

Roderick MacKenzie, MEng, Ph.D

Publications: [39](#) publications, [1512](#) citations, h-index [17](#), 1 book chapter

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Nationality: British, 12/03/82

Languages: English, mother tongue
German, verbal C1, written B2



Employment

9/2012-present: Assistant Professor, University of Nottingham, UK

- **I am the author of**, the General-purpose solar cell simulation tool (www.gpvdm.com), this is the world's only free and full 1D/2D/3D optical/electrical/thermal semiconductor device model specifically written to simulate organic electronic devices. It has over 20,000 downloads and 550 active users, spread throughout the world ranging from Jilin University in Eastern China to Samsung USA, and Japanese display manufactures. This physics based computational model puts me at the center of many exciting research collaborations throughout the world examples of these collaborations include:
Prof. W. Tian (Changchun, CN) – **Simulating perovskite solar cells**; Prof. Jacek Jasieniak (Monash University, AU) – **Simulating material interfaces in novel solar cells**; Dr. Chris Groves and Dr. Mujeeb Chaudhry (Durham, UK) – **High voltage light emitting transistor modeling**; Prof. Jenny Nelson (Imperial College, UK) – **Small molecule acceptor modeling**; Prof. Arved Hübler (TU Chemnitz, DE) – **3D topological modeling of printed solar cells**; Prof. Carsten Deibel (TU Chemnitz, DE) - **Machine Learning for solar cell development**.
- **University senate member:** Elected by my peers to be on the senate for 4 years.
- **PhD students:** Nahdia Majeed (current), Xingyuan Shi, James Monkes, Christopher Miles and Alanna Murphy.
- **Teaching:** 1st year Computer programming, 2nd year Electronic Engineering and MSc data presentation. Typical class sizes are 280-300 students. I take about 5-6 MEng/BEng project students per year. I also participate in scientific outreach to local junior schools in deprived areas.
 - 2017 Lord Dearing award for excellence in teaching
 - 2017 Faculty Teaching Excellence award
 - 2016 Faculty Teaching Excellence award

I enjoy teaching difficult/dry subjects to large classes and making them interesting.

- **Parliamentary science fellowship at the Parliamentary Office of Science and Technology** (1/05/2017-01/09/2019). I was seconded to parliament for about 1 day a week to apply data science/data mining techniques to help the scientists who work there understand and predict demand by MPs on the teams human resources. This involves harvesting social media feeds from members of parliament and performing analysis on the collected data to track how hot topics rise and fall within the chamber. This has resulted in two [blog posts](#).
- **Successful grants:** EPSRC 'bridging the gaps fund' to develop novel bio sensors (~£23,000), Newton fund money (~£100k) for graphene based solar cells, Royal Society travel grant (~10k) for small molecule acceptor solar cells, NVIDIA GPU program grant, parliamentary fellowship.
- **Editorships:** **Sub editor** Optical and Quantum Electronics (2015-2016), **Executive editor** Optical and Quantum Electronics - paid position (2016-2017)
- **Ad hoc Reviewer for:** Organic Electronics, ACS Nano, Advanced Materials, Advanced Energy Materials, Applied Physics Letters, Journal of Chemical Physics, Chem Physics Letters, Journal of Applied Physics, and IOP Journal of Physics D.

11/2011-8/2012: University of Freiburg, Germany, Post-Doc to Prof. Jenny Nelson

- I ran and initiated collaborations with; **Uli Würfel**, Fraunhofer-Institute developing transient characterization techniques for polymer organic solar cells; **Enrico Da Como**, LMU Munich Characterizing novel polymer based contacts for organic solar cells. The work was showcased on the front cover of Physical Chemistry Chemical Physics; **Elizabeth von Hauff**, Physics department Freiburg, I supervised a doctoral candidate who investigated the separation of photo-induced excitons in organic materials.

5/2009-8/2012: Imperial College London - Post-Doc to Prof. Jenny Nelson

- Collaboration with the **Chabinyk group**, University of California Santa Barbara (**UCSB**)
 - Included for the first time, recombination via deep carrier traps in an organic solar cell model.
 - Calibrated the model against experimental data provided by UCSB.
 - Extracted the energy resolved density-of-states from the experimental data using my model.
- Experimental work
 - Manufacture/measurement of gravure printed inverted organic solar cell.
- Predicting mobility in thin films of Fullerene Derivatives
 - Used molecular dynamics to generate thin film morphologies of fullerene Derivatives.
 - Quantum chemical methods (Density Functional Theory) to calculate molecular orbitals.
 - Application of Quantum mechanics to calculate inter-molecular hopping rates.
 - Monte-Carlo methods to calculate mobilities of thin films of derivatives.

2/2008-8/2008: University of Nottingham - Post Doctoral Research Associate

- Collaboration with Modulight Ltd., Finland and the European Space Agency (**ESA**), designed and optimized state-of-the-art 880 nm laser diodes for inter-satellite communication using my custom code. My asymmetric cavity designs out-performed their predecessors.
- Collaboration with **OSRAM, Regensburg, Germany**: Measurement of gain, refractive index, and cavity defects within 660 nm laser diodes used for photoactive cancer therapy.

Education

09/2004-07/2008: Ph.D, University of Nottingham – Department of Electronic Engineering

- Thesis title “Thermal Simulation and Temperature dependent Measurement of Quantum Well Laser Diodes”
- Used and developed drift diffusion models, thermal models, and electromagnetic mode solvers to design state-of-the-art lasers for telecommunication systems in collaboration with Chalmers University of Technology (Sweden) and Modulight Inc (Finland) within the EU project Fastaccess.
- Used computational analysis techniques to design lasers within the EU project Brighter in collaboration with Thales III-IV Lab, Paris.

9/2001-7/2004: The University of Nottingham, Department of Electronic Engineering

- 1st Class MEng (Hons), Electronic Engineering with German. Averages: 4th year: **~81%**, 2nd year: **81%**, 1st year: **83%**
- 3rd year taken in German as an ERASMUS exchange student at the Technische Universität Carolo-Wilhelmina zu Braunschweig (TU-BS), Germany

Summer semester of 2003:

- **Institute for Telecommunication systems at the University of Braunschweig, Germany**
 - Worked with automated Arabic handwriting recognition systems (Hidden Markov Models) for sorting hand written Arabic addresses on letters, developing feature extraction algorithms to interface Latin hidden Markov character recognition models to Arabic text.
 - Wrote tools for Arabic speakers to examine and correct the learning data base of hand written words. (www.ifnenit.com)

2000

- **Marconi Telecommunications**, Beeston - work experience

Free time

Hiking, running (10km/40 min, half marathon/1hr39min).