



## Personal Data

**Fabio Augusto da Costa Carvalho Chalub**, Born on 7th November, 1972 on Rio de Janeiro, Brazil. Portuguese and Brazilian citizen.

Professional address Departamento de Matemática, Universidade Nova de Lisboa, Quinta da Torre, 2829-516, Caparica, Portugal.

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ResearcherID <http://www.researcherid.com/rid/B-5040-2008>

## Academic Background

Ph.D. in Mathematics **Instituto de Matemática Pura e Aplicada (IMPA), Rio de Janeiro, Brazil**, May, 2001.

Equivalence in Portugal given by Universidade Nova de Lisboa

Area Partial Differential Equations

Thesis title “Huygens’ Principle for Dirac Operators”

Committee Jorge P. Zubelli (advisor), F. Alberto Grümbaum (UC Berkeley), Francesco Toppan (CBPF), Jair Koiller (LNCC), Carlos Isnard, Romand Paunov, Rafael Iorio Jr.

M.Sc. in Physics **Physics Department, Pontifícia Universidade Católica (PUC-Rio), Rio de Janeiro, Brazil**, March, 1997.

Area Statistical Mechanics

Thesis title “Critical Behavior of Self-Avoiding-Walks in dimension near 2”

Committee Rosane Riera (advisor), Fabio Reis (UFF), Marcelo Gomes (UFPE)

B.Sc. in Physics **Physics Department, Pontifícia Universidade Católica (PUC-Rio), Rio de Janeiro, Brazil**, December, 1994.

## Long-term Academic Affiliations

2005 — Now **Universidade Nova de Lisboa, Portugal**, *Assistant Professor*.

2003 — 2005 **University of Lisbon, Portugal**, *Post-doc in Partial Differential Equations*, Advisor: José Francisco Rodrigues, Grant from FCT/Portugal.



2001 — 2003 **University of Vienna, Austria**, *Post-doc in Partial Differential Equations*, Advisor: Peter Markowich, Grant from FWF/Austria.

## Short-term Academic Affiliations

2009 **Instituto de Matemática Pure e Aplicada, Rio de Janeiro, Brazil**, *March 2009*.

- 2009 **Centre de Recerca Matemàtica, Barcelona, Spain, February 2009.**  
2004 **Wolfgang Pauli Institute, Vienna, Austria, November-December 2004.**

## Papers in Refereed Journals

Papers marked with  are indexed in the **ISI-Web of Science** and with  are indexed in the **MathSciNet**.



D Dingli, F A C C Chalub, F C Santos, S Van Segbroeck and J M Pacheco “Reply: Evolutionary game theory: lessons and limitations, a cancer perspective” *British Journal of Cancer* 101: 2062-2063 (2009).



F.A.C.C.Chalub and M.O.Souza. “From discrete to continuous evolution models: a unifying approach to drift-diffusion and replicator dynamics”. *Theoretical Population Biology* **76**(4) 268–277(2009).



David Dingli, F. A. C. C. Chalub, F. C. Santos, S. Van Segbroeck, J. M Pacheco “Disease phenotype as the outcome of an evolutionary game between cells” *British Journal of Cancer* 101: 1124-1129 (2009).



F.A.C.C.Chalub and M.O.Souza “A non-standard evolution problem arising in population genetics”. *Comm. Math. Sciences* **7**(2) 489–502 (2009).



F.A.C.C.Chalub and M.O.Souza “Discrete versus continuous models in evolutionary dynamics: from simple to simpler – and even simpler – models”. *Math. and Computer Modelling*. **47** (7-8) 743-754 (2008).

J. M. Pacheco, F. S. Santos, F. A. C. C. Chalub, “Evolution of norms in a multi-level model of conflict and cooperation”, *Electronic Journal of Theoretical Physics*, **4** 16(II) 157–172 (2007).



J. M. Pacheco, F. S. Santos, F. A. C. C. Chalub, “Stern-judging : A simple, successful norm which promotes cooperation under indirect reciprocity”. *PLOS: Comp. Biol.* (2) 12, 1634–1638 (2006).



Fabio Chalub, Yasmin Dolak, Peter Markowich, Dietmar Oeltz, Christian Schmeiser, Alexander Soreff, “Model Hierarchies for Cell Aggregation by Chemotaxis.” *Math. Mod. and Meth. in App. Sci.*, 16, Supp 01, 1173–1198 (2006).



F. A. C. C. Chalub, F. C. Santos, J. M. Pacheco, “The Evolution of Norms.” *J. Theor. Biol.*, 241(2) 233-240 (2006).



F. A. C. C. Chalub and J. F. Rodrigues. "A class of kinetic models for chemotaxis with threshold to prevent overcrowding." *Port. Math.*, 63(2) (2006), 227-250.



Fabio A. C. C. Chalub and Jorge P. Zubelli, "Huygens' Principle for Hyperbolic Operators and Integrable Hierarchies." *Phys. D* **213** 231–245 (2006).



Fabio A. C. C. Chalub and Kyungkeun Kang, "Global convergence of a kinetic model for chemotaxis to a perturbed Keller-Segel model." *Nonlinear Analysis Series A: Theory, Methods and Applications*, **64** (4) 686–695 (2006).



F. A. C. C. Chalub and J. P. Zubelli. "Huygens' Principle, Dirac Operators, and Rational Solutions of the AKNS Hierarchy." *Math. Phys., Anal. and Geom.* **8** 187–210 (2005).



F. A. C. C. Chalub, P. Markowich, C. Schmeiser and B. Perthame. "Kinetic models of chemotaxis and their drift-diffusion limits." *Monat. f. Math.* **142**(1-2) 123–141 (2004).



Fabio A. C. C. Chalub. "On Huygens' Principle for Dirac Operators associated to Electromagnetic Fields". *An. Acad. Bras. Cienc.* **73**(4) 483–493 (2001).



Fabio A. C. C. Chalub and Jorge P. Zubelli. "On Huygens' principle for Dirac Operators and Nonlinear Evolution Equations". *J. Nonlin. Math. Phys.* V.8, Supplement, 62-68 (2001).



Riera, R. and Chalub, F. A. C. C. "Critical Behavior of the Chain-generating function of Self-avoiding-walks on the Sierpinski Gasket Family: The Euclidean Limit", *Phys. Rev. E* **58** (1998) 4001-4004.



Chalub, F. A. C. C., Aarão Reis, F. D. A. and Riera, R., "Connective Constant of SAWs on the Sierpinski Gasket Family", *J. Phys A: Math. Gen.* **30** (1997) 4151-4160.

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## Papers in books or proceedings



Francisco C. Santos, Fabio A. C. C. Chalub, and Jorge M. Pacheco. "A Multi-level Selection Model for the Emergence of Social Norms" *Advances in Artificial Life, Proceedings of the 9th European Conference, ECAL 2007, Lisbon, Portugal, September 10-14, 2007*, p 525–534. Edited by J. G. Carbonell and J. Siekmann, Lecture Notes in Computer Sciences 4648, Springer Verlag, Berlin, Heidelberg (2007).



F. A. C. C. Chalub and J. F. Rodrigues. “A Short description of kinetic models for chemotaxis.” *Hyperbolic Problems and Regularity Questions*, p. 59–68, Trends in Mathematics, ed. M. Padula, L. Zanghiratti. Birkäuser Verlag, Switzerland (2007).



F. A. C. C. Chalub and J. P. Zubelli. “Matrix Bispectrality and Huygens’ Principle for Dirac Operators.” *Partial Differential Equations and Inverse Problems*, Contemporary Mathematics, Vol 362, p. 89–112 (2004). Carlos Conca, Raúl Monásevich, Gunter Uhlmann, and Michal S. Vogelius (Editors).



F. A. C. C. Chalub and J. P. Zubelli. “Integrable systems, Huygens’ principle, and Dirac operators”, *Proceedings of the Workshop on Nonlinearity, Integrability and All That: Twenty Years after NEEDS ’79 (Gallipoli, 1999)*, 89–96, World Sci. Publishing, River Edge, NJ, 2000.

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## Pre-prints

F.A.C.C.Chalub and M.O.Souza “The continuous limit of the Moran process and the diffusion of genes in infinite populations”.

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## General Audience Papers



Fabio A. C. C. Chalub, “The Saros cycle: obtaining eclipse periodicity from Newton’s laws”. *Revista Brasileira de Ensino de Física*, **31**(1) 1303 (2009).

Fabio Chalub, “Um mergulho na história das ondas solitárias”, *Ciência Hoje das Crianças*, 119, págs 5–6, Novembro 2001 (in Portuguese).



Fabio A. C. C. Chalub e Jorge P. Zubelli, “Sólitos: Na Crista da Onda Por Mais de 100 Anos”, *Revista Matemática Universitária*, **30** (2001), 44–62 (in Portuguese). Re-edited in *Boletim da Sociedade Portuguesa de Matemática*, **51** (2004), 3–25.

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## Other Publications

A regular comentary in the magazine “Gazeta de Matemática”, published by the Portuguese Mathematical Society, called “Na linha de Frente”, since 2008 (in Portuguese).

“Biologia, Economia, Futebol e Maternidade”, *Revista Mundus*, Junho de 2006, p. 56-57 (in Portuguese).

Review on the book “Mathematical Biology”, 2 vol, by J. D. Murray, Springer. *Revista Matemática Universitária*, **37** (2004), 35–42 (in Portuguese).

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## Students

2009 — **João Soares**, *PhD student*.

2008 — 2009 **Inês Alexandra dos Santos**, *undergrad student*, grant from FCT/Portugal.

2006 — 2007 **Andreia Mordido**, *undergrad student*, grant from the project “Novos Talentos”, by Gulbenkian Foundation.

## Organization of conferences

**The Mathematics of Darwin Legacy**, Lisbon, November, 2009

**Summer School and Workshop on Kinetic and Statistical Methods for Complex Particle Systems**, Lisbon, July, 2009

## Participation in Projects

- 2009–2013 Project UTAustin/MAT/0035/2008, investigator in “Analysis of Nonlinear Partial Differential Equations”, funded jointly by University of Texas at Austin and FCT/Portugal. Principal Investigator: José Miguel Urbano.
- 2007–2011 Project CMU-Pt/0019/2007, principal investigator (since 2009) in “FCTUNL Activities Plan under the Mathematics focus area of the CMU-Portugal Program”, funded jointly by Carnegie Mellon University and FCT/Portugal.
- 2009—2010 Bilateral Agreement Portugal-Brazil, “Mathematical and Computational Aspects of Game Theory”, funded jointly by FCT/Portugal and Capes/Brazil. Leader of the Portuguese team.
- 2008—2011 Project PTDC/FIS/70973/2006, “Modelling of complex evolutionary processes, funded by FCT/Portugal (jointly with Jorge M. Pacheco (PI), Francisco Dionísio, Francisco Santos, João Manuel Lopes) Funding: 59.000 euros.
- 2007— 2010 Project PTDC/MAT/66426/2006, principal investigator in “Mathematical models of evolutionary processes”, funded by FCT/Portugal (jointly with Jorge M. Pacheco, Francisco Dionísio, Francisco Santos and João Manuel Lopes) Funding: 49.000 euros.
- 2007— 2010 Project PTDC/MAT/68615/2006, “Kinetic models and applications”, funded by FCT/Portugal (jointly with Filipe Oliveira (PI), Ana Jacinta Soares and Filipe Manuel Carvalho) Funding: 20.000 euros.
- 2005 — 2008 Project POCI/MAT/57546/2004, “Nonlinear PDEs: analysis and applications in Biology”, funded by FCT/Portugal (jointly with J. F. Rodrigues, L. Santos, M. Portilheiro and J. M. Urbano (PI)). Funding: 25.500 euros.

## Participation in Comitees

- Ph.D. Joaquim Correia, “Approximation of the hyperbolic conservation laws”, Universidade de Lisboa, February 2008.
- M.Sc. Raquel de Montalvão Cabral, “Jogos Evolucionários”, Universidade Federal Fluminense, Niterói, Brazil, June 2008.
- M.Sc. Ana M. Luz, “Modelos Difusivos e Cinéticos para Quimiotaxia”, Institute of Pure and Applied Mathematics (IMPA), Rio de Janeiro, Brazil, March 2004.

## Communications in Conferences

- July 2009 **Summer School and Workshop on Kinetic and Statistical Methods for Complex Particle Systems, Lisbon**, *Invited talk, 20 min*, Discrete and continuous models in evolutionary dynamics.

- March 2009 **Mathematical Methods and Modeling of Biophysical Phenomena, Angra do Reis, Brazil**, *Discrete and continuous models in evolutionary dynamics*, Invited talk, 50 min.
- February 2009 **Conference on Mathematical Biology: Modeling and Differential Equations, Barcelona, Spain**, *Singular differential equations in evolutionary biology*, Invited talk, 50 min.
- December 2008 **Lectures on Modelling Cancer Growth and Treatment, Estoril, Portugal**, *Discrete Process, Drift-diffusion equations and replicator dynamics*, Contributed talk, 20 min.
- September 2008 **Calculus of variations and its applications: from engineering to economy, Lisbon**, *Models for genetic evolution in large populations*, Invited talk, 25 min.
- September 2008 **Dynamics and applications, Braga, Portugal**, *Models for genetic evolution in large populations*, Invited talk, 25 min.
- June 2008 **American Mathematical Society / Sociedade Brasileira de Matemática First Joint Meeting, Rio de Janeiro**, *Multi-scale models for genetic evolution*, Invited talk, 30 min.
- May 2008 **Kinetic Equations: Direct and Inverse Problems, Mantova, Italy**, *Multi-scale models for genetic evolution*, Invited talk, 35 min.
- Dezember 2007 **Workshop on Biomechanics and Chemotaxis, Linz, Austria**, *Models for genetic evolution in large populations*, Invited talk, 45 min.
- October 2007 **Mathematics: Analysis, Modeling, Optimization and Simulation, Austin, Texas, USA**, *Models for genetic evolution in large populations*, Invited talk, 1 hour.
- August 2007 **Mathematical Methods and Modeling of Biophysical Phenomena, Búzios, Brazil**, *Introducion to evolutionary game theory*, Invited short-course, 2 lectures, 90 min each.
- August 2007 **Equadiff07, Vienna**, *Models for genetic evolution in large populations*, Invited talk in the minisimposium "Differential equations in mathematical biology", 30 min.
- July 2007 **26º Brazillian Mathematical Colloquium, Rio de Janeiro**, "*Mathematical Models for the Theory of Evolution*", Plenary talk, "scientific diffusion", 1 hour.
- September 2006 **International Conference on Interdisciplinary Mathematics and Statistical Techniques, SCRA2006, Tomar, Portugal**, "*The continuous Moran process*", invited talk, 20 min.
- July 2006 **Geometric Aspects of Integrable Systems, Coimbra, Portugal**, "*Huygens' Principle and Integrability*", contributed talk, 30 min.
- June 2006 **Nonlinear PDEs: Homogenization and Kinetic Equations, Vienna**, "*The Continuous Moran Process*", invited talk, 30 min.
- June 2006 **Portuguese Mathematical Society National Meeting, Lisbon**, "*Mathematical modeling for the evolution of large populations*", invited plenary talk, 1 hour.
- March 2006 **Mathematical Methods and Modelling of Biophysical Phenomena, Angra dos Reis, Brazil**, "*The Continuous Moran Process*", invited talk, 1 hour.
- September 2005 **Modelling Mathematical Methods: Computer Simulation of Tumor Growth and Therapy, Puerto de La Cruz, Tenerife, Spain**, "*The Continuous Moran Process*", contributed talk, 20 min.

- June 2005 **Partial Differential Equations in Industry and Engineering, ALFA meeting, Vienna and Strobl, Austria**, *"The Continuous Moran Process"*, invited talk, 40 min.
- June 2005 **Free Boundary Problems, Theory and Applications, Coimbra, Portugal**, *"Kinetic Models for Chemotaxis"*, contributed talk, 15 min.
- April 2005 **Workshop on Bioinformatics and Biomathematics, Teheran, Iran**, *"Kinetic Models for Cell Movement"*, invited short course, three lectures, 1 hour each.
- February 2005 **Mathematical Methods and Modelling of Biophysical Phenomena, Angra dos Reis, Brazil**, *"Kinetic Models for Chemotaxis"*, invited talk, 50 min.
- November 2004 **Modelling Cell Motility and Angiogenesis, Wolfgang Pauli Institute, Vienna, Austria**, *"Kinetic Models for Chemotaxis"*, invited talk, 30 min.
- July 2004 **Mathematical Models Applied to the Biological Sciences, Economics, and Complex Systems, Siena and Grosseto, Italy**, *"How to go across limits"*, invited talk, 30 min.
- June 2004 **Free Boundary Problems in Biomathematics, Multiscaling and Infinite-Dimensional Dynamical Systems, Montecatini, Italy**, *"Kinetic Models for Chemotaxis"*, contributed talk, 25 min.
- February 2004 **Brazilian Workshop on Mathematical Physics, Institute of Pure and Applied Mathematics (IMPA), Rio de Janeiro, Brazil**, *"Huygens' Principle and Integrable Systems"*, invited talk, 30 min.
- February 2004 **Workshop on Biomathematics and Evolutionary Dynamics, Institute of Pure and Applied Mathematics (IMPA), Rio de Janeiro, Brazil**, *"Introduction to Game Theory"*, invited short course, two lectures, 90 min each.
- February 2004 **Workshop on Biomathematics and Evolutionary Dynamics, Institute of Pure and Applied Mathematics (IMPA), Rio de Janeiro, Brazil**, *"Introduction to Chemotaxis"*, invited talk 50 min.
- July 2003 **24th Brazilian Mathematical Colloquium, Rio de Janeiro, Brazil**, *"Kinetic Models for Chemotaxis"*, invited talk in the subsection "Partial Differential Equations in Engineering and Industry", 30 min.
- July 2003 **VIII Workshop on Partial Differential Equations, July 2003, Rio de Janeiro, Brazil**, *"Kinetic Models for Chemotaxis"*, contributed talk, 50 min.
- July 2003 **18th International Conference on Transport Theory, July 2003, Rio de Janeiro, Brazil**, *"Kinetic Models for Chemotaxis"*, invited talk, 50 min.
- May 2003 **Analysis and Numerics for Modelling Semiconductor Devices and Biological Channels, College Park, Maryland, USA**, *"Kinetic Models for Chemotaxis"*, invited talk, 50 min.
- February 2003 **Applied Mathematics and Applications of Mathematics, AMAM-2002, Nice, France**, *"Kinetic Models for Chemotaxis and their Drift-Diffusion Limits"*, invited talk, 30 min.
- August 2002 **ICM 2002 Satellite Conference on Mathematical Biology, Guilin, China**, *"Kinetic Models for Chemotaxis and their Drift-Diffusion Limits"*, contributed talk, 20 min.
- June 2000 **RCP 264: Inverse Problems and Nonlinearity, Montpellier, France**, *"Huygens' Principle for Dirac Operators"*, contributed talk, 20 min.

- September 1999 **XXIV National Conference on Applied and Computational Mathematics, Santos, Brazil**, “*Huygens’ Principle for Dirac Operators*”, contributed talk, 15min.
- September 1996 **XIX National Meeting on Condensed Matter Physics, Águas de Lindóia, Brazil**, “*Critical Behavior of SAWs in dimension near 2*”, poster.
- August 1995 **XIX STATPHYS, August 1995, Xiamen, China**, “*Critical Behavior of SAWs in the Sierpinski Gasket Family*”, poster.
- June 1995 **XVIII National Meeting on Condensed Matter Physics, Caxambu, Brazil**, “*Critical Behavior of SAWs in the Sierpinski Gasket Family*”, poster.

## Selected Invited Lectures

- 2009 Universidade Federal Fluminense, Universidade Federal do Rio Grande do Sul (Brazil)
- 2008 Instituto Gulbenkian de Ciências, Centro de Matemática e Aplicações Fundamentais, Centro de Estruturas Lineares e Combinatória, Centro de Física Teórica e Computacional (Portugal)
- 2007 Fundação Getúlio Vargas (Brazil)
- 2006 Max-Planck-Institute for Mathematics in the Sciences (Germany), Instituto Politécnico de Setúbal, Instituto Superior Técnico (Portugal)
- 2005 Instituto de Matemática Pura e Aplicada (Brazil)
- 2004 Max-Planck-Institute for Mathematics in the Sciences (Germany), Universidade de Coimbra, Instituto Superior Técnico (Portugal)
- 2003 Universidade Federal Fluminense, Laboratório Nacional de Computação Científica, Instituto de Matemática Pura e Aplicada (Brazil), Universidade de Lisboa, Universidade de Coimbra (Portugal), University of Wrocław (Poland)
- 2002 Vienna University of Technology (Austria), Max-Planck-Institute for Mathematics in the Sciences, University of Greifswald (Germany)
- 2000 Vrije Universiteit Brussels (Belgium)

## Scientific Diffusion Talks

- “The Mathematics of Good and Evil”, Lisbon (2008), Azores (2008), Rio de Janeiro (2007), Porto (2007).
- “The Mathematics of dating”, Aveiro (2009), Lisbon (2006).

## Teaching Experience

- 2005 — Present **Universidade Nova de Lisboa**, *Department of Mathematics*, Assistant Professor.  
 Analysis III (for engineering): 2005, 2009, 2006-8 (course coordinator).  
 Analysis IV (for engineering): 2006 (exercises class).  
 Analytical Mechanics (for mathematics): 2007-8.
- 1995 — 1996 **Pontifical Catholic University, Rio de Janeiro**, *Department of Physics*, Teacher Assistant.  
 Experimental Physics I (for engineering); Physics (for Industrial Drawing); Physics I and II (for engineering)
- 1994 **Pontifical Catholic University, Rio de Janeiro**, *Department of Physics*, Instructor.  
 Physics II (for engineering)

1992 **Pontifical Catholic University, Rio de Janeiro**, *Department of Mathematics*,  
Instructor.  
Calculus I (for engineering)

## Other activities

Referee for *J. Phys. A: Math. Gen., Interf. and Free Bound., Port. Math., Adv. in Water Resources, Mathematical and Computer Modelling, Appl. Math. Letters, PLOS: Comp. Biol.*

Reviewer for *MathSciNet*.

Referee for the Dutch Science Fund.

Consultant for the Brazilian popular science magazine (electronic edition) *Ciência Hoje*.

Co-organizer *XV National Conference of Graduating Students*, 2000.

Co-organizer *I Meeting of graduating students in the State of Rio de Janeiro*, 1999.

National representative of graduating students in the Scientific-Technical Council of the *Coordenação Aperfeiçoamento de Pessoal de Nível Superior (CAPES)*, August, 1999.

President of the Graduating Students Association, *Instituto de Matemática Pura e Aplicada (IMPA)*, 1999.

Vice-president of the Graduating Students Association, *Pontifical Catholic University (Rio de Janeiro)*, 1995–1996.

High-school teacher (volunteer work in a Public School, 1996).