

**Nejib Zemzemi**  
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Nationality : Tunisian  
Born : 26/08/1981

## PHD in Applied Mathematics

### **Current Position : From July 2010**

Research Assistant at the computing laboratory, University of Oxford.

### **From September 2009 to June 2010**

Teaching assistant at Université d'Orsay (Paris 11) and part time researcher in the REO project INRIA Paris-Rocquencourt.

## **EDUCATION AND DIPLOMAS**

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### **From October 2006 to Decembrer 2009**

PHD thesis in applied mathematics at Université d'Orsay (Paris 11) and the REO project INRIA Paris-Rocquencourt.

Topic of the thesis : Theoretical and Numerical study of the electrical activity of the heart. Modelling and Numerical simulation of electrocardiograms.

PHD Supervisors : Mr Jean-Frédéric Gerbeau and Mr Miguel Fernández.

2005/2006

Master in applied mathematics (PDE & scientific computing) at Université d'Orsay, followed by an internship at INRIA

Topic of the internship : Modelling and Numerical simulation of electrocardiograms.

2004/2005

Preparation "agrégation de mathématiques" at Ecole Normale Supérieure (ENS) Tunis.

2002/2004

Bachelor in fundamental and applied mathematics (Maîtrise en Mathématiques fondamentales et appliquées) at ENS Tunis and the Science University of Tunis.

## **PUBLICATIONS AND COMMUNICATIONS**<sup>1</sup>

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### **Journals**

- M.A. Fernández, N. Zemzemi Decoupled time-marching schemes in computational cardiac electrophysiology and ECG numerical simulation. *Mathematical Biosciences*, 2010. Volume 226, Issue 1, July 2010, Pages 58-75.
- Muriel Boulakia, Serge Cazeau, Miguel A. Fernández, Jean-Frédéric Gerbeau, Nejib Zemzemi. *Mathematical Modelling Of Electrocardiograms : A Numerical Study*. *Annals of Biomedical Engineering* (2009). pp(1573-9686). DOI : 10.1007/s10439-009-9873-0
- M. Boulakia, M.A. Fernández, J.-F. Gerbeau, N. Zemzemi. A coupled system of PDEs and ODEs arising in electrocardiograms modelling. *AMRX. Appl. Math. Res. Express*, (2008) Vol. 2008 : article ID abn002. DOI : 10.1093/amrx/abn002.
- A. Azzouzi, Y. Coudière, R. Turpault, N. Zemzemi. Modelling of the his bundle and pacing optimization in cardiac electrophysiology. Submitted in *mathematical biosciences*.

### In preparation

- D. Chapelle, M. Fernández, J.-F. Gerbeau, P. Moireau, J. Sainte-Marie, N. Zemzemi. A 3D model for the electromechanical activity of the heart.

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<sup>1</sup>Authors are alphabetically ordered. (Laboratory convention).

- M.A. Fernández, J-F. Gerbeau, N. Zenzemi. Models and metamodels in electrocardiography.

### **Proceedings**

- G. Ebrard, M. Fernández, J-F Gerbeau, F. Rossi, N. Zenzemi. From intracardiac electrograms to electrocardiograms. Models and metamodels. In Proceedings of the Fifth International Conference on Functional Imaging and Modeling of the Heart FIMH 2009, N, Ayache, H. Delingette, M. Sermesant Eds. pp. 524-533, Springer, 2009.
- D. Chapelle, M. Fernández, J.-F. Gerbeau, P. Moireau, J. Sainte-Marie, N. Zenzemi. Numerical simulation of the electromechanical activity of the heart, n Proceedings of the Fifth International Conference on Functional Imaging and Modeling of the Heart (FIMH09), N, Ayache, H. Delingette, M. Sermesant Eds. pp. 357-365, Springer, 2009.
- M. Boulakia and M. A. Fernández and J. F. Gerbeau and N. Zenzemi. Direct and Inverse problems in Electrocardiography. AIP Conference Proceedings, pp. 113-117, AIP 2008.
- M. Boulakia, M.A. Fernández, J.-F. Gerbeau, N. Zenzemi. Towards the numerical simulation of electrocardiograms. In Proceedings of the Fourth International Conference on Functional Imaging and Modeling of the Heart (FIMH07), F.B. Sachse, G. Seemann Eds., pp. 420-429, Springer, 2007.

### **Submitted**

- N. Zenzemi, M.O. Bernabeu, J. Saiz, B. Rodriguez. Simulating drug-induced effects on the heart : from ion channel to body surface electrocardiogram. Submitted in Function Imaging and Modelling of the Heart 2011.
- N. Zenzemi, J. Saiz, B. Rodriguez, Effect of Dofetilide and L-type calcium current on the EADs appearance and the APD dispersion prolongation. Submitted in Heart Rhythm 2011.

### **Ongoing works**

- Prediction of cardiac drugs toxicity.
- Model Reduction using proper orthogonal decomposition technics.
- Inverse problem electrocardiography.
- Pacing optimization in cardiac electrophysiology.
- Heart Mesh adaptivity.

### **Communications**

- 9th World Congress on Computational Mechanics and 4th Asian Pacific Congress on Computational Mechanics (WCCM/APCOM 2010), July 19-23, 2010. Sydney Australia.
- International Workshop on Biomathematics and Biomechanics, November 20-23, 2009. Tozeur, Tunisia.
- International Conference on Functional Imaging and Modelling of the Heart (FIMH09). Jun, 03-05 2009, Nice. France.
- Groupe de Travail des Thesards du LJLL. December 02 2008, Paris, France.
- Open Bang Seminar. November 04 2008, INRIA-Rocquencourt Paris, France
- International Conference of Numerical Analysis and Applied Mathematics 2008 (ICNAAM 2008). September 14- 20 2008, Kos, Greece.
- First CRM-INRIA-MITACS meeting. May 02-09 2008, Montreal, CANADA.
- International Conference of Partial Differential Equations and Applications. Mars 25-29 2008, Hammamet, Tunisia.
- GDR Mathématiques pour la Biologie et la Médecine (MABEM). December 05-07 2007 à l'Institut de Mathématiques de Bordeaux, France.
- 10th Young Researchers and Life Sciences Meeting. April 25-27 2007. Institut Curie Paris, France.

### **Posters**

- First annual colloquium of health technologies, Maison de la chimie. October 23th 2009, Paris, France.
- Fifth International Conference on Functional Imaging and Modelling of the Heart (FIMH09). Jun 03-05 2009, Nice. France.
- Chaste Workshop. Mars 23-25 2009. Computational Laboratory, Oxford University, England.
- Congrès national d'analyse numérique 2007. Jun 04-08 2007. Laboratoire Jean Kuntzmann, Praz sur Arly Grenoble, France.

### **Summer schools**

- CEMRACS summer school, August 02nd–21st, Marseille, France.
- CEA-EDF-INRIA summer school. Model reduction and reduced basis Application in optimization. Jun 23- July 04, 2008. Paris, France.
- CEA-EDF-INRIA school Model Reduction theory and application. October 08-10, 2007. INRIA Paris - Rocquencourt, France

- REO Workshop : Blood and air flow modelling in complex geometries. March 05-06, 2008, INRIA Paris - Rocquencourt, France.
- CEA-EDF-INRIA summer school on data assimilation. Jun 26- July 07, 2006, Paris, France.

**Awards :**

*Best Poster award* in National Congress of Numerical Analysis (CANUM 2007).

**TEACHING EXPERIENCE AND SCIENTIFIC DIFFUSION.**

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Teaching

- Teaching assistant at Paris XI University : Statistical modelling. From September 2009 to January 2010 (96 h). Department of Mathematics, Orsay university.
- "Monitorat au Palais de la Découverte" : Presentations of different mathematical subjects to the public. From October 2007 to September 2009 (128 h). Department of Mathematics. Palais de la Découverte, Paris.

Students supervision

- Co-supervising with Blanca Rodriguez and Alfonso Bueno two Master 2 students (Lorenz Berger and Lloyd Chapman) for a short project at the Oxford University Doctoral Training Center (one week : from March 21st to 26th). The subject of the projects is to build a finite element code in order to solve the equations governing the electrical activity of the heart and perform some numerical investigations. Our goal was to introduce master student to the computer sciences and cardiac electrophysiology modelling fields. The supervision was preceded by giving a lecture to the DTC students.
- Planning to co-supervise with Blanca Rodriguez and Alfonso Bueno two Master 2 student (Ollie Britton and Kylie Beattie) for a long project in the Oxford university doctoral training center. The first project will be about modelling and simulating the drug induced effect on the cardiac electrical activity. The second project will be about understanding arrhythmic mechanism in human heart using numerical simulations.

Participation in Scientific Events

- Science European City. Palais de la Découverte Stand. November14-16 2008, Le Grand Palais, Paris.
- Science Fair : Science Village, Palais de la Découverte stand and Enigmath team 2007. Oct ober 12-14 2007, Jardin des Plantes, Paris.
- European Research and Innovation Exhibition. Stand of l'INRIA : The Heart Modelling (Cardio-sense3D project). Jun 07-09 2007, Parc des Expositions de la porte de Versailles, Paris.

**COMPUTER SKILLS**

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- Formal programming : Matlab, Scilab, Maple, freefem++.
- Programming : C, C++.
- Typesetting : Microsoft Word, Latex.
- Operating systems : Windows, Linux, Mac.