

## Joceline Lega

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 University of Arizona  
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## Education

Elève	Ecole Normale Supérieure, Paris	Physics	1984-1988
B.S	University of Paris VI, France	Physics	1985
M.S	University of Paris VI, France	Physics	1985
DEA	University of Nice, France	Dynamical Systems and Turbulence	1986
Doctorat	University of Nice, France	Theoretical Physics	1989

## Professional Appointments

2006 – present Professor, Department of Mathematics, University of Arizona  
 2000 – 2006 Associate Professor, Department of Mathematics, University of Arizona  
 1997 – 2000 Assistant Professor, Department of Mathematics, University of Arizona  
 1997 – present On leave without pay from CNRS (French National Center for Scientific Research)  
 1993 – 1997 Chargée de Recherche 1ère classe at CNRS, Institut Non Linéaire de Nice  
 1989 – 1993 Chargée de Recherche 2ème classe at CNRS, Laboratoire de Physique Théorique, Nice, France

*Administrative Appointments*

2009 – present Director, Institute for Mathematics & Education, University of Arizona  
 2008 – 2011 Director, Program in Integrated Science, University of Arizona  
 2007 – 2009 Assistant Director, Institute for Mathematics & Education, University of Arizona

*Visiting Positions*

Fall 2004 Visitor, Fields Institute for Research in Mathematical Sciences, Toronto, Canada  
 1994 – 1997 Visiting Assistant Professor, Department of Mathematics, University of Arizona  
 Fall 1993 Research Associate, Department of Physics and Applied Physics, University of Strathclyde, Glasgow, UK  
 Oct-Dec 1991 Post-doctoral fellow, Department of Applied Mathematics and Theoretical Physics, University of Cambridge, UK  
 Jan 90-Jun 91 Visiting Assistant Professor, Department of Mathematics, University of Arizona

## Honors

Fellow of the Institute of Physics (London), since 2004

National Academies Education Fellow in the Life Sciences for 2005 – 2006

## Editorial Boards

- Editor-in-Chief, *Physica D: Nonlinear Phenomena*, since 01/2008
- Editorial Board member, *Nonlinearity*, since 01/2004
- Editorial Board member, *Physica D: Nonlinear Phenomena*, since 01/2004

## Research Interests

- Modeling of nonlinear phenomena, with applications to physics and biology
- Pattern formation and instabilities
- Dynamics and stability of coherent structures

## Synergistic Activities

- Co-organizer, 2009 and 2010 IM&E Workshops on *Mapping the Calculus Curriculum*, University of Arizona
- Director, 2007 Arizona Summer Program on *Mathematical Modeling*, University of Arizona
- Co-chair, 2006 SIAM conference on *Nonlinear Waves and Coherent Structures*, Seattle
- Co-organizer, 2003 Workshop on *Patterns in Physics* at The Fields Institute, Toronto, Canada
- Co-organizer, SIAM Mini-symposium on the *Validity of Envelope Equations*, 2005 SIAM Conference on Applications of Dynamical Systems, Snowbird
- Organizer, SIAM Mini-symposium on the Dynamics and Stability of Coherent Structures, 2003 Joint Mathematics Meeting, Phoenix

## Professional Memberships

- American Association for the Advancement of Science (AAAS)
- American Mathematical Society (AMS)
- Association des Anciens Elèves, Elèves et Amis de l'Ecole Normale Supérieure
- Institute of Physics (IOP)
- Program in Applied Mathematics, University of Arizona
- Society for Industrial and Applied Mathematics (SIAM)

## Service to the Profession

- Member-at-Large, AAAS Section A (Mathematics), 2011 – 2015

- Member, *Kruskal Lecture Prize Selection Committee*, 2011
- Chair, 2011 *Math Awareness Month National Committee*
- Chair (2008) and member (2007), *AWM-SIAM Kovalevsky Lecture Prize Selection Committee*
- Chair, Nominating Committee, SIAM Activity Group on *Nonlinear Waves and Coherent Structures*, 2006
- Secretary, SIAM Activity Group on *Nonlinear Waves and Coherent Structures*, 2004 – 06
- Reviewer for all major journals in my area of research
- Reviewer for the National Science Foundation (US), the Engineering and Physical Sciences Research Council (UK), the US-Israel Binational Science Foundation, and the Netherlands Organization for Scientific Research (NWO)

### Past and Current Funding

- 2011 – 2012: *Intel Math National Training Agency*, Intel Foundation
- 2009 – 2011: *Intel Math National Training Agency*, Intel Foundation
- 2009 – 2014: *NSF GK-12: Graduate Students and Teacher Engaging in Mathematical Sciences (G-TEAMS)*, National Science Foundation
- 2008: *Laptops for the Program in Integrated Science*, Gateway Strategic Alliance Grant, The University of Arizona
- 2008 – 2011: *Explorations in Integrated Science: An Interdisciplinary Laboratory Course*, National Science Foundation (P.I. Gail Burd)
- 2007 – 2009: *Q-Bio: Integration of Quantitative Concepts into Introductory Biology*, National Science Foundation (P.I. Kate Dixon)
- 2006 – 2009: *Imaging of markers for skin cancer risk*, Arizona Biomedical Research Commission (P.I. Kate Dixon)
- 2004 – 2008: *Current problems in nonlinear dynamics: Macroscopic modeling of microscopic interactions and instability of coherent structures*, National Science Foundation
- 2003 – 2004: *Junior US-based Mathematicians at 03/04 Special Year at Fields Institute*, National Science Foundation
- 2003 – 2006: *New Mathematical Modeling Course*, TRIF (Technology and Research Initiative Fund), The University of Arizona
- 2000 – 2004: *Hydrodynamics of bacterial colonies*, National Science Foundation (U.S. – France Cooperative Research)
- 2000 – 2004: *Analysis and modeling of pattern formation in biological and physical systems*, National Science Foundation
- 1999 – 2000: *Hydrodynamics of bacterial colonies*, The University of Arizona Research Foundation
- 1997 – 1999: *Modeling of filament dynamics with applications to bacterial growths*, NATO Collaborative Research Grant (with A. Goriely and M. Tabor)
- 1994 – 1996: *Dynamic response, stabilisation, modulation and control of semiconductor lasers and laser amplifiers*, European Union

## Publications

46 peer-reviewed publications (see <http://math.arizona.edu/~lega> for links to articles), listed below

3 articles in progress, not listed

11 articles in books, not listed

- J. Lega, *Collective Behaviors in Two-dimensional Systems of Interacting Particles*, SIAM J. Appl. Dyn. Sys. **10**, 1213-1231 (2011)
- S. Lafortune, J. Lega, and S. Madrid, *Instability of local deformations of an elastic rod: numerical evaluation of the Evans function*, SIAM J. Appl. Math. **71**, 1653-1672 (2011)
- M. Herrera-Valdez and J. Lega, *Reduced models for the pacemaker dynamics of cardiac cells*, Journal of Theoretical Biology **270**, 164-176 (2011)
- D. Moulton and J. Lega, *Reverse draining of a magnetic soap film - Analysis and simulation of thin film equation with non-uniform forcing*, Physica D **238**, 2153-2165 (2009)
- J. Lega and T. Passot, *Hydrodynamics of bacteria colonies*, Nonlinearity **20**, C1-C16 (2007)
- S. Lafortune and J. Lega, *Spectral stability of local deformations of an elastic rod: Hamiltonian formalism*, SIAM J. Math. Anal. **36**, 1726-1741 (2005)
- J. Lega and T. Passot, *Hydrodynamics of bacterial colonies: phase diagrams*, Chaos **14**, 562-570 (2004)
- J. Lega and T. Passot, *Inverse cascade and energy transfer in forced low-Reynolds number two-dimensional turbulence*, Fluid Dynamics Research **34**, 289-297 (2004)
- S. Lafortune and J. Lega, *Instability of local deformations of an elastic rod*, Physica D **182**, 103-124 (2003)
- J. Lega and T. Passot, *Hydrodynamics of bacterial colonies: a model*, Phys. Rev. E **67**, 031906 1-18 (2003)
- B.R. Schöne, J. Lega, K.W. Flessa, D.H. Goodwin and D.L. Dettman, *Reconstructing daily temperatures from growth rates of the intertidal bivalve mollusk *Chione cortezi* (northern Gulf of California, Mexico)*, Palaeogeography, Palaeoclimatology, Palaeoecology **184**, 131-146 (2002)
- T.A. Christensen, G. D'Alessandro, J. Lega and J.G. Hildebrand, *Morphometric modeling of olfactory circuits in the insect antennal lobe: I. Simulations of spiking local interneurons*, Biosystems **61**, 143-153 (2001)
- J. Lega, *Traveling hole solutions of the complex Ginzburg-Landau equation: a review*, Physica D **152-153**, 269-287 (2001)
- J. Lega and A. Goriely, *Pulses, fronts and oscillations of an elastic rod*, Physica D **132**, 374-392 (1999).
- J. Lega and N. Mendelson, *A control-parameter dependent Swift-Hohenberg equation as a model for bioconvection patterns*, Phys. Rev. E **59**, 6267-6274 (1999)
- N. Mendelson and J. Lega, *A complex pattern of traveling stripes is produced by swimming cells of *Bacillus subtilis**, Journal of Bacteriology **180**, 3285-3294 (1998)
- S. Bottin and J. Lega, *Pulses of tunable size near a subcritical bifurcation*, Eur. Phys. J. B **5**, 299-308 (1998)
- O. G. Calderón, V. M. Pérez-García, J. Lega, and J. M. Guerra, *Loss-induced transverse effects in lasers*, Opt. Comm. **143**, 315-321 (1997)
- D. Hochheiser, J.V. Moloney and J. Lega, *Controlling optical turbulence*, Phys. Rev. A **55**, 4011-4014 (1997)
- J. Lega and S. Fauve, *Traveling hole solutions to the complex Ginzburg-Landau equation as perturbations of Nonlinear Schrödinger dark solitons*, Physica **102 D**, 234-252 (1997)
- J. Lega and J.M. Vince, *Temporal forcing of traveling wave patterns*, J. Phys. I France **6**, 1417-1434 (1996)

- G.K. Harkness, J. Lega, and G.L. Oppo, *Measuring disorder with correlation functions of averaged patterns*, Physica D **96**, 26-29 (1996)
- M.R.E. Proctor and J. Lega, *Secondary bifurcations and symmetry breaking as a route towards spatiotemporal disorder*, Int. J. Bifurcation and Chaos **5**, 841 (1995)
- J. Lega, J.V. Moloney, and A.C. Newell, *Universal description of laser dynamics near threshold*, Physica D **83**, 478-498 (1995)
- G. K. Harkness, J.C. Lega and G.L. Oppo, *Correlation functions in the presence of optical vortices*, Chaos, Solitons and Fractals **4**, 1519-1533 (1994)
- J. B. Geddes, J. Lega, J.V. Moloney, R.A. Indik, E.M. Wright and W.J. Firth, *Pattern selection in passive and active nonlinear optical systems*, Chaos, Solitons and Fractals **4**, 1261-1274 (1994)
- J. Lega, J.V. Moloney, and A.C. Newell, *Swift-Hohenberg equation for lasers*, Phys. Rev. Lett. **73**, 2978-2981 (1994)
- J. Lega, P.K. Jakobsen, J.V. Moloney, and A.C. Newell, *Nonlinear transverse modes of large-aspect-ratio homogeneously broadened lasers: II. Pattern analysis near and beyond threshold*, Phys. Rev. A **49**, 4201-4212 (1994)
- P.K. Jakobsen, J. Lega, Q. Feng, M. Staley, J.V. Moloney, and A.C. Newell, *Nonlinear transverse modes of large-aspect-ratio homogeneously broadened lasers: I. Analysis and numerical simulation*, Phys. Rev. A **49**, 4189-4200 (1994)
- J.V. Moloney, P.K. Jakobsen, J. Lega, S.G. Wenden and A.C. Newell, *Space-time complexity in nonlinear optics*, Physica D **68**, 127-134 (1993)
- A. C. Newell, T. Passot and J. Lega, *Order parameter equations for patterns*, Ann. Rev. Fluid Mech. **25**, 399-453 (1993)
- J. Lega, S. Jucquois, B. Janiaud and V. Croquette, *Localized phase jumps in wave trains*, Phys. Rev. A **45**, 5596-5604 (1992)
- F. Daviaud, J. Lega, P. Bergé, P. Couillet and M. Dubois, *Spatio-temporal intermittency in a 1-d convective pattern: theoretical model and experiments*, Physica D **55**, 287-308 (1992)
- J. Lega, *Secondary Hopf bifurcation of a one-dimensional periodic pattern*, Eur. J. Mech. B/Fluids **10**, #2 - Suppl., 145 (1991)
- P. Couillet, J. Lega and Y. Pomeau, *Dynamics of Bloch walls in a rotating magnetic field: a model*, Europhys. Lett. **15**, 221 (1991)
- J. Lega, *Defect-mediated turbulence*, Computer Methods in Applied Mechanics and Engineering **89**, 419-424 (1991)
- Y. Pomeau and J. Lega, *Structures macroscopiques en spirales comme configurations d'équilibre d'un ensemble de molécules chirales*, C. R. Acad. Sci. Paris II **311**, 1135 (1990)
- S. Ciliberto, P. Couillet, J. Lega, E. Pampaloni and C. Perez-Garcia, *Defects in roll-hexagon competition*, Phys. Rev. Lett. **65**, 2370-2373 (1990)
- P. Couillet, J. Lega, B. Houchmanzadeh and J. Lajzerowicz, *Breaking chirality in nonequilibrium systems*, Phys. Rev. Lett. **65**, 1352-1355 (1990)
- L. Gil, J. Lega and J.L. Meunier, *Statistical properties of defect-mediated turbulence*, Phys. Rev. A **41**, 1138-1141 (1990)
- J. Lega, *Forme spirale de la dislocation des ondes stationnaires*, C. R. Acad. Sci. Paris, **309** II, 1401 (1989)
- P. Couillet, L. Gil, and J. Lega, *A form of turbulence associated with defects*, Physica **37** D, 91-103 (1989)

- P. Couillet, L. Gil, and J. Lega, *Defect-mediated turbulence*, Phys. Rev. Lett. **62**, 1619-1622 (1989)
- P. Couillet, L. Gil, and J. Lega, *Une forme de turbulence associée aux défauts topologiques*, Bulletin de la Société Française de Physique, **67**, 12 (1988); and Mathematical Modeling and Numerical Analysis **23**, 385-394 (1989)
- P. Couillet and J. Lega, *Defect-mediated turbulence in wave patterns*, Europhys. Lett. **7**, 511 (1988)
- P. Couillet, C. Elphick, L. Gil, and J. Lega, *Topological defects of wave patterns*, Phys. Rev. Lett. **59**, 884-887 (1987)

## Invited Scholarly Presentations

81 invited scholarly presentations

Invited presentations in the last 5 years are listed below

- *A hydrodynamic model for the growth and dynamics of bacterial colonies*; mini-symposium on Numerical and Computational Aspects of Interface Problems and Applications, 7<sup>th</sup> World Congress on Computational Mechanics, Los Angeles, California, 16-22 July 2006
- *A model for the dynamics and growth of bacterial colonies*; Special session on Mathematical Modeling in Biology and Medicine, 1027<sup>th</sup> AMS Meeting, Tucson, Arizona, 21-22 April 2007
- *Collective behaviors in bacterial colonies*; Conference on the Mathematical modeling and analysis of populations in biological systems, Tucson, Arizona, 5-7 October 2007
- *Molecular dynamics simulations of live particles*; Mathematics Colloquium, Tulane University, November 9th, 2007
- *Molecular dynamics simulations of live particles*; Applied Mathematics and Analysis seminar, Duke University, November 19th, 2007
- *Collective Behaviors in Bacterial Systems*; Mini-symposium on Numerical and Computational Aspects of Interface Problems, 8th World Congress on Computational Mechanics and 5th European Congress on Computational Methods in Applied Sciences and Engineering, Venice, Italy, 30 June - 4 July 2008
- *Steady-state solutions for the reverse draining of a magnetic soap film*; America's Conference on Differential Equations, Veracruz, Mexico, October 19-23, 2009
- *Reverse draining of a magnetic soap film*; XII International Workshop on Instabilities and Nonequilibrium Structures, Viña del Mar, Chile, December 14-18, 2009
- *Reverse draining of a magnetic soap film*; Frontiers in Nonlinear Waves, conference in honor of Vladimir Zakharov's 70th birthday, Tucson, Arizona, 26-29 March 2010
- *Spectral stability of local deformations of an elastic filament*; Bifurcation Theory, Integrable Systems, and the Bispectral Problem, conference in honor of the 60th birthday of Emil Horozov, Sofia, Bulgaria, May 15-19, 2010
- *Reverse Draining of a Magnetic Soap Film*; Special session on Linear and Nonlinear Stability of Coherent Structures, 8th AIMS International Conference on Dynamical Systems, Differential Equations and Applications, Dresden, Germany, May 25-28, 2010
- *Collective Behaviors in Bacterial Systems*; Fluid dynamics: from theory to experiments, a meeting celebrating the retirement of Steve Childress, Bozeman, Montana, June 7-10, 2010

- *Thin film equations with non-uniform forcing*, Mathematics Colloquium, College of Charleston, 5 November 2010