

# Curriculum Vitae

Guillaume JAMES

Born April 18th, 1973. Citizenship : french. Marital situation : married, two children.

**Present position :** Professor, Grenoble Institute of Technology,  
Ensimag School of Informatics, Applied Mathematics and Telecom.  
Member of Laboratoire Jean Kuntzmann - LJK (UMR CNRS 5224,  
Applied Mathematics and Computer Science), Grenoble, France.  
Member of INRIA (French National Institute for Research  
in Computer Science and Automatic Control), BIPOP team.

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Cedex 9, France. Tel : +33 476 514394. E-mail : Guillaume.James@imag.fr.

## Education

- 15/12/2005 : Habilitation thesis in Mathematics (Univ. Paul Sabatier Toulouse 3).  
Title : *Nonlinear Waves in Discrete Media*.  
Examinators : Y. Brenier, C. Jones, A.Mielke (referees), G. Iooss,  
S. Aubry, A. Bendali, E. Lombardi, M. Peyrard, J-M Roquejoffre.
- 1996-99 : PhD in Mathematics, University of Nice. Title : *Internal Travelling  
Waves in the Limit of a Discontinuously Stratified Fluid*.  
Advisor : Gérard Iooss. Examinators : A.Mielke, J-C.Saut (referees),  
K.Kirchgässner, F.Dias, O.Guès.
- 1994-96 : DEA and Maîtrise (equivalent to M.Sc.), University of Nice,  
Turbulence and Dynamical Systems, Mathematical Engineering.

## Employment

- 09/2008-present : Professor, Grenoble INP - Ensimag.  
On leave at INRIA : 09/2012-08/2014.
- 02/2001-08/2008 : Maître de Conférences (associate professor), INSA de Toulouse.
- 09/2000-01/2001 : Postdoctoral research fellow, Mathematics Institute, University of  
Warwick (UK). Advisor : R.S. MacKay.  
Funding : European research training network LOCNET.
- 1999-00 : Military service as scientific assistant, Ecole Polytechnique, Palaiseau.
- 1996-99 : Allocataire moniteur (teaching assistant), University of Nice.

## Scientific responsibilities

- 01/2011-01/2014 : Head of the department Models and Deterministic Algorithms (110 researchers) at Laboratoire Jean Kuntzmann.
- 2004-2007 Principal Investigator of the CNRS project (ACI New Interfaces of Mathematics) *Nonlinear Localisation and Application to the Physics of Biological Molecules*, Toulouse University and ENS Lyon.
- 2002-2004 : European research training network LOcNET : *Localisation by Nonlinearity and Spatial Discreteness in Crystals, Biomolecules and Josephson Arrays*. Coordinator of the Toulouse team.  
(<http://homepages.warwick.ac.uk/~masfu/locnet.html>)

## Research activity

### Research Interests

- Dynamical systems in finite and infinite dimensions, in particular nonlinear oscillator networks (lattices). Bifurcation phenomena, localized waves (breathers, solitons).
- Nonlinear problems in Mechanics : waves in granular crystals, internal waves in stratified fluids.
- Mathematical modelling in biology : localized waves in large molecules (DNA, actin).

### Papers in refereed journals

- [1] G. James, *Small amplitude steady internal waves in stratified fluids*, Ann. Univ. Ferrara, Sez VII, Sc. Mat., Vol. XLIII (1997), p. 65-119.
- [2] G. James, *Réduction à une variété centrale du problème des ondes progressives en fluide continûment stratifié, dans la limite d'une stratification discontinue*, C. R. Acad. Sci. Paris, t. 327, Série I (1998), p. 699-704.
- [3] G. James, *Internal Travelling Waves in the Limit of a Discontinuously Stratified Fluid*, Arch. Rational Mech. Anal., vol. 160, n.1 (2001), p. 41-90.
- [4] G. James, *Existence of breathers on FPU lattices*, C. R. Acad. Sci. Paris, t. 332, Série I (2001), p. 581-586.
- [5] G. James, *Centre manifold reduction for quasilinear discrete systems*, J. Nonlinear Sci., vol. 13, n.1 (2003), p. 27-63.
- [6] Y. Sire and G. James, *Travelling breathers in Klein-Gordon chains*, C. R. Acad. Sci. Paris, t. 338, Série I (2004) p. 661-666.
- [7] B. Sánchez-Rey, G. James, J. Cuevas and J.F.R. Archilla, *Bright and dark breathers in Fermi-Pasta-Ulam lattices*, Phys. Rev. B 70, 014301 (2004).
- [8] G. James and P. Noble, *Breathers on diatomic Fermi-Pasta-Ulam lattices*, Physica D 196 (2004), p. 124-171.
- [9] G. James and Y. Sire, *Travelling breathers with exponentially small tails in a chain of nonlinear oscillators*, Commun. Math. Phys. 257 (2005), p. 51-85.

- [10] G. Iooss and G. James, *Localized waves in nonlinear oscillator chains*, Chaos 15 (2005), 015113.
- [11] Y. Sire and G. James, *Numerical computation of travelling breathers in Klein-Gordon chains*, Physica D 204 (2005), p. 15-40.
- [12] G. James and M. Kastner, *Bifurcations of discrete breathers in a diatomic Fermi-Pasta-Ulam chain*, Nonlinearity 20 (2007), p. 631-657.
- [13] G. James and Y. Sire, *Center manifold theory in the context of infinite one-dimensional lattices*, in *The Fermi-Pasta-Ulam Problem. A Status Report*, G. Gallavotti Ed., Lecture Notes in Physics 728 (2008), p. 207-238.
- [14] G. James and P. Noble, *Weak coupling limit and localized oscillations in Euclidean invariant Hamiltonian systems*, J. Nonlinear Sci. 18 (2008), p. 433-461.
- [15] J. Cuevas, G. James, P. Kevrekidis, B. Malomed and B. Sánchez-Rey, *Approximation of solitons in the discrete NLS equation*, Journal of Nonlinear Mathematical Physics 15, supplement 3 (2008), 124-136.
- [16] M. Peyrard, S. Cuesta-López and G. James, *Modelling DNA at the mesoscale : a challenge for nonlinear science ?*, Nonlinearity 21 (2008), T91-T100.
- [17] G. James, P. Noble and Y. Sire, *Continuation of relative periodic orbits in a class of triatomic Hamiltonian systems*, Ann. IHP, Analyse non linéaire 26 (2009), 1237-1264.
- [18] J. Cuevas, G. James, P. Kevrekidis and K. Law, *Vortex solutions of the discrete Gross-Pitaevskii equation starting from the anti-continuum limit*, Physica D 238 (2009), 1422-1431.
- [19] G. James, B. Sánchez-Rey and J. Cuevas, *Breathers in inhomogeneous lattices : an analysis via center manifold reduction*, Reviews in Mathematical Physics 21 (2009), 1-59.
- [20] M. Peyrard, S. Cuesta-López and G. James, *Nonlinear analysis of the dynamics of DNA breathing*, Journal of Biological Physics 35 (2009), 73-89.
- [21] G. James, A. Levitt and C. Ferreira, *Continuation of discrete breathers from infinity in a nonlinear model for DNA breathing*, Applicable Analysis 89 (2010), 1447-1465.
- [22] C. Ferreira, G. James and M. Peyrard, *Nonlinear lattice models for biopolymers: dynamical coupling to a ionic cloud and application to actin filaments*, Discrete and Continuous Dynamical Systems S 4 (2011), 1147-1166.
- [23] G. James, *Nonlinear waves in Newton's cradle and the discrete  $p$ -Schrödinger equation*, Math. Models Meth. Appl. Sci. 21 (2011), 2335-2377.
- [24] M. Peyrard and G. James, *Intrinsic localized modes in nonlinear models inspired by DNA*, Nonlinear Theory and its Applications (NOLTA), Vol. 3 (2012), 27-51.
- [25] G. James and D. Pelinovsky, *Breather continuation from infinity in nonlinear oscillator chains*, Discrete and Continuous Dynamical Systems A 32 (2012), 1775-1799.
- [26] G. James, *Periodic travelling waves and compactons in granular chains*, J. Nonlinear Sci. 22 (2012), 813-848.

- [27] G. James, P.G. Kevrekidis and J. Cuevas, *Breathers in oscillator chains with Hertzian interactions*, Physica D 251 (2013), 39-59.
- [28] B. Bidégaray-Fesquet, E. Dumas and G. James, *From Newton's cradle to the discrete  $p$ -Schrödinger equation*, SIAM J. Math. Anal. 45 (2013), 3404-3430.
- [29] G. James and Y. Starosvetsky, *Breather solutions of the discrete  $p$ -Schrödinger equation*, in *Localized Excitations in Nonlinear Complex Systems*, Eds. R. Carretero-González, J. Cuevas-Maraver, D. Frantzeskakis, N. Karachalios, P. Kevrekidis, F. Palmero-Acebedo, Nonlinear Systems and Complexity 7 (2014), 77-115, Springer.
- [30] G. James and D. Pelinovsky, *Gaussian solitary waves and compactons in Fermi-Pasta-Ulam lattices with Hertzian potentials*, Proc. R. Soc. A. 470 (2165), 2014.

### Publications in conference proceedings

- [1] G. James, *Passage à la limite vers un modèle à deux couches dans le problème des ondes progressives 2D en fluide continûment stratifié*, Rencontre du Non-Linéaire 1999, IHP Paris, Paris-Onze éditions, p. 125-130.
- [2] B. Sánchez-Rey, J.F.R. Archilla, G. James and J. Cuevas, *Breathers in FPU systems, near and far from the phonon band*, proceedings of the third conference on Localization and Energy Transfer in Nonlinear Systems, San Lorenzo de El Escorial, Spain, 17-21 June 2002, L. Vázquez, R.S. MacKay, M.P. Zorzano Eds., World Scientific (2003), p. 342-343. Poster presentation.
- [3] G. James and P. Noble, *Breathers on diatomic FPU chains with arbitrary masses*, proceedings of the third conference on Localization and Energy Transfer in Nonlinear Systems, San Lorenzo de El Escorial, Spain, 17-21 June 2002, L. Vázquez, R.S. MacKay, M.P. Zorzano Eds., World Scientific (2003), p. 225-232.
- [4] G. James, *A centre manifold technique for computing time-periodic oscillations in infinite lattices*, proceedings of the third conference on Localization and Energy Transfer in Nonlinear Systems, San Lorenzo de El Escorial, Spain, 17-21 June 2002, L. Vázquez, R.S. MacKay, M.P. Zorzano Eds., World Scientific (2003), p. 202-209.
- [5] Y. Sire and G. James, *Ondes solitaires pulsatoires en milieu discret*, Sième Rencontre du Non-Linéaire, IHP, Paris, 9-11 March 2005, R. Ribotta Ed., éditions Non Linéaire Publications (2005), p. 247-252.
- [6] J. Cuevas, G. James, P.G. Kevrekidis and K.J.H. Law, *Vortex Solutions of the Defocusing Discrete Nonlinear Schrödinger Equation*, International Conference on Numerical Analysis and Applied Mathematics, Rethymno, Crete, 18-22 September 2009, T.E. Simos, G. Psihoyios, Ch. Tsitouras Eds., AIP Conf. Proc. 1168 (2009), p. 135-138.
- [7] G. James, J. Cuevas and P.G. Kevrekidis, *Breathers and surface modes in oscillator chains with Hertzian interactions*, Proceedings of the 2012 International Symposium on Nonlinear Theory and its Applications (NOLTA 2012), Palma, Mallorca, Spain, 22-26 Oct. 2012, p. 470-473. Preprint available on arXiv : 1301.1769 [nlin.PS].

### Communications in conferences

- Symposium on Trends in Applications of Mathematics to Mechanics, Lab. Dieudonné, University of Nice, May 1998. Poster presentation.

- GDR Équations d’Amplitudes et Propriétés Qualitatives, Garchy, April 2000.
- CMI Symposium and EuroWorkshop on Hamiltonian Systems, ICMS (Edinburgh), May 2001. Invited speaker.
- EU-US workshop on discrete breathers, FORTH Campus (Heraklion), June 2001.
- MIR@W day on Discrete Breathers, Math. Institute, University of Warwick, November 2001.
- Workshop *Dynamical System Methods in Fluid Mechanics*, Oberwolfach, July 2002. Poster presentation.
- Workshop *Invasion phenomena in biology and ecology*, IHP, Paris, November 2002. Poster presentation.
- NATO Advanced Research Workshop *Intrinsic Localized Modes and Discrete Breathers in Nonlinear Lattices*, Erice (Sicily), July 2003. Poster presentation.
- Workshop *Discrete atomistic models and their continuum limit*, Weierstrass-Institut für Angewandte Analysis und Stochastik, Berlin, December 2003. Invited speaker.
- Workshop *Dynamics and patterns : at the interface between mathematics, mechanics and nonlinear physics*, Lab. Dieudonné, University of Nice, June 2004. Invited speaker.
- Workshop *Energy localization : from small polyatomic molecules to large biomolecules*, CECAM, Ecole Normale Supérieure de Lyon, September 2004.
- Workshop *Nonlinear excitations : theory and experiments*, University of Sevilla, March 2005.
- Workshop *Nonlinear Physics: Condensed Matter, Dynamical Systems and Biophysics*, IHP, Paris, May 2005. Poster presentation.
- Workshop *FPU+50 : Nonlinear waves 50 years after Fermi-Pasta-Ulam*, INSA de Rouen, June 2005.
- Workshop *Dynamical Problems in Mathematical Materials Science*, ICMS (Edinburgh), July 2005. Invited speaker.
- Workshop *Nonlinear dynamics of acoustic modes in finite lattices : localization, equipartition, transport*, Max-Planck Institute, Dresden, December 2006. Invited speaker.
- Workshop *Hamiltonian lattice dynamical systems*, Lorentz center, Leiden, October 2007. Invited speaker.
- Workshop *Coherence and persistence in nonlinear waves*, University of Nice, January 2009.
- GDR Modélisation, Asymptotique, Dynamique non-linéaire, Grenoble, March 2009.
- Workshop *Localized Excitations in Nonlinear Complex Systems*, Sevilla university, July 2009.
- *8th AIMS conference on dynamical systems, differential equations and applications*, Dresden university, May 2010.

- Workshop *Nonlinear waves and solitons in lattices*, ICMS, Edinburgh, April 2011. Invited speaker.
- SIAM Conference on Applications of Dynamical Systems, session *nonlinear phenomena in granular chains*, Snowbird (USA), May 2011.
- Euromech Colloquium *Nonsmooth contact and impact laws in mechanics*, Grenoble, July 2011.
- SIAM Conference on Nonlinear Waves and Coherent Structures, session *Strongly nonlinear lattices and granular crystals*, Seattle, June 2012.
- SIAM Conference on Mathematical Aspects of Materials Sciences, session *Nonlinear Lattice Dynamics*, Philadelphia, June 2013.
- 4th Canadian Conference on Nonlinear Solid Mechanics (CanCNSM2013), session *Mechanics of granular media*, Montreal, July 2013.
- James H. Belfer Memorial Symposium *Nonlinear Wave Phenomena*, TECHNION - Israel Institute of Technology, Haifa, January 2014. Keynote speaker.

### Visiting researcher

- University of Stuttgart, Math. Institut A, 7-18 Dec. 1998. Seminar.
- University of Warwick, Math. Institute, 9-15 May 2001. Seminar.
- Centre Emile Borel, IHP, Paris, 9 Sep.-15 Dec. 2002. Program *Dynamics of reactive fronts*.
- Lab. Léon Brillouin, CEA Saclay (Commissariat à l’Energie Atomique), 15 March-31 July 2004.
- Imperial College (London), Math. department, 13 Nov. - 15 Dec. 2006. Seminar.
- Max Planck Institut (Dresden), 13-27 Aug. 2007. Advanced study group : *Localizing energy through nonlinearity, discreteness and disorder*. Seminar.
- University of Warwick, Math. Institute, 03-14 Sept. 2007.
- McMaster University, 25 Feb.-03 March 2013. Grant from the French Embassy in Canada. Seminar (AIMS laboratory) and Colloquium (department of Mathematics and Statistics).

### Seminars

Centre de Math. Appli. - École Polytechnique (Nov. 99), Lab. d’Analyse Numérique et EDP - Univ. Paris-Sud (Jan. 00), Lab. d’Hydrodynamique - École Polytechnique (Jan. 00), Lab. de Modélisation en Mécanique - Univ. Paris 6 (Apr. 00), Lab. de Math. - Univ. Blaise Pascal - Clermont-Ferrand (June 00), Lab. de Math. Appli. - Univ. Lyon 1 (June 00), Math. Institute - Univ. Warwick (Oct. 00), Journée Mathématique - Institut de Math. - Toulouse (Oct. 01), Lab. de Math. Appli. - Univ. Lyon 1 (May 02), Ecole Nat. Aviation Civile (Nov. 03), Centre de Physique Théorique - CNRS Luminy - Marseille (Jan. 04), Math.

Department - Univ. Heriot Watt - Edinburgh (July 05), IRMA - Univ. Louis Pasteur - Strasbourg (Feb. 06), Lab. de Math. Jean Leray - Univ. Nantes (Apr. 06), Lab. de Math. - Univ. Savoie (Oct. 06), CERMICS - ENPC (Nov. 06), Lab. de Math. - Univ. Orléans (Nov. 06), Renc. Niçoises de Mécanique des Fluides - Institut Non Linéaire de Nice (Dec. 06), Institut Camille Jordan - Univ. Lyon 1 (March 07), Lab. de Math. - Univ. Pau (June 07), Lab. J. Kuntzmann - Univ. Grenoble (Fev. 08), Lab. J.-A. Dieudonné - Univ. Nice (Apr. 08), Centre de Physique Théorique - Fac. Sci. Luminy - Marseille (Apr. 08), Ecole d'été du non linéaire - Peyresq (Aug. 09), Summer school *Nonsmooth Contact and Impact Mechanics* - Aussois (Sept. 12), Colloquium Math. Dept. - Univ. Saarbrücken (Oct. 13), GDR Dynolin - ENSAM Lille (Oct. 13), LPMMC - Grenoble (Nov. 13).

## PhD thesis supervised

- Yannick Sire (Math Institute, Toulouse Univ., 2002-05), *Propagating solutions in Hamiltonian lattices and reaction diffusion systems*. Co-advisor J.-M. Roquejoffre.
- Cynthia Ferreira (Math Institute, Toulouse Univ., 2005-09), *Nonlinear dynamics of actin and DNA filaments*.
- Marion Lebellego (Math Institute, Toulouse Univ., 2008-11), *Nonlinear waves in discrete models of earthquake faults*. Co-advisor E. Lombardi.
- Samuel Martin (LJK Lab., Grenoble Univ., 2009-12), *Analysis of multi-agent dynamical systems*. Co-advisor A. Girard.
- Amin Bensassi (LJK Lab., Grenoble Univ., 2009-13), *Analysis and control of polynomial dynamical systems*. Co-advisor A. Girard.
- Jose-Eduardo Morales (INRIA and LJK Lab., Grenoble Univ., 2013-16), *Waves in excitable lattice dynamical systems*, Co-advisor A. Tonnelier.

## Grants

- Project *Nonlinear Localisation and Application to the Physics of Biological Molecules* (funding : CNRS and BQR Toulouse Univ.) : 43 KEur (2004-07).
- CNRS grants (Jean Kuntzmann Laboratory, Grenoble) : 4 KEur (2009), 4 KEur (2010), 2 KEur (2013), 2 KEur (2014).
- Rhône-Alpes regional grant : project *Nonlinear waves in granular systems* (IXXI Complex Systems Institute) : 5 KEur (2013-14).
- Contract with Docea Power company, 15 KEur (2011-12), Dimension reduction for RC network models.

## Teaching activity

### University of Nice (France), 1996-1999.

Teaching assistant in Mathematics (undergraduate students), 192 hours.

### École Polytechnique (Palaiseau, France), 1999-2000.

Teaching assistant in experimental fluid dynamics (undergraduate students), 112 hours.

## **University of Warwick (UK), 2000-2001.**

M.Sc. course (Mathematics) jointly with R.S. MacKay : *Coherent Structures*, 10 hours.

## **INSA (National Institute of Applied Sciences), Toulouse (France), 2001-08**

(192 teaching hours per year).

- Undergraduate teaching (INSA) : 2nd year students (example class), continuous learning program (courses, e-learning).
- Undergraduate teaching at Univ. Paul Sabatier, department of Mechanics (licence de Mécanique). Mathematical methods in Mechanics (example class), 30 hours per year (2001-2003).
- Research projects for 5th year students, Mathematics department (INSA) : coordinator (2001-2003), project supervision.
- Postgraduate course *Instability phenomena*, 5th year students, Mathematics department (INSA), 20 hours per year (2001-2003).
- M.Sc. course (Applied Mathematics) : *Local bifurcations and applications to Mechanics*, 2003-2005. 28 hours per year.

## **Grenoble INP - Ensimag, 2008-present.**

(192 teaching hours per year, with lectures and example classes).

- Partial differential equations and finite difference schemes
- Numerical methods (linear and nonlinear systems of equations, interpolation, optimization, integration of ODE)
- Linear algebra
- Dynamical systems

## **Administrative activities**

- Departmental Tenure Committee, applied mathematics, INSA Toulouse (Commission de spécialistes, section 26). Member 2003-08.
- Conseil de l'Institut de Mathématiques de Toulouse. Member 2004-2007.
- International relations (exchange students) : person in charge at the Mathematics department, INSA Toulouse, 2005-08.
- Education and student life committee, Ensimag (2009-2010).
- Scientific committee, research group Labex PERSYVAL-lab (Grenoble), action SIM (modeling and simulation), 2012-present.

## **Conference organisation**

Member of the scientific and organising committee in the *Rencontres du Non-Linéaire*, Institut Henri Poincaré, Paris (March 05, 06).



Member of the scientific and organising committee of the summer school *Ecole de Physique Non-Linéaire de Peyresq*, Peyresq (France), 26 June -03 July 05, 18-25 Sept. 06, 16-23 Sept. 07.

Organizer of the minisymposium *Lattice dynamical systems* at the conference Equadiff 2007 (Vienna, 5-11 Aug. 07).

Co-organizer (with D. Pelinovsky, Z. Rapti, G. Schneider) of the workshop *Lattice Differential Equations*, Mathematisches Forschungsinstitut Oberwolfach (15-21 Sept. 2013).

Co-organizer (with D. Pelinovsky) of the special session *Nonlinear waves in materials with microstructure*, 10th AIMS Conference on Dynamical Systems, Differential Equations and Applications (Madrid, 7-11 July 2014).

## Scientific reports

- Evaluation of research projects or workshop proposals : International Centre for Mathematical Sciences, Edinburgh (2006), Israel Science Foundation (2012), French National Research Agency (2013), Chilean National Commission for Scientific and Technological Research (2013).

- External referee for PhD thesis : L. Loukitch (INSA Rouen, 2006), M. Fraise (Toulouse Univ., 2011).

- Referee for scientific journals :

Applicable Analysis, Commun. Math. Phys., Commun. Nonlinear Sci. Numer. Simul., C. R. Acad. Sci. Paris Série I, Discrete and Continuous Dynamical Systems series B and S, Dynamical Systems, Int. J. Bifurcation and Chaos, Int. J. Modern Physics B, J. Complexity, J. Dynamics Diff. Eq., J. Nonlinear Sci., J. Royal Society Interface, Nonlinearity, Phil. Trans. Roy. Soc. Lond. A, Physica D, Physics Letters A, Physics Reports, Potential Analysis, Proc. R. Soc. A., SIAM Journal on Mathematical Analysis, ZAMP.