

## George Gregory Malliaras

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### Education

- University of Groningen (the Netherlands)* 1995  
**Ph.D.** awarded with highest honors (cum laude) in Mathematics and Physical Sciences.  
Thesis research on photorefractivity in polymers. Thesis advisor: Prof. Georges Hadziioannou  
(currently at University of Bordeaux).
- Aristotle University of Thessaloniki (Greece)* 1991  
**B.S.** in Physics.

### Professional Experience

- Ecole Nationale Supérieure des Mines de Saint Etienne (France)* September 2009 – Present  
Professor and Department Head, Department of Bioelectronics.
- Cornell University, Ithaca (NY)* August 2006 – August 2009  
Lester B. Knight Director, Cornell NanoScale Science and Technology Facility.
- Cornell University, Ithaca (NY)* November 2004 – August 2009  
Associate Professor, Department of Materials Science and Engineering.
- Cornell University, Ithaca (NY)* July 2004 – June 2006  
Director of Graduate Studies, Materials Science and Engineering.
- Cornell University, Ithaca (NY)* 2002 – August 2009  
Member of Graduate Field, Applied & Engineering Physics<sup>(\*)</sup>.
- Cornell University, Ithaca (NY)* 2002 – August 2009  
Member of Graduate Field, Electrical & Computer Engineering<sup>(\*)</sup>.
- Cornell University, Ithaca (NY)* January 1999 – October 2004  
Assistant Professor, Department of Materials Science and Engineering.
- IBM Almaden Research Center, San Jose (CA)* March 1997 – December 1998  
Postdoctoral Fellow, Center for Polymer Interfaces and Macromolecular Assemblies.
- University of Groningen (the Netherlands)* December 1995 – February 1997  
Postdoctoral Fellow, Materials Science Center.
- University of Nijmegen (the Netherlands)* February 1991 – September 1991  
Undergraduate Researcher, Physics Department.

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<sup>(\*)</sup> Admission to these Graduate Fields allowed me to supervise Ph.D. thesis in Applied Physics & Engineering, and in Electrical & Computer Engineering.

## Honors and Awards

- Fellow, Royal Society of Chemistry (2010).
- NY Academy of Sciences Blavatnik Award for Young Scientists (2007).
- DuPont Young Professor Grant (2005).
- NSF Faculty Early Career Development Award (2000).
- Cornell University awards: Fiona Ip Li '78 and Donald Li '75 Excellence in Teaching Award (2001), James M. and Marsha D. McCormick Award for Excellence in Advising First Year Students (two times).
- Ph.D. awarded with highest honors (cum laude).

## Professional Activities

- Associate Editor, *Japanese Journal of Applied Physics*, 2005 – present.
- Member of the Editorial Board, *Sensors*, 2006 – present.
- Member of the Editorial Advisory Board, *MRS Communications*, 2012 – present.
- Member of the Advisory Board, *Journal of Materials Chemistry B: Materials for Biology and Medicine*, 2012 – present.
- Chairman of the Editorial Board, *Journal of Materials Chemistry*, 2007 – 2010.
- Guest Editor, *Japanese Journal of Applied Physics* (2004), vol. 44, issue 5a (2005); *Journal of Polymer Science: Polymer Physics*, vol. 41, issue 21 (2003).
- Scientific Advisory Board, KAUST-Cornell Center for Energy and Sustainability, Cornell University, Ithaca, NY, 2010 – present.
- Scientific Advisory Board, Center for Organic Bioelectronics, Karolinska Institute and Linköping University, Sweden, 2007 – present.
- Scientific Advisory Board, Centre for Research on Adaptive Nanostructures and Nanodevices, Trinity College Dublin, Ireland, 2010 – present.
- Standing Committee of External Evaluators for the Italian Institute of Technology, 2013 – present.
- Scientific Advisory Board, Nano Terra, Inc., 2009 – present.
- Scientific Advisory Board, Orthogonal, Inc., 2009 – present.
- Board of Directors, Infotonics Technology Center, Inc., Canandaigua, NY, 2007 – 2008.
- Lead organizer, fpi6 (6<sup>th</sup> Symposium on Functional pi-Electron Systems), Ithaca, NY, June 2004.
- Organizer of symposia for Gordon Research Conferences, Materials Research Society (MRS), American Physical Society (APS), American Chemical Society (ACS), Minerals, Metals and Materials Society (TMS), and Society of Imaging Science and Technology (IS&T).
- 180+ papers in peer-reviewed journals.
- 230+ invited talks.
- 7,000+ citations, h-index = 47 (Web of Science, January 2013).

## RESEARCH

My research is in the area of *organic electronics and bioelectronics*. This term refers to the use of organic materials to create electronic devices with unique capabilities, an area that represents one of the most dramatic technological developments of the past two decades. Until 2009, my research explored key aspects of organic electronics, including (i) understanding the growth mechanisms of organic thin films, (ii) understanding the fundamentals of charge injection and transport in organic semiconductors, (iii) building novel devices from organic semiconductors (electroluminescent devices, photovoltaic cells, and transistors) and investigating the relevant device physics. Since my move to France in 2009, I focus on the application of organic electronic materials and devices at the interface with biology. My work includes (i) novel devices for interfacing with neurons, (ii) biosensors for diagnostics, toxicology and drug discovery, and (iii) devices that control cell adhesion and function.

### Representative publications (out of total of 180+ in peer-reviewed journals)

- D. Khodagholy, T. Doublet, M. Gurfinkel, P. Quilichini, E. Ismailova, P. Leleux, T. Herve, S. Sanaur, C. Bernard, and G.G. Malliaras, "Highly conformable conducting polymer electrodes for *in vivo* recordings", *Adv. Mater.* 36, H268 (2011).
- S.Y. Yang, B.N. Kim, A.A. Zakhidov, P.G. Taylor, J.-K. Lee, C.K. Ober, M. Lindau, and G.G. Malliaras, "Detection of transmitter release from single living cells using conducting polymer microelectrodes", *Adv. Mater.* 23, H184 (2011).
- F. Cicoira, M. Sessolo, O. Yaghmazadeh, J.A. DeFranco, S.Y. Yang, and G.G. Malliaras, "Influence of device geometry on sensor characteristics of planar organic electrochemical transistors", *Adv. Mater.* 22, 1012 (2010).
- R.M. Owens and G.G. Malliaras, "Organic electronics at the interface with biology", *MRS Bulletin* 35, 453 (2010).
- M. Kanungo, H. Lu, G.G. Malliaras and G.B. Blanchet, "Suppression of Metallic Conductivity of Single-Walled Carbon Nanotubes via Cycloaddition Reactions", *Science* 323, 234 (2009).
- A.A. Zakhidov, J.-K. Lee, H.H. Fong, J.A. DeFranco, M. Chatzichristidi, P. Taylor, C.K. Ober and G.G. Malliaras, "Hydrofluoroethers as orthogonal solvents for chemical processing of organic electronic materials", *Adv. Mater.* 20, 3481 (2008).
- J.D. Slinker, J.A. De Franco, M.J. Jaquith, W.R. Silveira, Y.-W. Zhong, J.M. Moran-Mirabal, H.G. Craighead, H.D. Abruña, J.A. Marohn, and G.G. Malliaras, "Direct measurement of the electric field distribution in a light-emitting electrochemical cell", *Nature Mater.* 6, 894 (2007).
- D.A. Bernards, S. Flores-Torres, H.D. Abruña, G.G. Malliaras, "Electroluminescence and photovoltaic response in ionic junctions", *Science* 313, 1416 (2006).
- A.C. Mayer, A. Kasimirov and G.G. Malliaras, "The dynamics of bimodal growth in pentacene thin films", *Phys. Rev. Lett.* 97, 105503 (2006).
- R. Ruiz, A. Papadimitratos, A.C. Mayer, and G.G. Malliaras, "Thickness dependence of mobility in pentacene transistors", *Adv. Mater.* 17, 1795 (2005).
- G.G. Malliaras and R.H. Friend, "An organic electronics primer", *Physics Today* 58, 53 (2005).
- Y. Zhang, J.T. Petta, D. Ralph, and G.G. Malliaras, "30 nm channel length pentacene transistors", *Adv. Mater.* 15, 1632 (2003).
- S. Bernhard, X. Gao, G.G. Malliaras, and H.D. Abruña, "Efficient electroluminescent devices based on a chelated osmium(II) complex", *Adv. Mater.* 14, 433 (2002).
- Y. Shen, D.B. Jacobs, G.G. Malliaras, G. Koley, M.G. Spencer, and A. Ioannidis, "Modification of ITO for improved hole injection in organic light emitting diodes", *Adv. Mater.* 13, 1234 (2001).
- Y. Shen, M.W. Klein, D.B. Jacobs, J.C. Scott, and G.G. Malliaras, "Mobility-dependent charge injection into an organic semiconductor", *Phys. Rev. Lett.* 86, 3867 (2001).

### **Past and current group members**

- 2 faculty, 1 research engineer, 7 postdocs, 7 graduate students and a technician currently in the Department of Bioelectronics at EMSE.
- 17 postdocs, 11 graduate students (Ph.D.), and 11 Master's students supervised at Cornell University.
- Former graduate students/postdocs are currently professors at University of Texas, Dallas (Jason Slinker), Bowling Green State University (Liangfeng Sun), South Dakota School of Mines (Zhengtao Zhu), King Abdullah University of Science and Technology (Aram Amassian), Shanghai Jiao Tong University (Hon Hang Fong), École Polytechnique de Montréal (Fabio Cicoira).

## **EDUCATION & STUDENT SUPERVISION**

### **Courses developed & taught**

- Developed and taught graduate level module on "Bioelectronics" at EMSE.
- Developed and taught graduate level course "Organic and Molecular Electronics" at Cornell.
- Developed and taught undergraduate level courses "Electronic Materials for the Information Age", "Atomic and Molecular Structure of Matter", and "Materials Design in Electronic Packaging" at Cornell University.

### **Ph.D. supervision (chair of committee)**

- Currently: Thomas Doublet (2013), Scherrine Tria (2013), Eleni Stavrinidou (2014), Pierre Leleux (2014), Xenofon Strakosas (2015), Ecole Nationale Supérieure des Mines de St. Etienne.
- Dion Khodagholy "Conducting polymer devices for interfacing with biology", EMSE (2012).
- Chung Han Wu "Low temperature preparation of wide band-gap metal oxide thin films with novel designed solution processes", Cornell (2011).
- Vladimir Pozdin "Design and growth of organic semiconductors for organic thin film transistors", Cornell (2011).
- Yee-Fun Lim "Solution processed solar cell technologies", Cornell (2011).
- John DeFranco "Patterning and processing of organic electronic devices using photolithography", Cornell (2011).
- Matt Lloyd "Organic photovoltaics from small molecules", Cornell (2007).
- Dan Bernards "Leveraging ionic charge in organic semiconductor devices", Cornell (2007).
- Jason Slinker "Electroluminescent devices from ionic transition metal complexes", Cornell (2007).
- Alex Mayer "Growth and structure dynamics of pentacene thin films with applications to OTFTs and OPVs", Cornell (2006).
- Jeff Mabeck "Chemical and biological sensing with organic thin-film transistors", Cornell (2006).
- Yuanjia Zhang "Nanoscale organic thin film transistors", Cornell (2006).
- Yulong Shen "Charge injection and transport in organic semiconductors", Cornell (2003).

### **External Examiner in HDR (Habilitation à Diriger des Recherches) committees**

- Jean Charles Ribierre, "Propriétés semiconductrices de nouveaux matériaux organiques conjugués et leurs applications dans le domaine de l'optoélectronique organique", University of Strasbourg, France (2011).

### **External examiner in Ph.D. committees**

- Giuseppe Tarabella, University of Parma, Italy (2012).
- Micael Charbonneau, University of Grenoble, France (2011).
- Matteo Tonezzer, University of Trento, Italy (2011).
- Mark-Jan Spijkman, University of Groningen, the Netherlands (2011).
- Loig Kergoat, Université Paris Diderot-Paris 7, France (2010).
- Ruben Costa, University of Valencia, Spain (2010).
- Omid Yaghmazadeh, Ecole Polytechnique, France (2010).
- Mahiar Hamedi, University of Linköping, Sweden (2008).
- Oana Jurchescu, University of Groningen, the Netherlands (2006).
- David Nillson, University of Linköping, Sweden (2005).
- Sjoerd Veenstra, University of Groningen, the Netherlands (2001).

## **SERVICE**

### **Head of Department of Bioelectronics, Ecole Nationale Supérieure des Mines de Saint Etienne**

I started the Department of Bioelectronics (BEL, [www.bel.emse.fr](http://www.bel.emse.fr)) at the Centre Microélectronique de Provence in September 2009. I set the scientific direction of BEL, recruited two junior faculty, coordinated the outfitting of laboratories dedicated to electrical characterization and to biology, and raised funds to hire postdocs and graduate students. As a result, 7 postdocs, 7 graduate students and a technician currently work at BEL. BEL also managed to attract two small companies (PIXinBIO and Microvitae), who moved to the CMP in order to work more closely with us. Projects funded at BEL include an ERC Starter Grant (1.5 million euros, won by Roisin Owens to develop sensors using living cells), an ANR grant (with la Timone and MicroVitae, to develop in vivo probes to study epilepsy), 3 CURIE postdoctoral fellowships, a Partner University Fund grant to establish a link with Cornell University, and several other regional, national and EU grants.

### ***Lester B. Knight* Director, Cornell NanoScale Science and Technology Facility (CNF)**

CNF ([www.cnf.cornell.edu](http://www.cnf.cornell.edu)) is the flagship facility of the National Nanofabrication Infrastructure Network, primarily funded by the National Science Foundation. It is a user's facility, whose mission is to support a broad range of nanoscale science and technology projects by providing state-of-the-art resources coupled with extensive staff support. With a 1,600 m<sup>2</sup> cleanroom, nanofabrication equipment of \$140M replacement value, an annual budget of \$7M, and 25 full-time staff, CNF serves over 700 users a year (2009 figures). About 50% of the users are from outside Cornell (academia and industry). My job as the Director included setting the scientific direction for the facility, attracting new users, and fundraising to keep the facility at the state-of-the-art.