

# ANDRÉ NACHBIN

## *Curriculum Vitae*

(last update: October 2019)

**IMPA**/National Institute of Pure and Applied Mathematics

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American citizen, born Chicago, IL.

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### =====**Employment**=====

**IMPA**: Full Professor of Mathematics, 2003 – present.

**IMPA**: Associate Professor of Mathematics, 1994 – 2003.

**Massachusetts Inst. of Tech. (MIT)**: Visiting Professor, Math. Dept., 2015 – 2016.

**New Jersey Inst. of Tech. (NJIT)**: Assistant Professor of Mathematics, 1992 – 1994.

**Ohio State University**: Instructor of the Mathematics Department, 1989 –1992.

### =====**Degrees**=====

**Ph.D. in Mathematics**, Courant Institute, New York University, 1989.

Thesis Title: *‘Reflection and transmission of water waves over rough bottoms.’*

Advisor: Prof. George Papanicolaou

**M.Sc., Civil Engineering**, COPPE, Federal University of Rio de Janeiro, Brazil, 1984.

Thesis Title: *‘Refraction and diffraction of waves by offshore structures.’*

Advisor: Prof. Luiz Carlos Wrobel. *(thesis in Portuguese)*

**B.Sc., Civil Engineering**, Federal University of Rio de Janeiro, Brazil, 1980.

*(fifth year specialization in Structural Analysis)*

### =====**Awards**=====

- Member of the Brazilian Academy of Sciences, 2014.
- David Parkin Visiting Professor of the University of Bath, UK. Visited the Dept. of Mathematical Sciences from September 2013 until February 2014.
- National Medal of Scientific Merit (Ordem Nacional do Mérito Científico/Comendador) granted by President Lula in 2006.

### ===== **Special Committees** =====

- Elected Program Director of the SIAM Activity Group on Nonlinear Waves and Coherent Structures, 2019–2020.
- Mathematics Coordinator for the Rio de Janeiro State Funding Agency, 2018–.
- Manager of Planning and Projects (IMPA), 2018–.
- SIAM T. Brooke Benjamin Prize Selection Committee, 2016.
- Board of Advisors of IMPA, 2010–2018.
- Board of Advisors of the Rio de Janeiro State Funding Agency (FAPERJ), 2012–2015.
- National Research Council (CNPq), Math. Division's Committee, 2011–2013.
- Head of Graduate Studies at IMPA, 2008–2010.
- National Funding Agency(CAPES), Ministry of Education, Math. Division's Committee, 2004–2007.

### ===== **Editorial Board** =====

- Member of the Editorial Board of the *SIAM J. on Applied Mathematics*, **2003–2014**.
- Member of the Editorial Board of the *Computational and Applied Mathematics* journal of the Brazilian Comp. & Appl. Math. Soc. (SBMAC; by Springer-Verlag), **2007–2015**.
- Member of the Editorial Board of the *J. of Math. in Industry* (Springer) **2010–present**.

### ===== **Publications** =====

1. Nachbin, A. & Papanicolaou, G.C.. Water waves in shallow channels of randomly varying depth, *Mathematics of Random Media, Lectures in Applied Mathematics*, AMS, v.27, p. 429-446, 1991.
2. Nachbin, A. & Papanicolaou, G.C.. Boundary element method for long-time water wave propagation over rapidly varying bottom topography. *Int. J. Num. Meth. Fluids* v.14, p. 1347-1365, 1992.
3. Nachbin, A. & Papanicolaou, G.C.. Water waves in shallow channels of rapidly varying depth. *J. Fluid Mech.*, v.241, p. 311-332, 1992.
4. Nachbin, A. & Papanicolaou, G.C.. Water waves in disordered media., *Comp. Appl. Math.*, v.13, n. 3, p. 235-245, 1994.
5. Nachbin, A. .The localization length of randomly-scattered water waves. *J. Fluid Mech.*, v.296, p. 353-372, 1995.
6. Nachbin, A. . Stability analysis of the generalized point vortex approximation, *Phys. Flu*, v. 8, n. 4, 1996.
7. Baker, G. & Nachbin, A. . Stable methods for vortex sheet motion in the presence of surface tension. *SIAM Journal of Scientific Computing*, v. 19, n. 5, p. 1737-1766, 1998.
8. Correia, A. & Nachbin, A., Vetorização e estratégias numéricas na resolução das equações de águas rasas via MATLAB, *Revista Matemática Universitária (Journal for College Mathematics)* , SBM (Brazilian Math. Society), 2001.

9. Fouque, J. & Nachbin, A. , Time-reversed refocusing of surface water waves. *SIAM Multiscale Modeling and Simulation*, v. 1, n. 4, p. 609-629, 2003.
10. Nachbin, A. & Sølna, K., Apparent diffusion due to topographic microstructure in shallow waters, *Phys. Flu.*, v. 15, n. 1, p. 66-77, 2003.
11. Nachbin, A., A terrain-following Boussinesq system, *SIAM J. Applied Mathematics*, v. 63, n. 3, p. 905-922, 2003.
12. Artiles Roqueta, W. & Nachbin, A., Asymptotic nonlinear wave modeling through the Dirichlet-to-Neumann operator, *Methods and Applications of Analysis (Hong Kong)*, Vol. 11, No. 4, pp. 475-492., 2004.
13. Artiles Roqueta, W & Nachbin, A., Nonlinear evolution of surface gravity waves over highly variable depth. *Physical Review Letters*, v. 93, p. 234501-1-234501-4, 2004.
14. Garnier, J. & Nachbin, A., The eddy viscosity for time-reversing waves in a dissipative environment. *Physical Review Letters*, Vol. 93, Vol. 15, 154501, 2004.
15. Fouque, JP., Garnier, J., Muñoz-Grajales, J. C. & Nachbin, A., Time-reversing solitary waves. *Phys. Rev. Lett.*, vol. 92, No. 9, 094502, 2004.
16. Alfaro-Vigo, D. G., Fouque, JP., Garnier, J. & Nachbin, A., Robustness of time reversal for waves in time-dependent random media. *Stochastic Process and Applications*, 113, pp. 289-313, 2004.
17. Fouque, JP., Garnier, J. & Nachbin, A., Shock structure due to stochastic forcing and the time reversal of nonlinear waves, *Physica D*, Vol. 195, pp. 324-346, 2004.
18. Fouque, JP., Josselin Garnier, & Nachbin, A.. Time reversal for dispersive waves in random media, *SIAM J. Appl. Math.*, Vol. 64, No. 5, pp. 1810-1836, 2004.
19. Muñoz-Grajales, J. C & Nachbin, A. , Dispersive wave attenuation due to orographic forcing. *SIAM J. Appl. Math.*, Vol. 64, No.3, pp. 977-1001, 2004.
20. Fouque, JP.; Garnier, J.; Nachbin, A. & Solna, K.. Time reversal refocusing for point source in randomly layered media. *Wave Motion*, 42 (3), pp. 238-260, 2005.
21. Muñoz-Grajales, J. C. & Nachbin, A.. Stiff microscale forcing and solitary wave refocusing. *SIAM Multiscale Modeling and Simulation*, Vol. 3, No. 3, pp. 680-705, 2005.
22. Garnier, J. & Nachbin, A.. The eddy viscosity for gravity waves propagating over turbulent surfaces. *Physics of Fluids*, vol 18. 055101, 2006.
23. Muñoz-Grajales, J. C. & Nachbin, A.. Improved Boussinesq-type equations for highly-variable depth. *IMA Journal of Applied Mathematics*, v. 71, p. 600-633, 2006.
24. Garnier, J., Muñoz-Grajales, J. C. & Nachbin, A. . Effective behavior of solitary waves over random topography. (*SIAM*) *Multiscale Modeling and Simulation*, v. 6, p. 995-1025, 2007.
25. Garnier, J., Kraenkel, R. & Nachbin, A. . Optimal Boussinesq model for shallow-water waves interacting with a microstructure. *Physical Review. E*, v. 76, p. 046311, 2007.
26. Nachbin, A., Choi, Wooyoung . Nonlinear waves over highly variable topography. *European Physical Journal Special Topics*, v. 147, p. 113-132, 2007.

27. Wrobel, J.S., Nachbin, A. & Marchesin, D. . Numerical simulation of injectivity loss in stratified reservoirs. *Comm. Numerical Methods in Engineering*, v. 23, p. 507-520, 2007.
28. Alfaro-Vigo, D.G., Correia, A. & Nachbin, A. . Complete time-reversed refocusing in reflection with an acoustic Lagrangian model. *Communications in Mathematical Sciences*, v. 5, p. 161-185, 2007.
29. Ruiz de Zárate, A., & Nachbin, A.. A reduced model for internal waves interacting with topography at intermediate depth. *Communications in Mathematical Sciences*, v. 6, p. 385-396, 2008.
30. Ruiz de Zárate, A, Alfaro-Vigo, D., Nachbin, A. & Choi, W., A Higher-Order Internal Wave Model Accounting for Large Bathymetric Variations, *Studies in Applied Mathematics*, v. 122, p. 275-294, 2009.
31. Nachbin, A., Discrete and continuous random water wave dynamics, *Discrete and Continuous Dynamical Systems. Series A*, v. 28, p. 1603-1633, 2010.
32. Fokas, A.S. & Nachbin, A. Water waves over a variable bottom: a nonlocal formulation and conformal mappings. *J. Fluid Mech.*, v. 695, p. 288-309, 2012.
33. Nachbin, A. & Simões, V. S., Solitary waves in open channels with abrupt turns and branching points. *J. Nonlin. Math. Physics*, Vol. 19, Suppl. 1, 1240011, 2012.
34. Luz, A.M. & Nachbin, A. Wave packet defocusing due to a highly disordered bathymetry. *Studies in Applied Math*, v. 130, p. 393-416, 2013.
35. Alfaro-Vigo, D. G., Oliveira, S. P., Zárate, A. R. & Nachbin, A. . Fully discrete stability and dispersion analysis for a linear dispersive internal wave model. *Comput. Appl. Math.*, v. 33, p. 203-221, 2014.
36. Nachbin, A. & Ribeiro-Junior, R., A boundary integral formulation for particle trajectories in Stokes waves. *Discrete and Continuous Dynamical Systems. Series A*, v. 34, p. 3135-3153, 2014.
37. Milewski, P.A., Galeano-Rios, C.A., Nachbin, A. & Bush, J.W.M., Faraday Pilot-Wave Hydrodynamics: Modelling and Computation, *J. Fluid Mech.*, v. 778, p. 361-388, 2015.
38. Nachbin, A. & Simões, V.S., Solitary waves in forked channel regions, *J. Fluid. Mech.*, v. 777, p. 544-568, 2015.
39. Nachbin, A., A hydrodynamic pilot-wave: when Classic visits Quantum Mechanics. *ICIAM Mathematical Intelligencer*, Springer, 2015.
40. Ribeiro-Junior, R., Milewski P.A. & Nachbin, A., Flow structure beneath rotational water waves with stagnation points. *J. Fluid Mech.*, v. 812, p. 792-814, 2017.
41. Nachbin, A., Milewski, P. & Bush, J. W. . Tunneling with a hydrodynamic pilot-wave model. *Phys. Rev. Fluids*, v. 2, p. 034801, 2017.
42. Nachbin, A. & Ribeiro-Jr., R. . Capturing the flow beneath water waves. *Philos. Trans. Royal Soc. A-Math. Phys. Eng. Sci.*, v. 376, p. 20170098, 2018.
43. Andrade, D. & Nachbin, A. A three-dimensional Dirichlet-to-Neumann operator for water waves over topography, *J. Fluid Mech.*, vol. 845, pp. 321–345, 2018.

44. Nachbin, A. Walking droplets correlated at a distance, *Chaos*, 28, 096110, 2018.
45. Andrade, D. and Nachbin, A. Two-dimensional surface wave propagation over arbitrary ridge-like topographies, *SIAM J. Appl. Math*, vol. 78, pp. 2465-2490, 2018.
46. Mailybaev, A.A. and Nachbin, A. Explosive ripple instability due to incipient wave breaking, *J. Fluid Mech.*, vol. 863, pp. 876–892, 2019.
47. Flamarion, M., Milewski, P.A. and Nachbin, A. Rotational waves generated by current-topography interaction, *Stud. Appl. Math*, Vol. 142, pp. 433–464, 2019.

===== **Books** =====

*Texts in Portuguese:* ☉

- Nachbin, A., *Modelling of Water Waves in Shallow Channels*, Computational Mechanics Publications, Boston, USA, 1993. 145p. ISBN: 1-56252-062-8.
- ☉ Nachbin, A. & Zárate, A. R., *Tópicos Introdutórios à Análise Complexa Aplicada*, IMPA, 2007, v. 1., 109p. ISBN: 978-85-244-0262-3.  
(*Introductory Topics in Applied Complex Analysis*)
- ☉ Nachbin, A., *Aspectos de Modelagem Matemática em Dinâmica dos Fluidos*, IMPA, 2001, 110p. ISBN: 85-244-0170-2  
(*Mathematical Modelling Aspects in Fluid Dynamics*)
- ☉ Nachbin, A. & Tabak, E., *Equações Diferenciais em Modelagem Matemática e Computacional*, IMPA, 1997, 99p. ISBN: 85-244-0127-3.  
(*Differential Equations in Mathematical and Computational Modelling*)

## Graduate Student Supervision

===== **Doctoral Research Supervision:** =====

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Student, graduation year [thesis related papers; # from my publications].  
thesis title; written in Portuguese (P); written in English (E).  
First job positions.

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- Juan Carlos Muñoz Grajales, 2002 [15,19,21].  
Dispersive wave attenuation and refocusing due to disordered orographic forcing. (E)  
Faculty in the Math. Dept. of the Universidad del Valle, Cali, Colombia.
- Daniel G. Alfaro Vigo, 2004 [16,28].  
Time-reversed acoustics in a randomly changing medium. (E)  
Post-doc in the Math. Dept. at UC Irvine, CA. Then faculty at the Math. Institute of the Federal Univ. of Rio de Janeiro (UFRJ).
- William Artiles Roqueta, 2004 [12,13].  
Modeling non-linear waves through the Dirichlet-to-Neumann operator. (E)  
Faculty in the Math. Dept. of the Federal Univ. of Pernambuco (UFPe).

- Júlia S. Wrobel, 2005 [27]. co-advisor: Prof. Dan Marchesin/IMPA.  
Loss of injectivity in stratified reservoirs. (P)  
Faculty in the Math. Dept. of the Federal Univ. of Espírito Santo (UFES).
- Ailín F. Ruiz de Zárate, 2007 [29,30].  
A reduced model for internal waves interacting with submarine structures at intermediate depth. (E)  
Faculty in the Math. Dept. of the Federal Univ. of Paraná (UFPR).
- Ana Maria S. Luz, 2009 [34].  
Wavetrain stability over a highly variable bathymetry. (P)  
Faculty in the Math. Dept. of the Federal Univ. Fluminense (UFF).
- Vanessa da Silva Simões, 2013 [33,38].  
Evolution of solitary waves in channels with abrupt turns and branching points. (E)  
Researcher at the Schlumberger Research Center in Rio (Industrial district of UFRJ).
- Roberto Ribeiro S. Junior, 2014 [36,40,42]. co-advisor: Prof. P.Milewski/Univ.Bath, UK.  
Particle trajectories generated by periodic waves with vorticity. (P)  
Post-doc at the Math. Dept. of the Univ. of Vienna and at the Math. Dept. of the University of Bath, UK. Then faculty in the Math. Dept. of the Federal Univ. of Paraná (UFPR).
- Carlos Antonio Galeano-Ríos, 2016 [37,A,B]. co-advisor: Prof. P. Milewski/Univ. Bath, UK.  
Hydrodynamic Pilot-waves: Analytical modeling approaches to the interaction of drops and surface waves. (E)  
Post-doc at the Math. Dept. of the University of Bath, UK.  
[A] Damiano, A.P., Brun, P.-T., Harris, D.M., Galeano-Ríos, C.A. and Bush, J.W.M., Surface topography measurements of the bouncing droplet experiment. *Exper. Fluids*, v. 57, p. 163, 2016.  
[B] Galeano-Ríos, C.A., Milewski, P.A., Vanden-Broeck, J.-M., Non-wetting impact of a sphere onto a bath and its application to bouncing droplets. *J. Fluid Mech.*, v. 826, p. 97-127, 2017.
- David Eugenio Andrade Perez, 2016 [43,45].  
Modeling of three dimensional water waves, (E)  
Post-doc at the Civil and Environmental Eng. Dept. of the Technion, Israel.
- Marcelo Flamarion, 2018 [47], co-advisor: Prof. P. Milewski/Univ. Bath, UK.  
Wave models due to current-topography interaction. (P)  
Faculty at the Math. Dept. of the Federal Rural Univ. of Pernambuco (UFRPe).

### ===== Master's Degree Supervision =====

(graduation year indicated, as well as the following PhD program)

- Elvis A. Agüero Vera. 2019. Obtained MSc without an undergraduate degree.
- Stevens Paz Sanchez. 2013. PhD student at the State Univ. of São Paulo, S.Carlos.
- Carlos A. Galeano Ríos. 2012. PhD student at IMPA (advisor A. Nachbin).
- Mauricio Jose Poletti Merlo. 2012. PhD student at IMPA (advisor M. Viana).
- Carlos Eugenio Sauer Ayala. 2010. PhD student at the MIT, Math. Dept., USA.
- Rafael A. Monteiro. 2010. PhD student at the Indiana Univ. , Math. Dept., USA.
- Vanessa da Silva Simões. 2009. PhD student at IMPA (advisor A. Nachbin).
- Dalia Mellisa Bonilla. 2006. PhD student at IMPA (advisor L.C. Velho).
- Juliana Faus da Silva Dias. 2005. PhD student at CAOS/Courant Inst., NYU, USA.
- Ailín Ruiz de Zárate. 2003. PhD student at IMPA (advisor A. Nachbin).
- Leonardo Xavier Espin Estevez. 2003. PhD student at NJIT, USA.
- José Koiller. 2002. PhD student at the Courant Institute, NYU, USA.
- Alexandre C. M. Federici. 1998. Student from UFRJ.

### ===== Post-Doctoral Supervision at IMPA =====

- David Eugenio Andrade Perez, 2016–2017.
- Ricardo André Barros, 2011–2013.
- Leonardo Espin Esteves, 2010–2011.
- Glauber José Ferreira Tomaz da Silva. 2007–2008.
- Daniel Gregorio Alfaro Vigo. 2006–2007.

## Invited seminars, colloquia and conference presentations

•: international talks. ⊙: within Brazil.

### 2019:

- Applied and Interdisciplinary Mathematics Seminar, University of Bath, UK.
- ⊙ Colloquium of the Physics Institute, Federal University Fluminense (UFF), Niterói.
- ⊙ Invited speaker at the Workshop on PDEs and Applied Mathematics, Federal University Fluminense (UFF), Niterói.

### 2018:

- ⊙ Physics Colloquium at the Physics Institute of the Federal University of Rio de Janeiro (UFRJ), Rio, Brazil.
- ⊙ PDE and Applied Mathematics seminar at the Math. Department of UFF (Federal University Fluminense), Niterói, RJ, Brazil.
- Colloquium at the Erwin Schrödinger International Institute for Mathematics and Physics, Vienna.
- ⊙ Invited speaker at the Workshop on Mathematical and Computational Problems of Incompressible Fluid Dynamics, IMPA.
- ⊙ Seminar at the Mechanical Engineering Department of the Catholic University of Rio (PUC), Rio de Janeiro.
- Invited speaker at the Hydrodynamic Quantum Analogs VIII, Brown University, Providence, USA.
- Invited speaker at the minisymposium MS12 organized by Prof. W. Choi (NJIT), SIAM Nonlinear Waves and Coherent Structures, Anaheim, CA, USA.

### 2017:

- ⊙ Opening conference at the Semana Nacional de Ciência e Tecnologia/SBPC, UFBA, Vitória da Conquista, Brazil.
- Invited speaker, Nonlinear Water Waves, Isaac Newton Institute for Mathematical Sciences, Cambridge, UK.
- Invited speaker, Nonlinear Water Waves Workshop, Schrödinger International Inst. for Mathematics and Physics, Vienna.
- ⊙ Invited speaker at the Oktobermat XV, Math. Dept., PUC/RJ.
- Invited speaker, Waves and Particles workshop, Novel Insights, Physics Dept., UNAM, Mexico.
- ⊙ Mechanics Seminar, Mathematics Dept., UnB, Brasília.
- ⊙ Invited speaker at the IX Symposium on Numerical Analysis and Optimization, UFPr (Federal University of Paraná), Curitiba, Brazil.
- Invited speaker at the workshop *Making a Splash - Droplets, Jets and Other Singularities* organized at the *Inst. for Computational and Experimental Research in Mathematics* (ICERM), Brown University, USA.
- Physical Mathematics Seminar, Mathematics Department, MIT, USA.



⊙ Seminar CAIME/UERJ, Math.Dept. UERJ (Rio de Janeiro State University).

**2016:**

• Contributed talks at the *Annual Meeting da American Physical Society, Division of Fluid Dynamics*, Portland, OR, USA.

• Invited instructor at the *The Burgers Program 2016, Summer Research School on Fluid Dynamics: Topics in Nonlinear Water Waves*, University of Maryland, USA.

• Invited lecturer at the *Partial Differential Equations Summer School*, Gulbenkian Foundation, Lisbon, Portugal.

• Applied Math Seminar, Ohio State University, Columbus, OH, USA.

⊙ invited speaker in the session *Recent Developments in Fluids*, 1st Joint Meeting Brazil-Italy in Mathematics, IMPA, Brazil.

⊙ Plenary speaker at the Brazilian National Conference on Applied and Computational Mathematics, Gramado, Brazil.

• Plenary speaker at the *Frontiers of Applied and Computational Mathematics*, New Jersey Inst. of Technology, Newark, USA.

⊙ Mechanical Engineering Seminar at COPPE/UFRJ (Federal University of Rio de Janeiro), Brazil.

**2015:**

• Physical Mathematics Seminar, Math. Department, MIT, USA.

• Invited speaker at the *Recent Advances in Applied and Computational Mathematics* meeting at the Huazhong University of Science and Technology Wuhan, China. Meeting in honor of Prof. Russ Caflisch's 60th birthday.

• Invited speaker at the *Water Wave Dynamics* meeting at the Math. Department of the University of Vienna, Austria.

• Invited speaker at the *Workshop on Interdisciplinary Mathematics*, Center for Interdisciplinary Mathematics at the Department of Mathematics, Penn State University.

• Contributed talk at the American Physical Society, Division of Fluid Dynamics Annual Meeting (APS/DFD), Boston, USA.

⊙ Invited speaker at the VII Summer Workshop of Mathematics, UnB, Federal University of Brasília, Brazil.

**2014:**

⊙ Invited speaker at the School "Around Vortices: from Continuum to Quantum Mechanics", IMPA, Brazil.

• Minisymposium and talk at the SIAM Conference on Nonlinear Waves and Coherent Structures, Cambridge, U.K..

• Invited speaker at the Conference on Stochastic Asymptotics and Applications in honor of the 60th birthday of Prof. J.P. Fouque, Department of Statistics and Applied Probability, University of California at Santa Barbara, USA.

• Fluid Dynamics Group Seminar, Dept. of Mat., Imperial College of London, U.K..

• The David Parkin Lecture of the University of Bath, U.K..

- The London Analysis and Probability Seminar, Imperial College of London, U.K..
- ⊙ Applied Mathematics Seminar at the Federal University of Santa Catarina (UFSC), Brazil.
- ⊙ Probability Seminar at the Federal University of Rio de Janeiro (UFRJ), Brazil.
- Invited speaker at the *Theory of Water Waves; Summer School*, Newton Institute, University of Cambridge, U.K..
- ⊙ Invited speaker at the XII Oktobermat, Mathematics Dept. of the Catholic University (PUC), Rio de Janeiro, Brazil.

### **2013:**

- Invited speaker at the Recent Developments in Applied Mathematics conference, Math. Dept., Stanford University. A conference to honor the 70th Birthday of Professor George Papanicolaou.
- Invited speaker at the IUTAM Symposium 2013: *Nonlinear interfacial wave phenomena from the micro to the macro-scale*, Cyprus.
- Applied Maths Seminar, Math. Dept. University of Manchester, UK.
- Applied Maths Seminar, Math. Dept. Univ. College of London.
- Lefschetz Center for Dynamical Systems Seminar, Division of Applied Math., Brown University, USA.
- ⊙: Computer Science Colloquium at the Federal University of Rio de Janeiro (UFRJ).

### **2012:**

- Applied and Computational Analysis seminar, DAMTP, University of Cambridge, UK.
- Centre for Nonlinear Mechanics seminar, Math. Dept., University of Bath, UK.
- Fluid Dynamics Group seminar, Math. Dept., Imperial College of London, UK.
- Invited speaker at the Workshop on Mathematical Aspects of Water Waves, Math. Dept., King's College of London, UK.
- Contributed talk at the Intern. Conf. on Nonlinear Waves in Fluids, in honor of Roger Grimshaw, Loughborough, UK.
- Physical Mathematics Seminar, Math. Dept., MIT, USA.
- Applied Mathematics Seminar, Math. Dept., Univ. of North Carolina at Chapel Hill, USA.
- Invited speaker in the minisymposium MS21, of the SIAM Conf. on Nonlinear Waves and Coherent Structures, Seattle, USA.
- ⊙ Invited speaker at the II Brazil-China Symp. on Applied and Computational Math., Iguazu Falls, Brazil.
- ⊙ Invited speaker at the VI Scientific Initiation Workshop, short-course on Waves in Fluids, IMPA, Brazil.
- ⊙ Invited speaker at the Intern. Workshop on N-vortex and N-body dynamics, Federal University of Rio de Janeiro (UFRJ), Brazil.
- ⊙ Seminar at the Environment Eng. Division of the *Engineering Club* of Rio de

Janeiro.

**2011:**

- Invited speaker at the Journées en l'honneur de George Papanicolaou (doctor honoris causa by Paris VII), Paris, France.
- Invited speaker at the workshop Qualitative and numerical aspects of water waves and other interface problems, Inst. E. Schrödinger, Vienna, Austria.
- Invited speaker at the workshop Advances in the Numerical Solution of Constrained Differential Equations in honor of Uri Ascher's 65th birthday, Vancouver, Canada.
- Contributed talk at the 7th International Congress on Industrial and Applied Mathematics - ICIAM 2011, Vancouver, Canada.
- ◉ Invited speaker at the IV EBED - Brazilian School on Differential equations, J.Pessoa, Brazil.
- ◉ Mathematics Colloquium at the Federal University of Santa Catarina (UFSC), Florianópolis, Brazil.
- ◉ Invited speaker at the III Symposium on Numerical Analysis and Optimization at the Federal University of Paraná (UFPr), Curitiba.

**2010:**

- Invited speaker at the conference Frontiers in Applied and Computational Mathematics, FACM 2010, NJIT, Newark, EUA.
- Invited speaker at a mini-symposium in the Second International Conference: Non-linear Waves—Theory and Applications , Beijing, China.
- Invited speaker at a mini-symposium in the European Geosciences Union, General Assembly 2010, Natural Hazards session NH5.1. Vienna, Austria.
- Invited speaker at the WAMCE 2010 – Workshop on Computational and Applied Mathematics for Engineering; Asumpcion, Paraguay.
- ◉ Invited speaker at a mini-symposium in the Brazilian Conference on Applied and Computational Math (CNMAC), Águas de Lindóia, SP.
- ◉ Dynamical and Stochastic Systems seminar at the State University of Campinas (UNICAMP), Campinas.
- ◉ Stochastic Processes and Applications seminar, at NUMEC/USP, State University of São Paulo, São Paulo, Brazil.
- ◉ Invited speaker at the 1st Franco-Brazilian Fluids Summer School, at the State University of Campinas (UNICAMP), Campinas.

**2009:**

- Invited speaker at the First Uruguayan Meeting on Fluid Mechanics, Montevideo, Uruguay.
- ◉ Invited speaker at the Brazilian Academy of Sciences; The Year of France in Brazil, Rio de Janeiro.

⊙ Invited speaker at the First Brazil-China Conference on Scientific Computing - BCSciComp2009, LNCC, Petrópolis.

⊙ Physics Colloquium at the Federal University of Rio de Janeiro (UFRJ).

⊙ Invited speaker at the Trends in Mathematics for Engineering Education, UNICAMP, Campinas, SP.

⊙ Organizer and speaker at the INCT Workshop on Mathematics and Climate Changes, IMPA.

⊙ Invited speaker at the SEMAP, Applied Math Week at the Federal University of Rio de Janeiro (UFRJ).

### **2008:**

• Invited speaker at the Latin American & Caribbean Congress of Theoretical and Applied Mechanics (LACCOTAM), Trinidad and Tobago.

• Invited speaker at a mini symposium in the International Conference: Nonlinear Waves—Theory and Applications, Beijing, China.

• Invited speaker at a mini-symposium in the SIAM Conference on Nonlinear Waves and Coherent Structures, Rome, Italy.

⊙ Plenary speaker at the AMS-SBM First Joint Meeting, IMPA.

⊙ Physics Colloquium, at the Federal University of Pernambuco, Recife, Brazil.

⊙ Invited speaker at the Graduate Students Meeting at UNICAMP, Campinas.

### **2007:**

• Invited speaker at the ALFA/SCAT First Latin American Scientific Workshop, Chile.

• Invited speaker at the NSF-Conicet Pan-American Advanced Studies Institute (PASI) on Interfacial Fluid Dynamics: From Theory to Applications, Argentina.

• Invited speaker at the ALFA/SCAT Second Latin American Scientific Workshop, Mexico.

⊙ Short-course in the 26o. Colóquio Brasileiro de Matemática (the Brazilian National Math Meeting), IMPA, Brasil.

⊙ Invited speaker at the "Mathematics Jornadas" at the Catholic University/PUC-Rio.

⊙ Invited speaker at the II National Meeting on Theoretical and Computational Physics, Institute of Theoretical Physics (IFT), São Paulo.

⊙ Inter-Institutional Colloquium on Stochastic Modeling and Application, CBPF (Brazilian Center for Physics Research), Rio.

### **2006:**

• Contributed speaker at the Eleventh International Conference on Hyperbolic Problems Theory, Numerics, Applications, Lyon, France.

- Invited speaker at the mini-symposium (MS18) of the SIAM Conference on Non-linear Waves and Coherent Structures, Orlando, USA.
- Invited speaker at the ALFA project on Scientific Computing Advanced Training (SCAT) Kick-off Meeting, Universidad Politecnica de Catalunya, Barcelona, Spain.
- Invited speaker at the Second European SCAT Workshop, Paris.
- Invited speaker at the I ENED, Encuentro Nacional de Ecuaciones Diferenciales, Cordoba, Argentina.
- Short-course in the Math. Dept. of the Universidad del Valle, Cali, Colombia.
- Invited speaker at the PDEs Workshop, Universidad del Valle, Cali, Colombia.

### **2005:**

- Physical Mathematics Seminar, Math. Dept., MIT, USA.
- Contributed talk at the Annual Meeting of the Division of Fluid Dynamics/American Physical Society, Chicago, USA.
- Invited speaker at the Frontiers on Applied and Computational Mathematics, NJIT, Newark, USA.
- Invited speaker at the Nonlinear Waves 50 Years after Fermi-Pasta-Ulam (FPU+50), Rouen, France.
- Invited speaker at the Partial Differential Equations, Optimal Design and Numerics, Benasque, Spain.
- Invited speaker at the Radiative transport and diffusion-approximation: From theory to applications, CIRM/Luminy, Marseille, France.
- ⊙ Invited speaker at the Fourth Industrial Math Week, at the Federal University of Paraná (UFPr), Curitiba, Brazil.
- ⊙ Invited speaker for a young audience at the 25th Colóquio Brasileiro de Matemática (Brazilian National Math. Meeting).

### **2004:**

- Invited speaker at the International Workshop on Nonlinear Waves, in honor of Prof. Papanicolaou's 60th birthday, Hong Kong.
- Invited speaker at a minisymposium in the Monte Carlo Methods and Probabilistic Methods in PDEs, Juan-Les-Pin, France.
- Contributed presentation at the SIAM Nonlinear Waves and Coherent Structures, University of Central Florida, Orlando, USA.
- Seminar at the Math. Dept., CAMP (Appl. Math. Program), University of Chicago, Chicago, USA.
- Invited speaker at the SBPC/AAPC joint meeting in Buenos Aires, Argentina.
- Seminar at the Physics Dept. of the University of New Mexico, Albuquerque, USA.
- ⊙ Plenary speaker at the XXVII CNMAC, Brazilian National Meeting for the Society of Computational and Applied Math., Porto Alegre, Brazil.

⊙ Invited speaker at the Workshop on Nonlinear Waves, Institute of Theoretical Physics (IFT) , São Paulo, Brazil.

⊙ Invited speaker at the 1st Undergraduate Math Meeting at the Federal University of Santa Catarina (UFSC), Florianópolis, Brazil.

⊙ Invited speaker at the VII Computational Modeling Meeting at IPRJ, Friburgo, Brazil.

### **2003:**

- Colloquium on Atmosphere-Ocean Science, Courant Institute, NYU, USA.

- Fluid Dynamics Seminar, New Jersey Institute of Technology, Newark, USA.

- Invited speaker at the Workshop on Wave Propagation and Time Reversal, University of California at Irvine, USA.

⊙ Invited speaker at the V Seminar on Waves, Tides and Ocean Engineering, at the Brazilian Navy's Institute for Ocean Studies Alm. Paulo Moreira, Arraial do Cabo, Brazil.

⊙ Invited speaker at the Math. Week of the Catholic University, Rio de Janeiro, Brazil.

### **2002:**

- Invited speaker at mini-symposium of the SIAM 50 Years Annual Meeting, Philadelphia, USA.

- Contributed talk at the SIAM 50 Years Annual Meeting, Philadelphia, USA.

- Center of Applied Mathematics Seminar, University of Porto, Portugal.

⊙ Invited speaker at the First Workshop on Nonlinear Analysis in PDEs, Federal University of Minas Gerais (UFMG), Belo Horizonte, Brazil.

⊙ Invited speaker at the Mini-Colloquium on Ondulatory Problems in Geophysical Fluids, IAG/USP, São Paulo, Brazil.

⊙ Invited speaker at the Regional Colloquium of the Brazilian Math Society (SBM), Curitiba, Brazil.

⊙ Invited speaker at the First Biannual Math Meeting of the Brazilian Math Society (SBM), Belo Horizonte, Brazil.

### **2001:**

- Invited speaker at the Workshop Imaging in a Noisy Environment, Institute of Applied and Computational Mathematics, Crete, Greece.

- Contributed talk at the SCiCADE, Intern. Congress on Scientific Computing and Differential Equations, Vancouver, Canada.

⊙ Invited speaker at the VI Workshop on Computational Methods for Atmospheric, Oceanic and Groundwater Flows, National Laboratory of Scientific Computing (LNCC).

⊙ Invited speaker at the VI ERMAC-UFU, local meeting of the Brazilian Society

for Applied and Computational Mathematics (SBMAC), Uberlândia, Brazil.

### **2000:**

- Computer Science Seminar, University of British Columbia, Vancouver, Canada.
- ⊙ Contributed talk at the Brazilian Meteorology Congress, State University of Rio de Janeiro (UERJ), Rio de Janeiro, Brazil.
- ⊙ Seminar at the Institute of Theoretical Physics (IFT), São Paulo, Brazil.
- ⊙ Seminar at the National Laboratory of Scientific Computing (LNCC), Petrópolis, Brazil.

### **1999:**

- Applied Mathematics Seminar, Università Degli Studi Roma Tre, Rome, Italy.
- Invited speaker at the V Workshop on Computational Methods in Atmospheric, Oceanic and Groundwater Flows, Trento, Italy.
- ⊙ General audience seminar ("divulgação") at the Federal University Fluminense (UFF), Niterói, Brazil.
- ⊙ Invited speaker at the UFMG session of the Brazilian Academy of Sciences, Belo Horizonte, Brazil.
- ⊙ Invited speaker at the Brazilian Navy's Institute for Ocean Studies Alm. Paulo Moreira, Arraial do Cabo, Brazil.
- ⊙ Invited speaker at the Workshop on Computational Modeling and Applications, National Laboratory of Scientific Computing (LNCC), Petrópolis, Brazil.

### **1998:**

- Applied Math Seminar, New Jersey Institute of Technology, Newark, USA.
- Invited speaker at the IV Workshop on Computational Methods for Atmospheric, Oceanic and Groundwater Flows, US Geological Survey, Denver, USA.
- Contributed talk at the IV International Conference on Mathematical and Numerical Aspects of Wave Propagation, SIAM, Denver, USA.
- ⊙ Math Colloquium at the Catholic University, Rio de Janeiro, Brazil.
- ⊙ Invited speaker at the Workshop in PDE: Thermo and Visco-Elasticity, Numerical Methods and Control, LNCC, Brazil.

### **1997:**

- ⊙ Math Modeling and Numerical Methods Seminar, State University of São Paulo (USP), São Paulo, Brazil.
- ⊙ Computing Seminar, State University of São Paulo (USP), São Carlos, Brazil.
- ⊙ Math and Scientific Computing Seminar, Federal University of Santa Catarina (UFSC), Florianópolis, Brazil.
- ⊙ Invited speaker at the II Workshop on Computational Methods for Atmospheric, Oceanic and Groundwater Flows, National Laboratory of Scientific Computing (LNCC),

Rio de Janeiro, Brazil.

### **1996:**

- Invited speaker at the II Workshop on Computational Methods for Atmospheric, Oceanic and Groundwater Flows, Trento, Italy.
- Invited speaker at the XIII National Seminars of Mathematics, Córdoba, Argentina.
- ⊙ Invited speaker at the PDEs and Numerical Analysis Meeting at the Federal University of Rio de Janeiro (UFRJ), Brazil.
- ⊙ Invited speaker at the High Performance Computing Meeting at the National Laboratory of Scientific Computing (LNCC), Rio de Janeiro, Brazil.
- ⊙ Invited speaker at the IV ERMAC, regional meeting of the the Brazilian Society for Applied and Computational Mathematics (SBMAC), Friburgo, Brazil.

### **1995:**

- Contributed talk at the III SIAM Conference on Mathematical and Computational Issues in the Geosciences, San Antonio, USA.
- ⊙ Applied Math Seminar, State University of São Paulo (USP), São Paulo, Brazil.
- ⊙ Mathematics Seminar, University of Brasília (UnB), Brasília, Brazil.
- ⊙ Particle Physics Seminar at the Brazilian Center for Physics Research (CBPF), Rio de Janeiro, Brazil.
- ⊙ Mathematics and Mathematical-Physics Seminar, Federal University of Minas Gerais (UFMG), Belo Horizonte, Brazil.
- ⊙ Physics Colloquium at the Brazilian Center for Physics Research (CBPF), Rio de Janeiro, Brazil.
- ⊙ Invited speaker at the I Workshop on Computational Methods for Atmospheric and Oceanic Flows, National Laboratory of Scientific Computing (LNCC), Rio de Janeiro, Brazil.
- ⊙ Invited speaker at the CNMAC (Brazilian Conference on Applied and Computational Math.), Curitiba, Brazil.
- ⊙ Contributed talk at the Italian-Latin American Conference in Applied and Industrial Mathematics, Federal University of Rio Grande do Sul (UFRGS), Porto Alegre, Brazil.

### **1994:**

- ⊙ Seminar at COPPE/Mechanical Engineering (UFRJ), Rio de Janeiro, Brazil.

### **1993:**

- Applied Math Seminar, University of Delaware, Newark, USA.
- Applied Math Seminar, Pennsylvania State University, University Park, USA.
- Invited speaker at the Probability and Numerical Methods Conference, INRIA, Paris, France.



- Contributed talk at the SIAM Annual Meeting, Philadelphia, USA.
- Contributed talk at the SIAM II International Conference on Mathematical and Numerical Aspects of Wave Propagation, Univ. of Delaware, Newark, USA.
- ◉ Applied Math Seminar, State University of Campinas (UNICAMP), Campinas, Brazil.
- ◉ Invited speaker at the III Workshop on Partial Differential Equations and Applications, IMPA, Rio de Janeiro, Brazil.

### **1992:**

- Calderón-Zygmund Seminar, University of Chicago, USA.
- Applied Math Seminar, Courant Institute, NYU, USA.
- Applied Math Seminar, State University of New York, Stony Brook, USA.
- Mathematics Colloquium, Haverford College, PA, USA.
- Applied Math Seminar, New Jersey Institute of Technology, Newark, USA.
- Civil Engineering Seminar, New Jersey Institute of Technology, Newark, USA.
- Invited speaker at the 45th Probability Seminar, Case Western University, Cleveland, USA.
- Contributed talk at the Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Talahassee, USA.
- Contributed talk at the SIAM Annual Meeting, Los Angeles, USA.

### **1991:**

- ◉ Applied Math Seminar, State University of São Paulo (USP), São Paulo, Brazil.
- ◉ Invited speaker at the Analysis Session of the XVIII Brazilian National Meeting, IMPA, Rio de Janeiro, Brazil.

### **1990:**

- Applied Math Seminar, University of Toronto, Canada.
- Mathematics Colloquium, University of Rochester, USA.

### **1989:**

- Probability Seminar, Ohio State University, Columbus, USA.
- Applied Math Seminar, General Motors Research Laboratories, Detroit, USA.
- Applied Math Seminar, Ohio State University, Columbus, USA.
- Contributed talk at the XXI International Conference on Boundary Elements Method, MIT, USA.
- Invited presentation at the Mathematics of Random Media, AMS-SIAM Summer Seminar, Virginia, USA.

### **1988:**

- ◉ Applied Math Seminar, IMPA, Rio de Janeiro, Brazil.

⊙ Applied Mechanics Seminar, National Lab. Scien. Computing (LNCC), Rio.

**1987:**

⊙ Applied Mechanics Seminar, National Lab. Scien. Computing (LNCC), Rio.

## APPENDIX: Remarks on my US teaching experience.

(2015-2016) Visiting professor, teaching at the Math Department of MIT.  
Stimulating the interest in Mathematics, for students from other fields.

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Graduate Course **18.306** (Advanced Partial Differential Equations with Applications)  
Comments by two graduate students from the Mechanical Engineering Dept.  
I omitted the names regarding the students' privacy.

From: XXXYYY [XXX@mit.edu]

Sent: Tuesday, May 17, 2016 4:12 PM

To: Andre Nachbin

Subject: Thank You!

Hi Prof. Nachbin,

I just wanted to reach out and say thanks for the amazing 18.306 class that you offered. As you might remember, I was quite confused about taking this class against another one, and I am really glad that I took 18.306.

It was really satisfying for me to understand most of the concepts discussed in the paper for the final project, even when it looked quite intimidating at first. The notes you uploaded on Stellar were also very useful and I am sure I will look back at them in the future as the need arises.

Thank you once again!

Regards,

XXX

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From: XXXYYY [XXX@mit.edu]

Sent: Thursday, March 03, 2016 3:21 PM

To: Andre Nachbin

Subject: Re: left e-vector

Hi Professor

Thank you! I had just never heard of left and right eigenvectors, but it makes sense now. I'm happy to keep asking questions! I'm enjoying your course a lot but realize my background in math is not as strong as math majors most likely.

Regards

XXX

## Undergraduate Course 18.04 (Complex Variables with Applications)

Comments by a student from the Physics Dept. I omitted the name regarding the students' privacy.

From: XXX [XXX@mit.edu]  
Sent: Friday, August 12, 2016 7:44 PM  
To: Andre Nachbin  
Subject: Mathematics, physics, and the final year

Hi Professor Nachbin,  
I hope you're having a good summer, and that your pilot wave investigation is continuing to uncover surprises! I'm writing to you in search of advice about potentially doubling down on mathematics this coming year and shooting for a major. I've been doing research in theoretical physics, and it seems that every path I go down, I run into the need for more mathematical foundation. I am a physics major, and my advisor in the physics department is suggesting that I fill my schedule with as much physics as possible (to the exclusion of mathematics), but I'm not sure that's the best approach. I have finished the standard undergraduate physics classes, so I would take only very specialized classes from the physics department. These will certainly be useful down the road, but (if all goes well, and I am in a graduate program the year after next) I will be taking these classes soon anyway. What I probably won't have a chance to learn thoroughly in the classroom after I graduate is mathematics. I've taken two semesters of algebra, differential equations, and your complex variables class (as well as the other GIRs), but it seems to me that fields like topology, lie algebra, and differential geometry are extremely useful in high level physics (and beautiful in their own right). I know that you're a card carrying mathematician, but it also seems to me that your work is somewhere between pure math and theoretical physics, so I thought you might have some insight on the topic: If you were planning to spend your life studying physical systems with mathematical tools, and you were slotting classes into your final undergraduate year, would you try to flesh out a mathematical underpinning, or just delve deeper into specialized physics?  
Thank you!  
XXX

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From XXX <XXX@mit.edu> Sat, Aug 20, 2016 at 4:00 PM  
To: Andre Nachbin <nachbin@impa.br>

Hi Professor Nachbin,  
Thank you for your response!  
I hear what you're saying, and I think I'll try to substitute a math course for one of the physics courses I would otherwise have taken. Even in this last week, the problem I have been working on for the summer took me into random matrix theory, and reminded me once again that "speaking the language" of mathematics more fluently, even in a general sense, would help me enormously. I greatly enjoyed 18.04, and it turned out to be crucial knowledge for quantum field theory (it seemed, as in so many physics texts, that the author pulled the tools (particularly the residue theorem) out of a hat). I'm planning to take the mathematics project lab (8.821) next semester, but maybe it would be better to take other mathematics in the fall (analysis, topology) and postpone that until the spring. Were you familiar with that course?  
XXX

(1994) Excellence in Teaching nomination by the Math Department of NJIT:

**NJIT**  
New Jersey Institute of Technology

DEPARTMENT OF MATHEMATICS

A Public  
Research University

Department of Mathematics

MEMORANDUM

TO: Leslie Weisman and Fadi Deek, Co-chairs  
Committee on Excellence in Teaching

FROM: P. Milojevic, Chair *P. M.*  
Mathematics Department Committee on Teaching Excellence

RE: Excellence in Teaching Award Nomination for Professor Andre Nachbin,  
Undergraduate Upper Division

DATE: March 31, 1994

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The Department of Mathematics Excellence in Teaching Committee recommends Professor Andre Nachbin for the Excellence in Teaching in the Upper Undergraduate Division Award.

The committee's recommendation is based on Dr. Nachbin's outstanding performance as a teacher as evidenced by his student evaluations and recommendation letters.

Dr. Nachbin is a dedicated and dynamic teacher who has the ability to present a subject matter in a clear way and is able to excite interest in it. He has also supervised a research project on numerical computations with applications to Fluid Dynamics.

Dr. Nachbin exemplifies the kind of dedicated teacher who deserves to be nominated for the above award and we recommend him highly.

cc: G. Kriegsmann

GK:sjs

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