

# CURRICULUM VITÆ

November 24th, 2019

## General Information

**Surname, Name:** GERARDO-GIORDA, Luca

**Citizenship:** Italian

**Professional Address:** **BCAM**

Basque Center for Applied Mathematics

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**Researcher ID:** J-2309-2012

## Current Position

- **Research Line Leader**, Mathematical Modeling in Biosciences (**MMB**)  
Basque Center for Applied Mathematics, since 2014.

## Previous Appointments

- **BCAM Researcher**, Basque Center for Applied Mathematics, 2011-2014.
- **Center for Disease Ecology Fellow**, Emory University, 2010-2011.
- **Adjunct Faculty**: Dept of Mathematics and Computer Science, Emory University, 2009-2010.
- **Post-doc researcher**: Dept of Mathematics and Computer Science, Emory University, 2008-2010.
- **Research Fellow**: Dept of Mathematics, University of Trento, 2004-2007.
- **Marie Curie Industry Fellow**: IFP (Institut Français du Pétrole), 2003-2004.
- **Research Fellow**: Dept of Mathematics, University of Trento, 2003.

## Education

**December 2002:** Ph.D. in Mathematics, University of Trento

**Thesis:** *Domain Decomposition Algorithms for Transport and Wave Propagation Equations*

**Advisor:** Prof. Alberto Valli (University of Trento).

**November 1996:** Laurea (Degree) in Mathematics at the University of Turin.

**Thesis:** *Wavelet Bases on Bounded Domains and Applications* (in Italian).

**Advisor:** Prof. Claudio Canuto (Politecnico di Torino)

## Qualifications:

- Full Professor in Numerical Analysis, Italian Ministry of Research (2018).
- Professor in Applied Mathematics, French Ministry of Research (2014).
- Ramon y Cajal Fellow, Spanish Ministry of Research and Innovation (2011).

## Summary

Dr. Luca Gerardo-Giorda is an expert in numerical analysis and modeling of complex systems, and has 15 years experience in the development of numerical methods and algorithm optimization, with peculiar focus on biomedical and epidemiological problems. He has been awarded a Marie Curie Industry Fellowship in 2003, and has been qualified for a Ramon y Cajal Fellowship in 2011, as Professor in Applied Mathematics by the French Ministry of University in 2014, and as Full Professor in Numerical Analysis from the Italian Ministry of University in 2018. Dr. Gerardo-Giorda graduated in Mathematics from University of Turin and received a PhD in Mathematics from the University of Trento with a thesis on domain decomposition methods and parallel computing. In collaboration with scientists of varied background, he focused on applied interdisciplinary research, working on the modeling and numerical simulation of complex systems in several institutions in Europe (Univ. of Trento, Ecole Polytechnique in Paris, and IFP - the French Institute of Oil). In 2008 he moved to Emory University (Atlanta, USA), where he worked extensively on reducing the computational costs of the numerical simulations in electrocardiology, and the relation between the electrical activity of the heart and patient illness. Becoming interested in a more population level approach to disease he was awarded in 2010 a Fellowship at the Center for Disease Ecology at Emory University to study infectious disease dynamics using a combination of analytics and computer simulations tied to public health data sets. In late 2011 he joined BCAM, where since 2014 he is leading the research line in Mathematical Modeling in Biosciences. He served as Guarantor Researchers for the Severo Ochoa Excellence accreditation to BCAM. His Research Line currently includes 3 Post Doc researcher, 3 PhD students, 3 external scientific members and some interns. Dr. Gerardo-Giorda authored several publications on international journals focusing on the computational aspects of a wide range of problems from electromagnetism to biomedical problems and epidemiology, and recently extended his interests towards data assimilation and Bayesian parameter estimation procedures. Dr. Gerardo-Giorda is involved in several research projects aiming at developing supporting tools for biomedical investigation. In particular, he focuses on the electrophysiological and metabolic dynamics of brain and pancreatic cells, migraine, cardiac modeling and Radio Frequency Ablation, in collaboration with hospitals in Spain and Italy, as well as research institutions in both Europe and the USA.

**Publications:** 51 published (30 articles on international journals, 9 peer-reviewed proceedings, 2 book chapters, 4 extended abstract, 1 Thesis, 5 in revision), 3 technical reports, 6 in preparation.

**Publications in Q1:** 70% overall (80% since 2013, 100% since 2015).

**h-index:** 11

**Total citations:** 612 (392 since 2014, Google Scholar, November 2019)

**Talks at conferences and workshops:** 3 plenary (2017, 2018, 2019), 37 Invited, 15 Contributed

**Invited seminars:** 31

**Past advisorial activity:** 2 Post Doc (BCAM, 2014-2019), 1 honor student (Emory, 2011), 3 PhD student (2 UPV/EHU, 2019, and U. of Trento, Italy, 2006), 1 undergrad student (UPV/EHU, 2016), 1 Master Student (Milan Polytech, 2017), 3 Internships (BCAM, 2014-2015).

**Current advisorial activity:** 1 Post Docs, 2 PhD students (1 more to join through Ministerial grant - expected early 2020)

## Recent highlights

- PI of grant RTI2018-093416-B-I00, MULTIQUANT, funded by Spanish National Research Agency.
- Invited contribution to the Valencia Intelligencer, ICIAM 2019.
- Contribution at the 2019 Congress of the European Society of Cardiology.
- Invited speaker at the congress RITMO2018 of the Spanish Society of Cardiology.
- Member of the Spanish Research Network in Computational Cardiac Modeling (DPI2016-81873-REDT)
- Plenary Speaker at DSABNS 2019, SDS2018, and the 41st South African congress in Applied and Numerical Mathematics, 2017
- PI of grant MTM2015-69992-R, BELEMET funded by Spanish Ministry MINECO
- Guarantor researcher for the BCAM SEVERO OCHOA accreditation (SEV-2013-0323)

## Individual grants

1. Center for Disease Ecology Fellowship: Emory University, 2010-2011.
2. Marie Curie Industry Fellowship (contract nr. HPMI-GH-99-00012-05): 2003-2004.
3. Ph.D. support grant: Italian Ministry of University and Education, 1999-2002.
4. Emory University travel and seed research grant, 2009-2010.
5. European Mathematical Society travel support grant, 2001, 2005.

## Research Grants

6. RTI2018-093416-B-I00 MULTIQUANT: *MULTI*scale modeling with applications in *QUANT*itative bioscience. **PI Luca Gerardo-Giorda**. Funded by: AEI (Spanish State Research Agency)/FEDER (UE) - Programa estatal de I+D+I orientado a los retos de la sociedad. Period: 01/2019-12/2021. Budget: Eur 44.528,00 (plus the salary of 1 PhD student for 4 years).
7. DPI2016-81873-REDT, Spanish Research Network in Computational Cardiac Modeling. PI: J. Saiz-Rodriguez (U. Politecnica de Valencia). **MMB group is a node of the Network**. Funded by: MINECO - Programa estatal de Redes Tematicas de Excelencia. Period: 07/2017-06/2019. Budget: Eur 20.000,00
8. MTM2015-69992-R, BELEMET: *Brain ELEctro METabolic activity: modeling and numerical approximation*. **PI Luca Gerardo-Giorda**. Funded by: MINECO - Programa estatal de I+D+I orientado a los retos de la sociedad. Period: 01/2016-12/2018. Budget: Eur 61.710,00
9. MTM2016-81711-REDE, Spanish Strategic Network in Mathematics. PI: T. Chacon (U. de Sevilla). **L. Gerardo-Giorda is the BCAM reference researcher in the Network**. Funded by: MINECO - Programa estatal de Redes Estrategicas de Excelencia. Period: 07/2017-06/2019. Budget: Eur 120.000,00
10. KK-2016/00026: BG-16 Investigacion colaborativa en medicina de precision y biomarcadores. Coordinating Institution: CIC bioGUNE. **L. Gerardo-Giorda research partner**. Funded by: Basque Government, program ELKARTEK. Period: 03/2016-12/2017. Budget: Eur 48.911,00
11. AYD-000-278: CIPAS: *Computational Inverse Problems Across Scales*. PI: Erkki J. Somersalo. **L. Gerardo-Giorda research partner**. Funded by: Bizkaia Talent. Period: 09/2015-06/2016. Budget: Eur 36.828,33
12. AYD-000-285: BRAhMS: *BRain Aura Mathematical Simulation*. PI: Sebastiano Stramaglia. **L. Gerardo-Giorda research partner**. Funded by: Bizkaia Talent. Period: 11/2014-04/2016. Budget: Eur 44.625,00
13. H2020 - MSCA - RISE-2014, GEAGAM *Geophysical Exploration using Advanced Galerkin Methods* PI: David Pardo (Ikerbasque), **L. Gerardo-Giorda research partner**. Consortium: BCAM (ES), UPV/EHU (ES), INRIA (FR), BSC (ES), TOTAL (FR), KAUST (KSA). Period: 01/11/2014 - 31/10/2017.
14. SEV-2013-0323 SEVERO OCHOA accreditation and grant, funded by the MINECO (Spanish Ministry of Science and innovation), Institutional strengthen 2013 call. PI: Luis Vega Gonzalez, **L. Gerardo-Giorda guarantor researcher**. Host Institution: BCAM. Period: 01/07/2014 - 30/06/2018. Budget: 4.000.000 Eur.
15. HR-CEM: *High resolution numerical models for cardiac electrophysiology*, PI Yves Coudiere (U. Bordeaux 1 and INRIA), **L. Gerardo-Giorda research partner**. Consortium: U. Bordeaux 1, INRIA, IHU-LIRYC, U. Nantes, U. Pau, U. Ottawa, BCAM. Funded by ANR (Agence Nationale de Recherche), France. Period: 2013-2017. Budget: 412.257 Eur.

16. *Un simulateur de l'électrophysiologie cardiaque* PI Y. Coudière (U. Bordeaux 1 and INRIA), **L. Gerardo-Giorda research partner**. Consortium: U. Bordeaux 1, INRIA, IHU-LIRYC, U. Nantes, U. Pau, BCAM. Funded by INRIA-ADT (Action Développement Technologique). Period: 2012-2014. Budget: 120.000 Eur.
17. *Ecological and evolutionary analysis of infectious diseases*. PI: L. Real (Emory U.). **L. Gerardo-Giorda researcher**. Funded by National Institutes of Health (R01-AI047498/AI/NIAID NIH HHS/United States). Period 2010-2015. Budget: USD 1.200.000.

## Workshop organization grants

18. RC-2019-1-38: *Quantitative Biomedicine for Health and Disease V*. **PI Luca Gerardo-Giorda**. Funded by: Basque Gov. - Workshop organization (Ikerbilerak). Budget: Eur 2.000,00
19. RC-2018-1-44: *Populations in epidemics and ecology: modeling and simulations II*. **PI L. Gerardo-Giorda**. Funded by: Basque Gov. - Workshop organization (Ikerbilerak). Budget: Eur 3.333,00
20. RC-2018-1-43: *Quantitative Biomedicine for Health and Disease IV*. **PI Luca Gerardo-Giorda**. Funded by: Basque Gov. - Workshop organization (Ikerbilerak). Budget: Eur 2.900,00
21. RC-2017-2-26: *Populations in epidemics and ecology: modeling and simulations*. **PI L. Gerardo-Giorda**. Funded by: Basque Gov. - Workshop organization (Ikerbilerak). Budget: Eur 2.000,00
22. RC-2017-1-14: *Quantitative Biomedicine for Health and Disease III*. **PI Luca Gerardo-Giorda**. Funded by: Basque Gov. - Workshop organization (Ikerbilerak). Budget: Eur 2.600,00
23. RC-2016-1-24: *Quantitative Biomedicine for Health and Disease II*. **PI Luca Gerardo-Giorda**. Funded by: Basque Gov. - Workshop organization (Ikerbilerak). Budget: Eur 2.100,00
24. RC-2015-1-56: *Quantitative Biomedicine for Health and Disease*. **PI Luca Gerardo-Giorda**. Funded by: Basque Gov - Workshop organization (Ikerbilerak). Budget: Eur 2.373,00

## Industrial contracts

25. *Modelado computacional para ablación cardiaca por radiofrecuencia*. **MMB group research partner**. Funded by MedLumics S.L., Madrid, Spain. Period: 07-12/2015. Budget: Eur 6.966,00

## Supervision of research activities

### Current Post Docs

- Nicole Cusimano. Since May 2016.  
PhD in Applied Math (2015), Queensland U. of Technology, Brisbane, Australia.

### Former Post-Docs

- Argyrios Petras (January 2017 - September 2019)  
currently postdoctoral researcher, IHU LIRYC Bordeaux, France
- Ana Gonzales-Suares (October 2014 - September 2016)  
currently *Juan de La Cierva* postdoctoral researcher at U. Pompeu Fabra, Barcelona.
- Gabriela Capo Rangel (February - August 2019)  
currently postdoctoral researcher, Okinawa Institute of Science and Technology, Japan.

### Current PhD Students

- Isabella Marinelli (Predoc Severo Ochoa 2015).
- Martina Conte (Predoc La Caixa INPhINIT 2017).
- Marina Echeverria Ferrero (Predoc Severo Ochoa 2018), *expected to join the lab in September 2019.*

### Theses supervision

- Julia M. Kroos (University of the Basque Country), 2019. **Role:** Advisor.  
*Patient-specific modeling of Cortical Spreading Depression applied to migraine study.*  
PhD Thesis in Applied Mathematics.
- Gabriela Capo Rangel (University of the Basque Country), 2019. **Role:** Co-advisor.  
*Computational predictive modeling of integrated cerebral metabolism, electrophysiology and hemodynamics.*  
PhD Thesis in Applied Mathematics.
- Cristina Vaghi (Politecnico di Milano), 2017. **Role:** Co-advisor.  
*POD Reduced Order Modelling for Cortical Spreading Depression*  
Master Thesis in Mathematical Engineering
- Nerea Arrarte Terreros (University of the Basque Country), 2016 **Role:** Advisor.  
*Single trial BOLD response detection and resting state network characterization in functional MRI*  
Undergraduate Thesis in Physics
- Joshua P. Keller (Emory University), 2011. **Role:** Co-advisor.  
*Modeling and numerical simulation of rabies raccoon in NY State*  
Honor Thesis in Mathematics

### Internship supervision

- Isabella Marinelli (University of Trento, Italy), 2015.  
**Subject:** *Personalization of conductivity coefficients via diffusion tensor imaging in cortical spreading depression simulation*
- Mohamed Menad (Chlef University, Algeria), 2015.  
**Subject:** *Numerical simulation of the spread of an invasive species in the Basque Country*
- Sheila Saiz-Alonso (University of the Basque Country), 2014.  
**Subject:** *IVUS-CFD coupling in the assessment of FFR in stenotic arteries.*

## Selected publications in biomedical modeling (last 3 years)

1. J.M. Kroos, M. de Tommaso, E. Vecchio, N. Burdi, S. Stramaglia, **L. Gerardo-Giorda (2019)**. *Clinical correlates of mathematical modeling of cortical spreading depression: Single-cases study*, **Brain and Behaviour**. 00:e01387. <https://doi.org/10.1002/brb3.1387>
2. A. Petras, M. Leoni, J. Jansson, J.M. Guerra, **L. Gerardo-Giorda (2019)**. *A computational model of open-irrigated radiofrequency catheter ablation accounting for mechanical properties of the cardiac tissue*. **Int. J. Num. Meth. Biomed Engrg**. <https://doi.org/10.1002/cnm.3232>
3. G. Capo Rangel, J. Prezioso, **L. Gerardo-Giorda**, E. Somersalo and D. Calvetti (2019). *Brain energetics plays a key role in the coordination of electrophysiology, metabolism and hemodynamics: evidence from an integrated computational model*, **J. Theor. Biol** 478, pp. 26-39.
4. A. Petras, M. Leoni, J. Jansson, J.M. Guerra, **L. Gerardo-Giorda (2019)**. *Tissue drives lesion: computational evidence of interspecies variability in cardiac radiofrequency ablation*. In: Coudière Y., Ozenne V., Vigmond E., Zenzemi N. (eds) **Functional Imaging and Modeling of the Heart, FIMH 2019**. Lecture Notes in Computer Science, vol 11504, pp. 139-146. Springer, Cham
5. N. Cusimano, **L. Gerardo-Giorda (2018)**. *A space-fractional Monodomain model for cardiac electrophysiology combining anisotropy and heterogeneity on realistic geometries*, **J. Comp. Physics**, Vol. 362, pp. 409-424, <https://doi.org/10.1016/j.jcp.2018.02.034>.
6. I. Marinelli, T. Vo, **L. Gerardo-Giorda**, R. Bertram, (2018). *Transitions Between Bursting Modes in the Integrated Oscillator Model for Pancreatic  $\beta$ -cells*. **J. Theor. Biol** 454, pp. 310-319. <https://doi.org/10.1016/j.jtbi.2018.06.017> (Q1).
7. D. Calvetti, G. Capo Rangel, **L. Gerardo-Giorda**, and E. Somersalo (2018). *A computational model integrating brain electrophysiology and metabolism highlights the key role of extracellular potassium and oxygen*, **J. Theor. Biol.** 446, pp. 238-258, DOI: 10.1016/j.jtbi.2018.02.029.
8. J.M. Kroos, I. Marinelli, I. Diez, S. Stramaglia, J. Cortes, and **L. Gerardo-Giorda (2017)** *Patient-specific computational modeling of Cortical Spreading Depression: personalization via Diffusion Tensor Imaging*. **Int. J. Num. Meth. Biomed Engrg**, 33 (11), e2874
9. A. Gonzales-Suarez, E. Berjano, J.M. Guerra, **L. Gerardo-Giorda (2016)** *Computational Modeling of Open-Irrigated Electrodes for Radiofrequency Cardiac Ablation Including Blood Motion-Saline Flow Interaction*. **PLoS One** 11(3), e0 0150356
10. J.M. Kroos, I. Diez, S. Stramaglia, J. Cortes, and **L. Gerardo-Giorda (2016)** *Geometry shapes propagation: assessing the presence and absence of cortical symmetries through a computational model of cortical spreading depression*. **Frontiers in Computational Neuroscience** 10 (6).

# Mathematical Modeling in Bioscience group at BCAM

The MMB group (<http://www.bcamath.org/en/research/lines/MMB>) aims at building bridges between mathematics and other Life Science disciplines, by providing innovative simulation tools to be efficiently used for in silico pathology assessment and clinical decision making support. The group started its operations in late 2014 with one PhD student and one Post Doc, consolidated itself through 2015-2016 and is in full bloom. The first years of the group have been devoted to build up collaborations with external partners such as the BioCruces Health Research Institute in Bilbao, and the Hospital de Santa Creu i San Pau in Barcelona, and to develop methods and tools that are currently extensively exploited.

## Team

**Research Line Leader:** Luca Gerardo-Giorda

**Ikerbasque Research Fellow:** M Aguiar (from August 2019)

**Post Docs:** N Cusimano, A Petras

**PhD Students:** I Marinelli, M Conte, M Echeverria Ferrero (from September 2019)

**External Scientific Members:** Erkki Somersalo (CWRU, Cleveland, USA), Sebastiano Stramaglia (Univ. of Bari, Italy), Francesco Montomoli (Imperial College, UK)

**Gender balance:** 50% of the group members are females (72% not considering ESM).

## Research areas

### A1 *Modeling and numerical simulation of cerebral activity*

Collaborators:

- Computational Neuroimaging Lab, BioCruces Health Research Institute; Prof. JM Cortes
- Neurology Department, Galdakao Hospital; Dr. M. Gomez Beldarrain
- Dept of Neurology, Bari Polyclinic and University; Prof. M. de Tommaso and Dr. E. Vecchio
- Dept Applied Math, Case Western Reserve University (Cleveland, USA); Prof. D. Calvetti
- MOX, Milan Polytechnic; Prof. S. Perotto

### A2 *Computational modeling of cardiac Radiofrequency ablation.*

Collaborators:

- Unitat de arritmias, Hospital de Santa Creu i San Pau (Barcelona); Dr. JM Guerra Ramos
- Abbott-St Jude Medical
- V-Heart SN: Spanish Research Network in Computational Cardiac Modeling.
- CFD/CT line (BCAM).

### A3 *Approximation of space-fractional PDE and application to electrocardiology*

Collaborators:

- LNLW research line (BCAM).
- University Campus Biomedico, Italy; Dr. A. Gizzi.

### A4 *Modeling of the pancreatic $\beta$ cells in pediatric diabetes*

Collaborators:

- Pediatric diabetology, BioCruces HRI; Dr. L. Castaño and Dr. S. Gaztambide
- Department of Mathematics, Florida State University (Thallahasse, USA); Prof. R. Bertram

### A5 *Multiscale modeling of glioma spread*

Collaborators:

- University of Granada (Spain); Prof. J. Soler, Prof. J. Nieto.
- University of Parma (Italy); Prof. M. Groppi.

### A6 *Domain decomposition methods for PDE and ecological modeling*

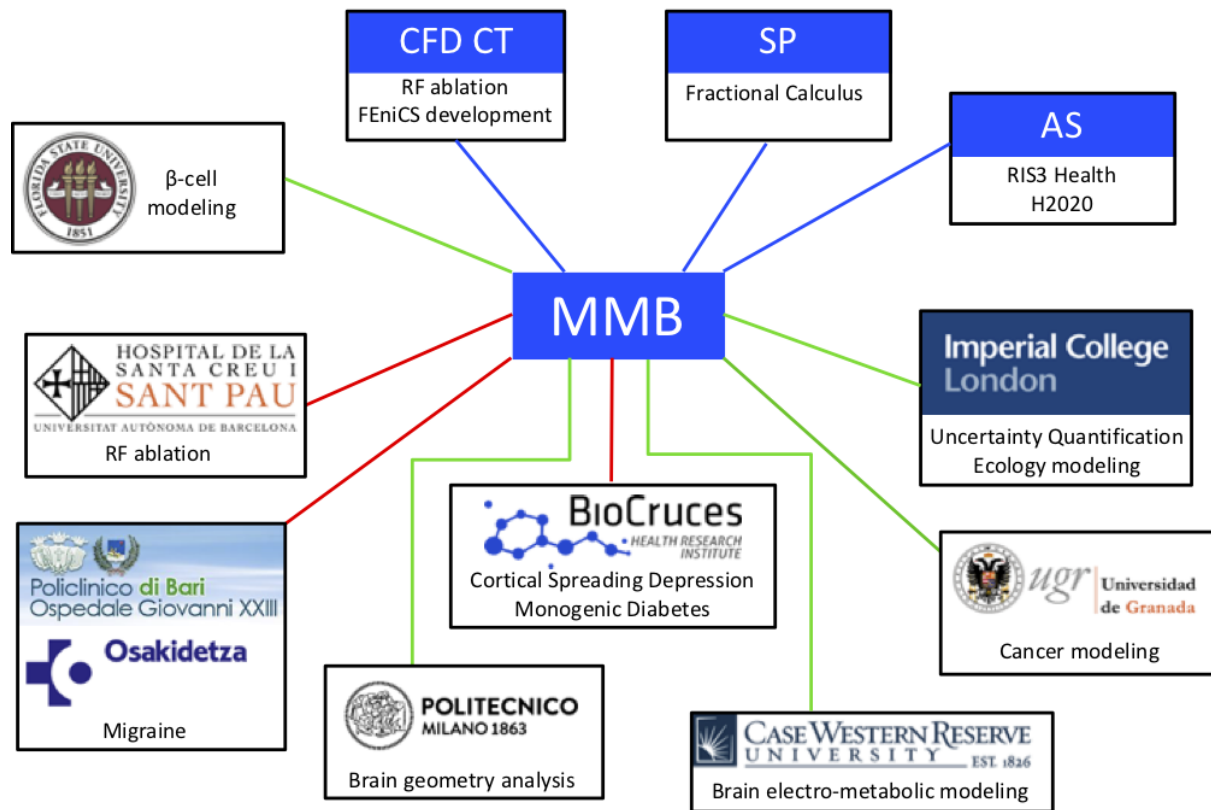
Collaborators:

- Dept Math, Loughborough U. (UK);
- Imperial College (UK)

## Main scientific results (2015-2019)

- A1a First ever patient-specific model of Cortical Spreading Depression [25, 26, 27, 29, 31, 2]<sup>1</sup>;
- A1b First double feedback coupled model of electro-metabolic activity of the brain [22, 6].
- A1c First triple feedback model of electro-metabolic activity and hemodynamics of the brain [16].
- A2a First computational model of RFA to ever account for tissue deformation [14, 17, 19];
- A2b First computational model of open irrigated electrode in RFA [30, 32, 34];
- A3a An innovative numerical method to compute Fractional Laplacian on general bounded domains [21]
- A3b First space-fractional model for electrocardiology on general domains [23]
- A4a First model for  $\beta$ -cell activity able to reproduce the various observed  $\text{Ca}^{2+}$  oscillation [20]

## Current collaborations of the research group



<sup>1</sup>numbering refers to full list of publications at the end of document



# Organization

## Workshops

- **QBIO2019** - Fifth Workshop on Quantitative Biomedicine for Health and Disease Bilbao, Spain, 2019 (with J. Cortes, S. Stramaglia, and N. Cusimano).
- **PinEE II** - Populations in epidemics and ecology: modeling and numerical simulations Bilbao, Spain, 2018 (with P. Magal).
- **QBIO2018** - Fourth Workshop on Quantitative Biomedicine for Health and Disease Bilbao, Spain, 2018 (with J. Cortes, S. Stramaglia, and N. Cusimano).
- **PinEE** - Populations in epidemics and ecology: modeling and numerical simulations Bilbao, Spain, 2017 (with F.A. Milner).
- **QBIO2017** - Third Workshop on Quantitative Biomedicine for Health and Disease Bilbao, Spain, 2017 (with J. Cortes, S. Stramaglia, and N. Cusimano).
- **QBIO2016** - Second Workshop on Quantitative Biomedicine for Health and Disease Bilbao, Spain, 2016 (with J. Cortes and S. Stramaglia).
- **QBIO2015** - Workshop on Quantitative Biomedicine for Health and Disease Bilbao, Spain, 2015 (with J. Cortes and S. Stramaglia).
- **III BCAM Workshop on Computational Math** Bilbao, 2014 (with S. Korotov and J. Jansson)

## Conference sessions and minisymposia

- Session *State of the art of computational methodologies for mathematical models of human brain electrophysiology, hemodynamics and metabolism* - SIAM Conference on Life Sciences - Boston, MA, USA, 2016 (with D. Calvetti and E. Somersalo).
- Session *Mathematical and numerical modeling of the cardiac electro-mechanical coupling* - conference **FJIM2014** (First Joint Int. Meeting of the Italian and Spanish Societies for Mathematics), Bilbao, Spain, 2014 (with S. Scacchi).
- Session *A posteriori error estimation and mesh adaptivity* - conference **CMN2013** (Congress on Numerical Methods in Engineering), Bilbao, Spain, 2013 (with S. Korotov).
- Session *Domain Decomposition techniques in Life Science modeling and simulation* - conference **DD21** (XXI Int. Conf. on Domain Decomposition Methods), Rennes, 2012 (with V. Dolean).
- Session *Numerical Methods in Cardiovascular Problems* - **IMACS World Congress** (Computational and Applied Mathematics & Applications in Science and Engineering) - Athens, GA, USA, August 2009 (with A. Veneziani).

## Schools

- Summer school on *Fractional and other nonlocal problems* - Bilbao, 2018 (with E Akhmatskaya, N Cusimano, M Murillo and M Gunzburger)
- **UQAP** Summer school on *Uncertainty Quantification for Applied Problem* - Bilbao, 2016 (with E Akhmatskaya, MP Calvo and JM Sanz Serna)

## Media

- Participation in "Investigadores por el mundo", Radio Libertad FM, January 2019  
<https://www.investigadoresporelmundo.com/podcast/investigador-espaol-en-italia-la-befana-bcam-ref100070347.html>
- Participation in "El cazador de cerebros", Spanish national TVE2, November 2016  
<http://www.rtve.es/alcarta/videos/el-cazador-de-cerebros/cazador-cerebros-suenan-cientificos/3798059/>
- Interview in the Portuguese newspaper "Observador", November 2015  
<http://observador.pt/especiais/matematica-um-jogo-do-qual-aprender-as-regras/>
- Interview with Radio Euskadi (in Spanish), May 2014  
<http://www.eitb.tv/es/radio/radio-euskadi/la-mecanica-del-caracol/1411318/2265820/matematicas-cardiovasculares-y-eugenius-francowski-en-navarra/>

## Dissemination

- *Harmony, movement and Mathematics* (in Spanish), Bilbao Art District, May 2019.
- *The surgeon of our children will be a mathematician* (in Spanish), Pint of Science, Bilbao, 2016.
- *Art and Mathematics: an intriguing couple* (in Spanish), Bilbao Art District, October 2015.
- *At the heart of Mathematics* (in Spanish), IES A. Pérez Díaz, S.ta Cruz de La Palma, October 2015.
- *Is there a mathematician under that white coat?* (in Spanish), Mathematics in everyday's life, Bidebarrieta Library, Bilbao, May 2014.
- *Even mathematics has a heart* - MatMed: Mathematics and Medicine, Valladolid, February 2014.
- *Even mathematics has a heart* - Olimpiadas Matemáticas Españolas, 2013.
- *Mathematics and medicine: a strange pair?* - Rotaract Club section of Trento, April 2003.

## Technology development and industrial transfer

### Software

The interface conditions for Maxwell's system studied in publication [40]. with V. Dolean and M.J. Gander are the core of a parallel solver developed by the INRIA team CAIMAN in Sophia-Antipolis.

### Industrial transfer

The optimized algebraic interface conditions studied during the Marie Curie Fellowship at the Institut Français du Pétrole have been implemented in TEMIS3d<sup>®</sup>, a Beicip Franlab (<http://www.beicip.fr>) software simulating the time evolution of underground oil reservoirs.

# Participation to Conferences and Workshops

## Conferences

1. **PLACE 2019** (Platform of Laboratories for Advances in Cardiac Experience) - Rome, Italy, 2019
2. **SIPF2019** (XXVII Congress of the Italian Society for Neurophysiology) - Ferrara, Italy, 2019
3. **ICIAM2019** (9th Int. Congress on Industrial and Applied Mathematics) - Valencia, Spain, 2019
4. **FIMH2019** (Functional Imaging and Modeling of the Heart) - Bordeaux, France, 2019
5. **DSABNS** (10th Conf. on Dyn. Syst. Applied to Biology and Nat. Sciences) - Naples, Italy, 2019.
6. **ECMI2018** (European Conf. on Mathematics for Industry) - Budapest, Hungary, 2018.
7. **RITMO2018** (Electrophysiology & Stimulation - Spanish Soc of Cardiology) - Sevilla, Spain, 2018.
8. **CMBE2017** (5th Int Conf. on Comput. and Biomedical Engineering), Pittsburgh, USA, 2017.
9. **SANUM** (41st South African Congress on Num and Applied Math) - Johannesburg, RSA, 2017.
10. **SIAM Conference on Computational Science and Engineering** - Atlanta, USA, 2017.
11. **DD24** (24th Int. Conf. on Domain Decomposition Methods) - Svalbard, Norway, 2017.
12. **SIMAI 2016** (Italian Society for Applied and Industrial Mathematics) - Milan, Italy, 2016.
13. **WCCM XII & APCOM VI** (12th World Congress on Comp Mech) - Seoul, 2016.
14. **SIAM 2016 Annual Meeting and Conference on the Life Sciences** - Boston, USA, 2016.
15. **100xCiencia** (Communicating Frontier Science) - La Palma, Spain, 2015.
16. **AIP2015** (Int. Conf. on Applied Inverse Problems) - Helsinki, Finland, 2015.
17. **RSME2015** (Congress of the Real Sociedad Matematica Española), Granada, 2015.
18. **SIMAI 2014** (Italian Society for Applied and Industrial Mathematics) - Taormina, Italy, 2014.
19. **FJIM2014** (1st Joint Int. Meeting of the Italian and Spanish Math. Soc.) - Bilbao, Spain, 2014.
20. **DD21** (21th Int. Conf. on Domain Decomposition Methods) - Rennes, France, 2012.
21. **EEID2011** (Ecology and Evolution in Infectious Diseases) - Santa Barbara, USA, 2011.
22. **SIAM 2010 Annual Meeting and Conference on the Life Sciences** - Pittsburgh, USA, 2010.
23. **CMBE2011** (2nd Int Conf. on Comp. and Biomedical Engrng), Washington DC, USA, 2011.
24. **SIMAI/SEMA 2010** (Italian & Spanish Soc for Appl & Industrial Math) - Cagliari, Italy, 2010.
25. **MPF2010** (IV Int. Symposium on Modelling of Physiological Flows) - Chia Laguna, Italy, 2010.
26. **IMACS** (Comp & Applied Math & Applications in Science and Engrng) - Athens, USA, 2009.
27. **CMMSE2009** (Int Conf on Comp & Math Methods in Science & Engrng) - Gijon, Spain, 2009.
28. **DD17** (17th Int. Conf. on Domain Decomposition Methods) - Strobl, Austria, 2006.
29. **ECMTB2005** (European Conf. on Math. and Theor. Biology) - Dresden, Germany, 2005.
30. **DD16** (16th Int. Conf. on Domain Decomposition Methods) - New York City, USA, 2005.
31. **A-HYKE2** (2nd Int. Conf. "Around HYperbolic and Kinetic Equations") - Paris, France, 2004.
32. **ENUMATH 2003** (5th European Conf. on Num. Math.) - Prague, Czech Republic, 2003.
33. **DD15** (15th Int. Conf. on Domain Decomposition Methods) - Berlin, Germany, 2003.
34. **IPERFE2002** (X Italian Meeting on Hyperbolic Equations) - Ferrara, Italy, 2002.
35. **FBP2002** (Free Boundary problems: Theory and Applications) - Trento, Italy, 2002.
36. **DD14** (14th Int. Conf. on Domain Decomposition Methods) - Cocoyoc, Mexico, 2002.
37. **AMIF 2000** (II Int. Conf. on Applied Math for Industrial Flow Problems) - Il Ciocco, Italy, 2000.
38. **WASCOM '99** (X Int. Conf. on Waves and Stability in Continuous Media) - Vulcano, Italy, 1999.

## Workshops

1. **FEM Circus & Rodeo** (Parallel computing framework for FEM) - Bilbao, Spain, 2019.
2. **Quantitative Biomedicine for Health and Disease V** - Bilbao, Spain, 2019.
3. **WONAPDE2019** (6th Chilean Workshop on Num. Anal. of PDE) - Concepcion, Chile, 2019.
4. **VMAD2019** (9th Valparaíso's Mathematics and Applications Days) - Valparaíso, Chile, 2019.
5. **Mathematics for BioMedicine** - Rome, Italy, 2018.

6. **SDS2018** (10th Workshop on Structured Dynamical Systems) - Monopoli, Italy, 2018.
7. **PinEE II** Populations in Epidemics and Ecology: modeling and simulations - Bilbao, Spain, 2018.
8. **Mathematical and Numerical Modeling of the Cardiovascular System** - Rome, Italy, 2018
9. **Quantitative Biomedicine for Health and Disease IV** - Bilbao, Spain, 2018.
10. **Mathematical Modeling of Cortical Spreading Depression (SD) and Related Phenomena**, IMA Minneapolis, USA, 2018.
11. **Populations in Epidemics and Ecology: modeling and simulations** - Bilbao, Spain, 2017.
12. **Quantitative Biomedicine for Health and Disease III** - Bilbao, Spain, 2017.
13. **Mathematical solutions for Industry: success stories and perspectives** - ICMAT, Madrid, Spain, 2016
14. **SDS2016** (9th Workshop on Structured Dynamical Systems) - Monopoli, Italy, 2016.
15. **Quantitative Biomedicine for Health and Disease II** - Bilbao, Spain, 2016.
16. **Numerical Resolution of Inverse Problems II** - Bilbao, Spain, 2016.
17. **Quantitative Biomedicine for Health and Disease** - Bilbao, Spain, 2015.
18. **Transcardio 2014** - Barcelona Supercomputing Center, Spain, 2014
19. **Fluid Dynamics and Electromagnetism: Theory and Numerical Approximation** - Levico Terme, Italy, 2014.
20. **BCAM Workshop on Nonlinear Dynamics in Biological Systems** - Bilbao, Spain, 2014
21. **M2OP** (Multiphysics, Multiscale and Optimization Problems) - Bilbao, Spain, 2014
22. **Fractional Calculus, Probability, and Non-local Operators: Applications and Recent Developments** - Bilbao, Spain, 2013.
23. **Emergence, spread and control of infectious diseases** - CRM, UA Barcelona, Spain, 2013
24. **Trobada d'edps i aplicacions** - Girona, Spain, 2013
25. **Nonsmooth phenomena in cardiac dynamics** - Bilbao, 2013
26. **NIH Workshop Surveillance theory for infectious disease detection and control** - Atlanta, 2012
27. **EFEF 2012** European Finite Element Fair - Bilbao, Spain, 2012.
28. **Aquitaine-Euskadi Workshop in Applied Mathematics** - Bilbao, Spain, 2012.
29. **MIMMO-BIO** (Math. Innovative Methods and MOdels of BIOsciences) - Trento, Italy, 2011.
30. **Georgia Scientific Computing Symposium 3** - Emory University, Atlanta, USA, 2011.
31. **IMA Workshop Computing with Uncertainty** - University of Minnesota, 2010.
32. **Modeling Toxoplasma Gondii** - NIMBioS, U. Tennessee at Knoxville, USA, 2010.
33. **Georgia Scientific Computing Symposium** - GaTech, Atlanta, 2010.
34. **White Workshop in Mathematical Biology** - Trento, Italy, 2009.
35. **The Cardiac Physiome: Multiscale and Multi-physics Mathematical Modelling Applied to the Heart**, Isaac Newton Institute, Cambridge, UK, 2009.
36. **Georgia Scientific Computing Symposium** - Emory Univ., Atlanta, 2009.
37. **Fast Algorithms for Scientific Computing** - New York City, USA, 2008.
38. **MUA** (Mathematics today for man and environment) - Montecatini Terme, Italy, 2007.
39. **MPF2006** (3rd Int. Symposium on Modelling of Physiological Flows) - Bergamo, Italy, 2006.
40. **Methods of mathematical analysis in Biology, Medicine and Environment** - Montecatini Terme, Italy, 2006.
41. **Computational Life Sciences** - Innsbruck, Austria, 2005.
42. **Math Everywhere** (A workshop to celebrate V. Capasso 60th birthday) - Milano, Italy, 2005.
43. **Résolution performante des systèmes linéaires pour la solution d'équations aux dérivées partielles couplées** - GAMNI - Institut Henri Poincaré, Paris, 2004.
44. **Mécanique des Fluides Numérique** - CEA-GAMNI -Institut Henri Poincaré, Paris, 2004.
45. **Multiphase Fluid Flows and Multi-Dimensional Hyperbolic Problems** Isaac Newton Institute, Cambridge, UK, 2003.
46. **Problems in Electromagnetism** - Trento, Italy, 2002.
47. **PARAMAS 2001**, ASCI Laboratory, University of Orsay (Paris-Sud), 2001.

48. **LMS Workshop on Domain Decomposition Methods in Fluid Mechanics** - University of Greenwich, England, 2001.
49. **Condition limites numériques pour les systèmes hyperboliques; application en mécanique des fluides** - Institut Henri Poincaré, Paris, 2001.
50. **DI'MOD01** (Modélisation Distribuée) - Université Paris XIII, Villetaneuse (France), 2001.
51. **Wavelets and Applications** - Turin Polytechnic (Italy), 2000.

## Scientific communications

### Plenary lectures

1. *Enhancing predictivity of mathematical models in spatial ecology: accurate landscape description and Uncertainty Quantification*, DSABNS2019 (10th Conference on Dynamical Systems Applied to Biology and Natural Sciences), Naples, Italy, 2019.
2. *Fractional operators in action: tackling important modeling challenges in cardiac electrophysiology*, SDS2018 (10th Workshop on Structured Dynamical Systems) - Monopoli, Italy, 2018.
3. *Some Mathematical and Numerical Aspects of Brain Activity Modeling*, 41st South African Congress on Numerical and Applied Mathematics, 2017.

### Invited talks at Conferences and workshops

4. *Application of space-fractional PDEs in electrocardiological modeling*, ICIAM2019.
5. *Numerical approximations of the fractional Laplacian on bounded domains via the method of semi-groups*, ICIAM2019.
6. *Using FEniCS-HPC in the simulation of endocardial radiofrequency ablation*, FEM Circus & Rodeo (Workshop on parallel computing framework for FEM) - Bilbao, Spain, 2019.
7. *Numerical approximation of the spectral Fractional Laplacian on bounded domains*, WONAPDE2019 (6th Chilean Workshop on Num. Anal. of PDE) - Concepcion, Chile, 2019
8. *Fractional operators in action: tackling important modeling challenges in cardiac electrophysiology*, VMAD2019 (9th Valparaiso Mathematics and Application's Days) - Valparaiso, Chile, 2019.
9. *Impact of tissue elasticity on RF ablation: insights from a computational model* - Transcardio 2018.
10. *Advanced computational modeling in the development of new ablation strategies* - Conference ECMI2018.
11. *Advanced computational modeling in the development of new ablation strategies* - Conference RITMO2018.
12. *Patient-specific computational modeling of cortical spreading depression via diffusion tensor imaging* - Workshop Math. Modeling of Cortical Spreading Depression and Related Phenomena, 2018.
13. *Modelling cardiac structural heterogeneity via space-fractional differential equations* - Conference CMBE2017
14. *A computational model for cardiac radiofrequency ablation with open-irrigated electrodes* - Conference SIAM CSE 2017.
15. *Optimized Schwarz Methods in the Stokes-Darcy coupling* - Conference DD24, 2017
16. *Model reduction for the dispersal of invasive species in a realistic landscape* - SIMAI 2016
17. *A computational model for cardiac radiofrequency ablation with open-irrigated electrodes* - SIMAI 2016
18. *Geographically accurate simulation of invasive species dispersal* - Congress WCCMXII 2016.
19. *Patient-specific computational modeling of Cortical Spreading Depression* - Workshop SDS2016.
20. *Computational modelling in the optimization of Cardiac Radio Frequency Ablation procedures* - Workshop Mathematical solutions for Industry: success stories and perspectives, 2016.
21. *Dynamic spatio-temporal analysis of infectious diseases ecology* - Workshop Numerical Resolution of Inverse Problems II, 2016
22. *Dynamic spatio-temporal analysis of infectious diseases ecology* - Conference AIP2015.
23. *Uncertainty Quantification and its role in designing efficient simulations for biomedical applications* - Conference RSME 2105
24. *Optimized partitioned procedures for the Stokes-Darcy coupled problem* - Conference RSME 2105
25. *Modeling and Simulation in the Life Sciences* - Workshop Transcardio 2014.
26. *Optimized partitioned procedures for the Stokes-Darcy coupled problem* - Conference SIMAI 2014
27. *Computational aspects and challenges in the spatial propagation of cardiac action potentials* - First BCAM Workshop on Nonlinear Dynamics in Biological Systems, 2014
28. *Stokes/Darcy Coupling in Filtration Problems* - Workshop M2OP, 2014

29. *Model adaptivity in electrocardiology simulations* - Workshop Trobada d'edps i aplicacions - Girona, Spain, 2013
30. *Spatial modeling in heart electrophysiology and its numerical approximation* - Workshop Nonsmooth phenomena in cardiac dynamics, Bilbao, 2013
31. *Surveillance risk mapping methods* - NIH - RAPIDD Workshop Surveillance theory for infectious disease detection and control, Atlanta 2012.
32. *Optimized Schwarz coupling and model adaptivity in numerical electrocardiology* - Minisymposium Domain Decomposition Solvers in Computational Cardiology, Conference DD21, 2012.
33. *Mathematical and numerical aspects in modeling heart electrophysiology* - Aquitaine-Euskadi Workshop in Applied Mathematics, 2012.
34. *Finite elements modeling of epidemics in a realistic landscape* - Workshop MIMMO-BIO, Trento, Italy, 2011.
35. *Efficient preconditioners for the Bidomain system in Electrocardiology* - Minisymposium Methods of cardiac electro-mechanics - Conference CMBE2011, Washington DC, USA, 2011.
36. *Some advances in computational electrocardiology* - Session Compact Physiological Models for Cardiovascular System, SIAM Conference on the Life Sciences, Pittsburgh, USA, 2010.
37. *Optimized Schwarz Methods for Maxwell Equations* - Minisymposium Domain Decomposition Methods, Iterative Solvers and Adaptive Methods, Conference SIMAI 2010, Cagliari, Italy, 2010.
38. *Numerical approximation for the diffusion of an age-structured population* - Doctorate School on Cell growth and pattern formation, University of Trento, 2007.
39. *Algebraic Optimization of interface conditions in domain decomposition methods for strongly heterogeneous unsymmetric problems* - Minisymposium Optimized Schwarz Methods, Conference DD16, 2005.
40. *Modified Non-Overlapping Schwarz Algorithms for the Harmonic Maxwell's System* - Minisymposium Recent Developments of Schwarz Methods, Conference DD15, 2003.

### Contributed talks at Conferences and workshops

41. *Patient-specific modeling of Cortical Spreading Depression* - Workshop Math. for BioMedicine, 2018
42. *Combining tissue anisotropy and heterogeneity in cardiac electrophysiology: a space-fractional Monodomain model* - INdAM Workshop Math and Num Modeling of the Cardiovascular System, 2018
43. *Modeling uncertainty in invasive species dispersal through geographically accurate landscape* - Workshop Population in Epidemics and Ecology, 2017.
44. *Large scale simulation of synthetic markets* - Workshop Fractional Calculus, Probability, and Non-local Operators: Applications and Recent Developments - Bilbao, Spain, 2013.
45. *Incorporating the effect of landscape heterogeneities in the spread of an epidemics in wildlife* - Workshop Emergence, spread and control of infectious diseases - CRM, Barcelona, Spain, 2013
46. *Optimization of Robin-Robin partitioned procedures in Fluid Structure Interaction problems* - Conference MPF2010, Chia Laguna, Italy, 2010.
47. *Numerical approximation of diffusion models in age-structured population dynamics* - White Workshop in Mathematical Biology, Trento, Italy, 2009.
48. *Optimized Schwarz Methods for Maxwell Equations* - IMACS World Congress, Athens, USA, 2009.
49. *Efficient methods for numerical simulations in electrocardiology* - CMMSE2009, Gijon, Spain, 2009.
50. *Modeling human atrial tissues* - MUA Workshop, Montecatini Terme, 2007.
51. *Modeling the spread of excitation in atrial tissues: theory and numerical simulation* - Workshop MFP2006.
52. *A domain decomposition method for the diffusion of an age-structured population in a multilayer environment* - Conference DD17, 2006.
53. *Modeling cardiac electrophysiology: theory and numerical simulation* - FIRB workshop, Montecatini Terme, 2006.
54. *Strongly Heterogeneous Advection-Diffusion Problems: the Domain Decomposition Approach* - Conference ENUMATH 2003.
55. *A Robin/Robin preconditioner for strongly heterogeneous advection-diffusion problems* - Conference DD14, 2002.

## Seminars

1. *Advanced computational modeling in the design of new ablation strategies*, Campus Biomedico, 2019.
2. *Patient-specific computational modeling of Cortical Spreading Depression*, U. of Bordeaux, 2018
3. *Optimized Schwarz Methods in the Stokes-Darcy problem*, Brown University, USA, 2017
4. *Patient-specific computational modeling of Cortical Spreading Depression*, Wits U., S. Africa, 2017
5. *Patient-specific computational modeling of Cortical Spreading Depression*, U. of Trento, Italy, 2016
6. *Patient-specific computational modeling of Cortical Spreading Depression*, U. of Bari, Italy, 2016
7. *Accurate electrophysiological modeling of excitable tissues*, Politecnico di Milano, Italy, 2016
8. *Numerical simulation of cortical spreading depression on individual brain geometries*, Case Western Reserve University, USA, 2015
9. *Optimized partition procedures for the coupled Stokes-Darcy problem*, Emory U., USA, 2015.
10. *Optimized Schwarz methods for PDEs*, Université Laval, Canada, 2014.
11. *Optimized Schwarz methods for PDEs*, Brown University, USA, 2014.
12. *Optimized Schwarz methods for PDEs*, University of Rhode Island, USA, 2014.
13. *Optimized Schwarz methods in the numerical approximation of PDE*, U. de Pau, France, 2013.
14. *Some problems in spatial epidemiology*, KAUST, Saudi Arabia, 2013.
15. *Optimized Schwarz methods in the numerical approximation of PDE*, KAUST, Saudi Arabia, 2013.
16. *Some problems in modeling spatial dynamics for disease ecology*, BC3 - Basque Center for Climate Change, 2012.
17. *Modeling and numerical simulations for some problems in Life Sciences*, U. of Dundee, UK, 2012.
18. *Parameter estimation for dynamical systems in ecology of infectious diseases*, U. Trento, Italy, 2012.
19. *Some mathematical and numerical aspects in electrocardiology modeling*, U. of Sussex, UK, 2012.
20. *Dynamical systems and disease ecology modeling: parameter estimation and applications* - Imperial College, UK, 2012.
21. *Some modeling and numerical aspects in heart electrophysiology* - BCAM, 2011.
22. *Optimized Schwarz Methods for PDEs* - Georgia Tech, USA, 2010.
23. *Modeling the electrical activity of the heart* - U. of Colorado at Colorado Springs, USA, 2009.
24. *Optimized Schwarz Methods in the numerical solution of PDEs* - NCAR, Boulder, CO, USA, 2009.
25. *Fast and efficient Bidomain simulations in Electrocardiology* - U. of Trento, Italy, 2009.
26. *Modeling and Numerical simulation in heart electrophysiology* - Georgia Tech, USA, 2008.
27. *Modeling and numerical simulation in heart electrophysiology* - Emory U., USA, 2008.
28. *Modeling and Numerical simulation in heart electrophysiology* - Milan Polytechnic, Italy, 2007.
29. *Domain decomposition methods for strongly heterogenous advection-diffusion problems* - U. of Padova, Italy, 2005.
30. *Optimisation algébrique de conditions d'interface en décomposition de domaine* - U. de Genève, Switzerland, 2004.
31. *Algorithmes de Schwarz pour le système de Maxwell harmonique* - U. de Nice-Sophia Antipolis, France, 2004.
32. *Schwarz algorithms for the harmonic Maxwell system* - U. of Milan, 2004.

## Posters

1. *Stay on the safe side: in-silico assessment of radiofrequency ablation protocols to prevent steam pop formation*. Conference of the European Society of Cardiology, 2019. Presented by A. Petras.
2. *Effect of Tissue Elasticity in Cardiac Radiofrequency Catheter Ablation Models*, Conference Computing in Cardiology 2018. Presented by A. Petras. **Winner of Best poster presentation**.
3. *Fractional models of electrophysiology: accounting for anisotropy and heterogeneity on realistic geometries*, Workshop MANNA (Modeling, Analysis & Numerics for Nonlocal Applications), 2017.
4. *Incorporating observational data in disease dynamics for targeted surveillance*, Conference EEID (Ecology and Evolution in Infectious Diseases), 2011.
5. *Schwarz coupling of Bidomain and Monodomain models in electrocardiology*, The Cardiac Physiome Project Workshop, 2009.
6. *A fast and efficient preconditioner for the Bidomain Model in electrocardiology*, Workshop Fast Algorithms for Scientific Computing, 2008.



## Teaching Activity

### University of Trento (1999-2008)

#### Tutoring

- Faculty of Sciences (99/00, 02/03).

#### Lab Instructor

- Faculty of Economics: *General Mathematics* (99/00)
- Faculty of Sciences: *Biomathematics* (05/06, 06/07, 07/08)
- Faculty of Engineering: *Mathematical Analysis 2* (00/01, 01/02, 05/06),  
*Calculus 2* (02/03),  
*Calculus 1* (05/06, 06/07, 07/08)

#### Instructor

- Faculty of Economics (PhD Program in Economics and Management):  
*Crash Course in Mathematics and Statistics* (06/07, 07/08)
- Faculty of Engineering: *Mathematical Analysis* (06/07, 07/08)

### Emory University (2009-2010)

#### Instructor

- *Linear Algebra* (Spring 09)
- *Life Science Calculus I* (Fall 09)
- *Life Science Calculus II* (Spring 10)

### University of the Basque Country (2012-2018)

#### Instructor

- Master in Mathematics  
*An introduction to domain decomposition methods for PDEs* (Spring 13)
- Master in Mathematics  
*An introduction to differential modelling in biosciences* (Fall 17)

### University of Verona (2017-2018)

#### Instructor

- Master in Mathematics  
*The electrophysiology of excitable tissues: modelling and numerical simulations* (Fall 17)

## Teaching evaluation

The students' evaluation referring to the courses I gave at Emory University are attached to the application. Additional information can be collected from Prof. Dwight Duffus, who is my referee for teaching, and whose contacts are listed in the References list

## Responsibilities

### Administrative tasks

- Courses organization in the framework of the Master in Mathematics joint BCAM-UPV (University of the Basque Country) program, since 2012.

### Committees:

- Ph.D. in Aeronautics, Imperial College London, UK.  
Candidate: Marco Pietropaoli, 2018.
- Ph.D. in Computer Architecture, Universitat Politecnica de Catalunya, Spain.  
Candidate: Cristobal Samaniego, 2015.
- Ph.D. in Computer Architecture, Universitat Politecnica de Catalunya, Spain.  
Candidate: Ana Beatriz Eguzkitza, 2014.
- Ph.D. in Biomechanical Engineering, Georgia Institute of Technology, USA.  
Candidate: David L. Bark, 2010.

## Principal Collaborators

### Clinical

- Dr. Jose M Guerra, Unitat de arritmia, Hospital de la Santa Creu i Sant Pau, Barcelona, Spain
- Dr. Marian Gomez Beldarrain, Neurology Department, Galdakao Hospital, Bilbao, Spain
- Prof. Marina de Tommaso, Neurology department, Policlinico di Bari, Italy.
- Dr. Eleonora Vecchio, Neurology department, Policlinico di Bari, Italy.
- Dr. Luis Castaño, Pediatric diabetology, Cruces Hospital, Barakaldo, Spain
- Dr. Sonia Gaztambide, Pediatric diabetology, Cruces Hospital, Barakaldo, Spain

### Mathematics and Statistics

- Prof. Daniela Calvetti, Dept App. Math., Case Western Reserve University, Cleveland, USA.
- Prof. Erkki Somersalo, Dept App. Math., Case Western Reserve University, Cleveland, USA.
- Dr. Francesco Montomoli. Dept Aeronautics, Imperial College London, UK.
- Prof. Richard Bertram, Dept Math, Florida State University, USA.
- Dr. Marco Discacciati, Dept Math, Loughborough University, UK.
- Dr. Dae-Jin Lee, BCAM.
- Dr. Pedro Caro, Ikerbasque and BCAM.
- Dr. Gianni Pagnini, Ikerbasque and BCAM.
- Dr. Gavino Puggioni, University of Rhode Island, USA.
- Prof. Alessandro Veneziani, Dept. Math and CS, Emory University, Atlanta, USA.
- Prof. Simona Perotto, MOX, Politecnico di Milano, Italy
- Dr. Franco Dassi, Dept Math, University Bicocca, Milan, Italy
- Prof. Enrico Scalas, University of Sussex, UK.
- Prof. Lance A Waller, Dept. Biostatistics, Emory University, Atlanta, USA.

### Biomedical

- V-Heart SN: Spanish Research Network in Computational Cardiac Modeling.
- Dr. Alessio Gizzi, Università Campus Biomedico, Roma, Italy
- Prof. J. Cortes, BioCruces, Cruces Hospital, Bilbao, Spain.
- Prof. S. Stramaglia, University of Bari and National Institute for Nuclear Physics, Italy.
- Prof. Banafshe Larijani, Ikerbasque and Biofisika Institute, Bilbao, Spain.
- Prof. Miguel Angel Nadal, Diabetes research unit, Miguel Hernandez University, Elche, Spain.
- Prof. Leslie Real Lab, Dept. Biology, Emory University, Atlanta, USA.

# Mobility

## Long term visits

- CMAP (Centre de Mathématiques Appliquées) , École Polytechnique (France), March-December 2001: “*Stagiaire de Recherche*”. Collaboration with Prof. Patrick LeTallec and Prof. Frédéric Nataf.

## Short term visits

- INRIA, MACS Project, Rocquencourt (France), December 2001, June-July 2003.
- Isaac Newton Institute, Cambridge (UK), April 2003, July 2009.
- Université de Nice-Sophia Antipolis (France), July 2004.
- Université de Genève (Switzerland), September 2004.
- CMAP, École Polytechnique (France), December 2004, January 2005, April 2005, June 2005.
- INRIA, CAIMAN Project, Sophia Antipolis (France), July 2006.
- NCAR, IMAGE Team, Boulder, CO (USA), November 2009.
- University of Colorado at Colorado Springs (USA), November 2009.
- INRIA, ANUBIS Project, Bordeaux (France), May 2010.
- IMA, University of Minnesota, Minneapolis (USA), October 2010.
- INRIA, CARMEN Project, Bordeaux (France), December 2011, April 2012, December 2012, October 2013.
- Imperial College, London (UK), March 2012, October 2014, December 2015
- University of Sussex, Brighton (UK), June 2012.
- KAUST, Tuwal (Saudi Arabia), January 2013.
- University of Pau (France), January 2013.
- Universtiy of Girona (Spain), June 2013.
- CRM, Universidad Autonoma de Barcelona (Spain), June 2013.
- Universidad Politecnica de Catalunya (Spain), June 2013.
- Barcelona Supercomputing Center (Spain), June 2013, December 2015
- University Laval, Quebec City, Canada, February 2014.
- Emory University, Atlanta (USA), October 2012, February 2014, October 2015, February 2017
- Brown University, Providence, USA, February 2014, April 2017
- University of Rhode Island, USA, February 2014, October 2015, April 2017
- Case Western Reserve University, Cleveland, USA, October 2015, April 2017
- Università Campus Biomedico, Roma, Italy, April 2018
- University of Valparaiso, Chile, January 2019

## Miscellaneous

### Languages

**Italian:** Mother tongue.

**English:** Fluent (lived 3 years in the USA).

**French:** Fluent (lived 2 years in France)

**Spanish:** Fluent (lived 8 years in Spain)

**German:** Basic knowledge.

### Computer skills

- **Operating Systems:** Linux, MacOS, Windows.
- **Technical Computing:** MATLAB, Maple, R
- **Programming:** C++
- **Numerical Software:** LifeV (Finite Element Library, <http://www.lifev.org>), FEniCS-HPC (Finite Elements software for HPC, <http://www.fenics-hpc.org>), ParaView (Post-processing visualization Tool, <http://www.paraview.org/>), NetGen (Grid generator, <http://www.hpfem.jku.at/netgen/>), VMTK (Vascular Modeling Toolkit, <http://www.vmtk.org>).
- **Text Processors:** T<sub>E</sub>X, L<sup>A</sup>T<sub>E</sub>X

### Military Duties

- Lieutenant in the Italian Army Artillery, January 1998 - March 1999.

### Other Working Experiences

- Consultant for IMHO LLC, Atlanta, GA, USA, 2011-2015.
- Consultant and teacher of mathematics for a private school: January-November 1997.
- Employee in the Italian bank BANCA CRT (currently Unicredit Bank): February-July 1992.

### Editorial activity

- Discrete and Continuous Dynamical Systems B, special issue 2019.
- Applied and numerical Mathematics, special issue 2019.

### Refereeing activity

- M2AN, Mathematical Modeling and Numerical Analysis
- Journal of Computational Physics
- SIAM Journal on Scientific Computing
- SIAM Journal on Matrix Analysis and Applications
- IEEE Transactions on Antennas and Propagation
- ASME Journal of Biomechanical Engineering
- Epidemiology and Infection
- PLoS One
- Discrete and Continuous Dynamical Systems

## Continuing Education

- IMA Tutorial “**Computing with Uncertainty**” - University of Minnesota, 2010.
- “**Cell growth and pattern formation**” - University of Trento, 2007.
- EMS Summer School “**Mathematical Models of the Heart**” - SIMULA Labs, 2006.
- “**Grid generation Techniques in Scientific Computing**” - MOX, Milan Polytechnic, 2005.
- Summer School “**Mathematical Models in Life Science: Theory and Simulation**” - Dobbiaco (BZ), Italy, July 2005.
- “**De la physique atomique à l’elasticité non lineaire: un approche mathématique**” - Prof. P.L. Lions, College de France Lectures, 2003.
- “**School on Nonlinear Analysis**” - University of Trento, 2002.
- EMS Summer School “**Simulation of Fluid Structure Interaction**” - Prague, 2001.
- **CEMRACS 2001** School on Multiscale Problems - ASCI Laboratory, University of Orsay, 2001.
- “**Analysis and Geometry on Metric Spaces II**” - University of Trento, 2000.
- “**Analysis and Geometry on Metric Spaces I**” - University of Trento, 1999.

## Other training

- Course on **Managing skills**, Prof. V. Lopez, 2013.
- Workshop on **Strategy, Culture and Leadership: Seizing the ambition for excellence**, Prof. L. Huete, 2011.

## Previous participation in the organisation of Research Groups

- In collaboration with A. Veneziani, we built, starting in early 2008, a research and numerical simulation group at the Mathematics and Computer Science Department of Emory University (Atlanta). The group set up collaborations with biologists, cardiologists and radiologists from the Emory University Hospital and School of Medicine, working towards a patient-specific simulation. The group set up also collaborations with Bioengineers from the Georgia Institute of Technology. Initially, the team included one Professor (A. Veneziani), one Post-Doc (myself), two PhD Students and three visiting students, and later grew up to ten people, among which four postdoctoral researchers and five PhD students.
- During the 2004-2008 years, I participated in the creation of the research group **BioMaSCoT** (Biological Modeling and Scientific Computing Trento), based at the Mathematics Department of the University of Trento. I was involved in the organization of the group seminars and, together with A. Lunelli, I was managing the group website (<http://www.science.unitn.it/biomascot/>)

## Non-scientific Workshops

- Workshop “**CASIMIR**” (Creating A Succesful Italian Model In Research) - Milano, February 2005.

## Non-scientific communications

- “What after Ph.D.?” - Meetings of the University of Trento, May 2005.
- “Is there room for young researchers in private companies?” - National Conference “Il Quarto Stato della Ricerca: perspectives and expectations of young researchers by young researchers”, Roma, May 2005.

## References

1. **Prof. José Maria GUERRA RAMOS**  
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2. **Prof. Alessandro VENEZIANI**  
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3. **Prof. George E. KARNIADAKIS**  
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4. **Prof. Yves COUDIÈRE**  
*Professor of Applied Mathematics*, Université Bordeaux 1  
INRIA Projet CARMEN, LYRIC Institute Modeling Team  
Centre de Recherche Bordeaux Sud-Ouest, 200 avenue de la Vielle Tour, 33405 Talence, France  
Phone: +33 (0)5 24 57 40 36      Email: [yves.coudiere@inria.fr](mailto:yves.coudiere@inria.fr)
5. **Prof. Daniela CALVETTI**  
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## Full publications list

### Submitted

1. N. Cusimano, F. Del Teso, **L. Gerardo-Giorda**. *Numerical approximations for fractional elliptic equations via the method of semigroups*, to appear on **ESAIM M2AN**.  
<https://doi.org/10.1051/m2an/2019076>
2. M. Conte, **L. Gerardo-Giorda**, M. Groppi. *Glioma invasion and its interplay with the nervous tissue: a multiscale model*, to appear on **Journal of Theoretical Biology**.  
<https://doi.org/10.1016/j.jtbi.2019.110088>
3. G. Capo Rangel, **L. Gerardo-Giorda**, E. Somersalo and D. Calvetti. *Metabolism plays a central role in the cortical spreading depression: evidence from a mathematical model*, to appear on **Journal of Theoretical Biology**.
4. N. Cusimano, A. Gizzi, F.H. Fenton, S. Filippi, **L. Gerardo-Giorda**. *A roadmap for spatially non-local mathematical modelling in cardiac electrophysiology*. In review in **Communications in Nonlinear Science and Numerical Simulation**.

### In preparation

5. A. Petras, M. Leoni, J. Jansson, J.M. Guerra, **L. Gerardo-Giorda**, *Cardiac wall stiffness is a major factor in the outcome of RFA procedures: insights from a computational study*.
6. J.M. Guerra, Z. Moreno Weidmann, A. Petras, M. Leoni, J. Jansson, **L. Gerardo-Giorda**, *High power RF ablation: procedure assessment through computational modeling*.
7. A. Petras, M. Echeverria, M. Leoni, J.M. Guerra, **L. Gerardo-Giorda**, *Electrode tip and applied power are the main responsible for steam pop occurrence during endocardiac RF catheter ablation: evidence from a computational study*.
8. J.M. Kroos, G.E. Karniadakis, **L. Gerardo-Giorda**, *Uncertainty Quantification in the modeling of Cortical Spreading Depression*.
9. F. Dassi, J.M. Kroos, S. Perotto, **L. Gerardo-Giorda**, *An efficient mesh smoothing strategy for cortical geometries*.
10. J.M. Kroos, F. Dassi, S. Perotto, M. Gomez-Bildarrain, **L. Gerardo-Giorda**, *Cortical curvature as indicator of predisposition for migraine?*
11. G. Puggioni, **L. Gerardo-Giorda**, L. Waller and L. Real, *A Dynamic Nonparametric Spatial Point Process Model*.

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12. N. Pepper, **L. Gerardo-Giorda** and F. Montomoli (2019). *Metamodeling on detailed geography for accurate prediction of invasive alien species dispersal*, **Scientific Reports**, 9, 16237.  
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15. **L. Gerardo-Giorda** (2019). *Some current challenges in quantitative biomedicine*, **Valencia Intelligencer**, ICIAM2019, pp. 63-71, Springer.
16. G. Capo Rangel, J. Prezioso, **L. Gerardo-Giorda**, E. Somersalo and D. Calvetti (2019). *Brain energetics plays a key role in the coordination of electrophysiology, metabolism and hemodynamics: evidence from an integrated computational model*, **J. Theor. Biol.** Vol. 478, pp. 26-39.  
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