Virtual J. Nanoscale Science and Technology*, **10(15)**, Oct. 11, 2004.
53. "Spontaneous folding of planar surfaces into three-dimensional objects by magnetic self-assembly," M. Boncheva, S. Andreev, L. Mahadevan, A. Winkelmann, D. Reichman, M. Prentiss, S. Whitesides and G. Whitesides, *Proceedings of the National Academy of Sciences (USA)*, **102**, 3924-29, 2005.
54. "Self-similar nested wrinkling patterns in skins," K. Efimenko, M. Rackaitis, E. Manias, A. Vaziri, L. Mahadevan and J. Genzer, *Nature-Materials*, **4**, 293, 2005.  
Press coverage in : *San Jose Mercury News*, *Aberdeen News*, ...
55. , "Gravitational collapse of colloidal gels," S. Manley, J.M. Skotheim, L. Mahadevan, D. Weitz, *Physical Review Letters* **94**, 218302, 2005.
56. "Using the peel test to measure the work of adhesion in a confined elastic film," A. Ghatak, L. Mahadevan and M. Chaudhury, *Langmuir*, **21(4)**, 1277-81, 2005.
57. " Non-equilibration of hydrostatic pressure in blebbing cells," G. Charras, J. Yarrow, M. Horton, L. Mahadevan and T. Mitchison, *Nature*, **435**, 95, 2005.

58. "Buckling of drying droplets of colloidal suspensions", N. Tsapis, E. Dufresne, S. Sinha, C. Riera, J. Hutchinson, L. Mahadevan, D. Weitz, *Physical Review Letters*, **94**, 018302, 2005.
59. "Self-organized Origami," L. Mahadevan and S. Rica, *Science*, **307**, 1740, 2005.  
Press coverage in : New York Times (22 Mar, 2005), Geoskop, Die Welt, National Geographic...
60. "Physical limits and design principles for plant and fungal movements," J. Skotheim and L. Mahadevan, *Science*, **308**, 1308, 2005.  
Cover article of Science. Press coverage in a variety of sources such as : National Geographic, Christian Science Monitor, Scientific American etc. ...
61. "The 'Cheerios' effect", D. Vella and L. Mahadevan, *American Journal of Physics* **73**, 817, 2005.  
Press coverage in: AIP Physics News, MSNBC, Die Zeit, CBS radio ...
62. "Soft lubrication: the elastohydrodynamics of conforming and non-conforming contacts," J. Skotheim and L. Mahadevan, *Physics of Fluids*, **17**, 092101, 2005.  
Awarded the 2006 Francois Frenkiel Prize by the American Physical Society.
63. "Solenoids and plectonemes in stretched, twisted elastomeric filaments," A. Ghatak and L. Mahadevan, *Physical Review Letters*, **95**, 057801, 2005.
64. "Powerful curves," L. Mahadevan and T. Mitchison, *Nature*, **435**, 895, 2005.
65. "Non spherical bubbles," A. B. Subramaniam, M. Abkarian, L. Mahadevan and H. Stone, *Nature*, **438**, 930, 2005.
66. "A simple model for the dynamics of adhesive failure," D. Vella and L. Mahadevan, *Langmuir*, **22**, 163, 2006.
67. "Capillary rise between elastic sheets," H-Y Kim and L. Mahadevan, *Journal of Fluid Mechanics*, **548**, 141, 2006.
68. "Superficial wrinkles in stretched, drying gelatin films," R. Rizzieri, L. Mahadevan, A. Vaziri and A. Donald, *Langmuir*, **22**, 3622, 2006.
69. "Transitions to nematic states in homogeneous suspensions of high aspect ratio magnetic rods," A. Gopinath, L. Mahadevan and R.C. Armstrong, *Physics of Fluids*, **18**, 028102, 2006.
70. "Dynamics of surfactant-driven fracture of particle rafts," D. Vella, H-Y Kim, P. Aussillous and L. Mahadevan, *Physical Review Letters*, **96**, 178301, 2006.
71. "Compressive buckling of reinforced microtubules and composite network behavior of living cells," C. Brangwynne, F.C. MacKintosh, S. Kumar, N. Geisse, L. Mahadevan, K. Parker, D. Ingber, D. Weitz, *Journal of Cell Biology*, **173**, 733, 2006.  
Featured commentary in *Current Biology* by J. McGrath.
72. "Crack-front instability in a confined film," Adda Bedia and L. Mahadevan, *Proceedings of the Royal Society of London, series A*, 2006.

73. "Dynamics of fracture in drying suspensions," Dufresene, D. Stark, N. Greenblatt, J. Cheng, J. Hutchinson, L. Mahadevan and D. Weitz, *Langmuir*, **22**, 7144, 2006.
74. "Modeling DNA loops using the theory of elasticity," A. Balaeff, L. Mahadevan and K. Schulten, *Physical Review E*, **73**, 031919, 2006.
75. "Fall and rise of a viscoelastic filament," A. Roy, L. Mahadevan and J-L Thiffeault, *Journal of Fluid Mechanics*, **563**, 283, 2006.
76. "A dynamic fate map of the forebrain shows how vertebrate eyes form and explains two causes of cyclopia," S.J. England, G. Blanchard, L. Mahadevan and R. Adams, *Development*, **133**, 4613, 2006.
77. "Mechanics of interfacial composite materials," A.B. Subramaniam, M. Abkarian, L. Mahadevan and H.A. Stone, *Langmuir*, **22**, 10204, 2006.
78. "Sensorimotor control during isothermal tracking in *Caenorhabditis Elegans*," L. Luo, D.A. Clark, D. Biron, L. Mahadevan and A. Samuel, *Journal of Experimental Biology*, **209**, 4652, 2006.
79. "Nonlinear mechanics of fibrous networks," A. Kabla and L. Mahadevan, *J. Roy. Soc. Interface*, **4**, 99, 2007.
80. "Persistence of a pinch in a pipe," L. Mahadevan, A. Vaziri and M. Das, *Europhysics Letters*, **77**, 40003, 2007.
81. "Curvature condensation and bifurcation in an elastic shell," M. Das, A. Vaziri, A. Kudrolli and L. Mahadevan, *Physical Review Letters*, **98**, 014301, 2007.
82. "Universal dynamics of cell spreading," D. Cuvelier, M. Thery, Y. Shu, S. Dufour, J-P. Thiery, M. Bornens, P. Nassoy and L. Mahadevan, *Current Biology*, **17**, 1, 2007.  
Featured commentary in *Current Biology* by J. McGrath.
83. "Force of an actin spring," J. Shin, B. Tam. R. Brau, M. Lang, L. Mahadevan and P. Matsudaira, *Biophysical Journal*, **92**, 3729, 2007.
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Perspective article in *Biophysical Journal*, **94**, 4, 2008.
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90. "Undulatory propulsion on land," Z.V. Guo and L. Mahadevan, *Proceedings of the National Academy of Sciences (USA)*, **105**, 3179, 2008.
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93. "Equilibrium of an elastically confined drop," H-M Kwon, H-Y. Kim, J. Puell and L. Mahadevan, *J. Applied Physics*, **103**, 093519, 2008.
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96. "Localized and extended deformations of elastic shells," A. Vaziri and L. Mahadevan, *Proceedings of the National Academy of Sciences (USA)*, **105**, 7913, 2008.
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106. "Tissue tectonics: morphogenetic strain rates, cell shape change and intercalation," G. Blanchard, A. Kabla, N. Schultz, L. Butler, B. Sanson, N. Gorfinkiel, L. Mahadevan and R. Adams, *Nature Methods*, **6(6)**, 458, 2009.

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News and Views in Nature Reviews-Gastroenterology, Current Biology. Subject of various articles and interviews in popular press, e.g BBC, La Recherche, New Scientist etc.

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Subject of various articles and interviews in popular press, e.g. New Scientist etc.

150. "Forced tearing of ductile and brittle thin sheets," T. Tallinen and L. Mahadevan, *Physical Review Letters*, **107**, 245502, 2011.

151. "Hydrodynamics of writing with ink," J. Kim, M-W Moon, K-R Lee, L. Mahadevan, H-Y Kim, *Physical Review Letters*, **107**, 264501, 2011.

152. "The branch with the longest reach," Z. Wei, S. Mandre and L. Mahadevan, *Europhysics Letters*, **97**, 14005, 2012.

153. "A biophysical marker of severity in sickle cell disease," D. Wood, A. Soriano, L. Mahadevan, J. Higgins, S. Bhatia, *Science Translational Medicine*, in press.

154. "Actin network growth under load," O. Campas, L. Mahadevan, J-F. Joanny, *Biophysical Journal*, in press.

155. "Skating on a film of air: drops impacting on a surface," J. Kolinski, S. Rubinstein, S.

Mandre, M. Brenner, D. Weitz, L. Mahadevan, *Physical Review Letters*, in press.

156. "Minimal surfaces bounded by elastic lines," L. Giomi and L. Mahadevan, *Proceedings of the Royal Society (London), series A*, in press.

157. "Geometric control of rippling in supported nanolines," V. Tirumala, C. Stafford, L. Ocola, J. Douglas and L. Mahadevan, *Nanoletters*, in press.

### **Invited Lectures (of more than 120 in the last decade)**

January 2001, "Buckling phenomena in fluids," G I Taylor Lecture, Cambridge Philosophical Society, Cambridge, UK

May 2002, "A search for structure: from molecules to morphogenesis" Inaugural Lecture of the Schlumberger Professor of Complex Physical Systems, Cambridge University, UK.

February 2003, "Size, shape and structure: mechanics of macromolecular assemblies", Frontiers in Science Seminar, Whitehead Institute for Biomedical Research, Cambridge, USA

May 2003, "Geometry and physics in biology," Inaugural lecture on the opening of the Corfield Institute of Applied Mathematics, Cambridge University, UK.

November 2003, "Physical packing problems: from DNA to origami," Alan Taylor Lecture, Oxford University, UK.

March 2004, 4 lectures on "Physics of the cell," International Winter School, Les Houches, France.

January, 2005, "Shape, flow, motion and locomotion," 3 lectures at the MIT Center for Theoretical Physics Retreat – Common Man Inn, NH

May 2005, "Mechanics in extreme geometries," Exxon-Mobil Frontiers in Soft Matter Conference, Clinton, NJ

June 2005, "Particulate interfaces," Invited talk at Conference on Granular Physics, Kavli Institute for Theoretical Physics, Santa Barbara, CA

July 2005, "Draping, wrinkling and crumpling: geometry and physics," Plenary Lecture, Society for Industrial and Applied Mathematics Annual Meeting, New Orleans, LA

April 2006, "Mathematics, mechanics and motility," DARPA DSRC Outlook speaker, Washington, D.C.

September 2006 – April 2007, Midwest Mechanics Lecturer. Lectures on 5 different topics at 10 Universities (Illinois, Wisconsin, Iowa, IIT, Northwestern, Purdue, Notre Dame, Michigan, MSU, Minnesota): 1. Extreme elasto-hydrodynamics: flags, fishes and flying carpets. 2. Draping, wrinkling and crumpling: geometry and physics. 3. Surface tension

shorts: from A(phids) to Z(ippers). 4. Macromolecular assemblies: order, disorder, statics and dynamics. 5. Soft adhesion and lubrication: glues, cells and joints.

February 2007, "Mathematics, mechanics and motility," NIH Director's Lecture Series, National Institutes of Health, Bethesda, MD.

July 2007, "Soft Hydraulics: physics and physiology," Invited Speaker, StatPhys 21, International Conference on Statistical Physics, Genoa, Italy.

October 2007, "Mathematics, mechanics and motility," Plenary Lecture, International conference on Bio-inspired engineering, Dead Sea, Israel.

December 2007, "Cellular hydraulics," Invited lecture, American Society of Cell Biology Symposium on "Building a cell", Washington, DC

July 2008, "Mechanochemistry and motility," Plenary lecture, Society for Mathematical Biology Annual Meeting, Toronto, CA.

April 2009, "Motility: mathematics, mechanics, mimetics," German-American Frontiers in Engineering Symposium sponsored by the US National Academy of Engineering, Potsdam, Germany.

July 2009, "Extending the material," Inauguration of the Oxford Center for Collaborative Applied Mathematics, Oxford, UK.

April 2010, "Morphogenesis," Plenary Lecture, British Mathematics Colloquium, British Applied Mathematics Colloquium, Edinburgh, UK.

Nov 2010, "Geometry and the brain," Singleton lectures, Department of Brain and Cognitive Sciences, MIT, Cambridge, MA, USA.

May 2011, "Soft interfaces and morphogenesis," Amick Lectures, Department of Mathematics, University of Chicago, IL, USA

## **Doctoral and post-doctoral students**

### **Doctoral theses (at MIT)**

1. Teichman, J. "Wrinkling and sagging of viscous sheets," 2002. Currently at Institute for Defense Analysis, Washington D.C.
2. Eungdamrong, J. (jointly with T. Mitchison, Harvard Medical School) "Polymerization-driven force generation in *Listeria*", 2002.
3. Shin, J. (with P. Matsudaira, Biology, MIT) "Statics and dynamics of actin assemblies," 2003. Currently Assistant Professor of Mechanical Engineering, KAIST, Korea.

### **Doctoral theses (at Cambridge)**

1. Skotheim, J. "Some poroelasticity problems in biomechanics," 2004. Currently Assistant Professor of Biological Sciences, Stanford University.

2. Cohen, A. (with M Pepper, Cavendish) "Nanoscale mechanics," 2003. Currently Associate Professor of Chemistry, Harvard University.
3. Vella, D. (with H Huppert, DAMTP) "Interfacial failure," 2007. Currently Lecturer in Applied Mathematics, Oxford University.

### **Doctoral theses (at Harvard)**

1. Hohlfeld, E. "Creases, point bifurcations and the spontaneous breakdown of scale invariance," 2008. Currently postdoc in Chemistry, University of California, Berkeley.
2. Guo, Z. (with S. Ramanathan, Molecular and Cell Biology) "Some problems in biomechanics and neurobiology," 2010. Currently postdoc in Neurobiology at Janelia Farms, Virginia.
3. Mani, M. (with M. Brenner, SEAS) "Dynamics at soft interfaces," 2010. Currently Simons postdoc at KITP, Santa Barbara.
4. Yong, E-H, "Elasticity and biophysics," 2012.
5. Mukherjee, A. "Elastohydrodynamics: from flutter to bird song," 2012.
6. Kolinski, J. "Interfacial dynamics," started in Sep 2008.
7. Wei, Z. "Between the discrete and continuum," started in Sep 2008.
8. McCormick, A. "Topology, mechanics and statistics of elastic curves," started in 2010.
9. Ocko, S. "Swarm dynamics, " started in 2011.

### **Post-doctoral associates and senior visitors (at MIT)**

1. Dr. E. Cerda, Topic: Nonlinear Physics. February, 1997 – June, 1998.  
Currently Professor of Physics, U. de Santiago de Chile, Santiago, Chile.
2. Dr. S. Chaieb (with G. McKinley). Topic: Experimental nonlinear physics. September 1998- December 1999. Currently Assistant Professor of Mechanical Science and Engineering, KAUST, Saudi Arabia.
3. Dr. A. Upadhyaya (with R. Kamm) Topic: Pattern formation in adherent and motile cells. January 2000-December 2001. Currently Assistant Professor of Physics, University of Maryland.
4. Professor Martine Ben Amar, Universite de Paris VI, sabbatical 1998-99.
5. Professor Yves Pomeau, Ecole Normale Superieure, Paris, April 2000.

### **Post-doctoral associates and senior visitors (at Cambridge)**

1. Dr. D. Richard, Topic: Experimental soft matter physics. Aug. 2001 – June 2002. Dr. Richard is with Vivendi Water, Stockholm.
2. Dr. J. Dumais, Topic: Plant cell morphogenesis. Sep. 2001 – July 2003. Dr Dumais is currently an Associate Professor of Biology at Harvard University.
3. Dr. E. Cerda, Professor of Physics, U. Santiago de Chile, Chile. July 2001 – Dec 2003.
4. Dr. M. Adda-Bedia. CNRS, LPS, ENS, Paris, France. February 2002 – February 2003. Currently Charge de Recherche, Laboratoire de Physique Statistique, Ecole Normale Supérieure, Paris.
6. Dr. Y. Forterre, Topic: Experimental soft matter physics, Aug. 2002 – present. Currently Charge de Recherche, Equipe Physique Nonlineaire, Université de Provence, Marseilles.

### **Post-doctoral associates and senior visitors (at Harvard)**

1. Dr. C. Riera, Topic: Nonlinear physics. Sep 2002 – Sep 2004. Currently a private entrepreneur.
2. Dr. M. Argentina, Topic: Elastohydrodynamics and animal locomotion, Sep 2002 – Aug. 2004. Currently a Maitre d'Conference (Asst. Prof.) of Physics at the Univ. of Nice, France.
3. Dr. A. Ghatak, Topic: Experimental studies on adhesion, March 2002 – May 2004. Currently Associate Professor of Chemical Engineering IIT, Kanpur, India.
4. Dr. C. Koudella, Topic: Computational molecular mechanics, Sep 2002 – Aug 2004. Currently on Wall Street.
5. Dr. M. Das, Topic: Physics of soft membranes, Sep 2004 – Oct 2005. Currently postdoc in Physics at the Vrije Universiteit, Amsterdam, Netherlands.
6. Dr H-Y Kim, Topic: Capillarity and elasticity, Sep 2004 – Dec 2004. Currently Asst Prof. of Mechanical Engineering at Seoul National University, Korea.
7. Dr. A. Kabla, Topic: Physical mechanics, Dec 2004 – Jan 2007. Currently Lecturer (Asst Prof.) of Engineering, Cambridge University, UK..
8. Dr. A. Gopinath, Topic: Physiology and materials, Jan 2005 – Aug 2007. Currently postdoctoral fellow in Physics, Brandeis University.
9. Dr. D. Cuvelier, Topic: Experimental Biophysics, Sep 2005 – Aug 2007. Currently Maitre d'Conference at the Institut Curie and the University of Paris, France.

10. Dr. M. Wyart (with M. Brenner, D. Fisher, D. Nelson), Aug. 2005- July 2006. Currently Asst. Professor of Physics, New York University, New York.
11. Dr. I. Kulic, Topic: Biophysics, Nov 2006 – April 2008. Currently Charge de recherche at CNRS, Laboratoire de Physiochimie polymeres, Strasbourg, France.
12. Dr. J. Higgins, MD. Topic: Sickle cell disease. Jan. 2006 – Aug. 2009. Currently Asst. Prof. of Systems Biology, Harvard Medical School, Boston, MA.
13. Dr. E. Reyssat, Topic: Elastohydrodynamics, Oct. 2007 – July 2009. Currently Charge de Recherche, Lab. de Physique et Mecanique Milieux Heterogenes, ESPCI, Paris, France.
14. Dr. S. Mandre (with M. Brenner), Topic: Elastohydrodynamics. Aug. 2006 –June 2010. Currently Asst. Prof. of Engineering, Brown University, Providence, RI.
15. Dr. H. Liang, Topic: Surfaces and interfaces, April 2007 – April 2010. Currently Asst. Prof. of Mechanics, University of Science and Technology, Hefei, China.
16. Dr. T. Savin, Topic: Soft matter physics, Oct. 2007 – Dec. 2009. Currently Research Associate, Materials Physics, ETH, Zurich.
17. Dr. O. Campas (with M. Brenner), Topic: Biophysics of morphogenesis, Oct 2007 – present.
18. Dr. M. Venkadesan (with D. Lieberman), Topic: Human biomechanics, Oct 2008 – Dec 2010. Currently Asst Prof., NCBS-TIFR, Bangalore, India.
19. Dr. A. Slim, Topic: Flow in and deformation of porous media, Oct 2009 – Jan 2011. Currently with Schlumberger-Boston Lab.
20. Dr. K. Kamrin, Topic: Plasticity in thin geometries (NSF fellow), Sep 2008-Jan 2010. Currently Asst Prof. of Mech. Engg., MIT.
21. Dr. G. Morrison, Topic: Statistical mechanics of networks, Oct. 2008 – present.
22. Dr. M. Bandi, Topic: Soft matter physics, Oct. 2009 – Oct. 2011. Currently Asst. Prof. of Physics, Okinawa Institute of Science and Technology, Japan.
23. Dr. L. Giomi, Topic: Geometry and statistical physics, July 2010 – present.
24. Dr. A. Concha (with R. Wood), Topic: Fluid physics and control of insect flight, Mar 2010 – present.
25. Dr. P. Paoletti, Topic: Control theory for swarms, July 2010 – present.
26. Dr. P. Mellado (with K. Parker), Topic: Biomimetic surfaces, Aug 2010 – present.
27. Dr. S. Gerbode, Topic: Tendril and flower morphogenesis, Sep 2010 – Nov. 2011. Currently Asst Prof. of Physics, Harvey Mudd College, CA.
28. Dr. T. Tallinen, Topic: Gut morphogenesis, Sep 2010 – present.

29. Dr. G. Wyn Jones, Topic: Inverse problems in soft matter, Jan 2010 – present.

30. Dr. J. Biggins, Topic: Brain and eye morphogenesis, Oct 2010 – present.

### **Additional mentoring**

I collaborate extensively with experimentalists, and so in addition to formal advising, I have informally advised and mentored many students who were doing their Ph.D. elsewhere. Below is a list of those who I have written papers with on problems that were separate from their PhD. A few of them (\*) later came to work as postdocs with me.

A. Hosoi (currently Prof. of Engineering, MIT), A. Samuel (currently Prof. of Physics, Harvard), W. Ryu (currently Asst. Prof. of Physics, Toronto), M. Skorobogatiy (currently Prof. of Physics at Ecole Polytechnique, Montreal), R. da Silveira (C. de Recherche, Ecole Normale Supérieure, Paris), A. Balaeff, C. Riera(\*) M. Argentina(\*), A. Ghatak (\*), P. Aussillous, D. Cuvelier (\*) etc.