

Associate Professor Brian Rodriguez (Permanent)

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Education

North Carolina State University	Physics	M.S. (01), Ph.D. (03)
University of North Carolina at Chapel Hill	Physics	B.S. (97)

Employment

2017-Present	Associate Dean for Science Study Abroad, UCD College of Science
2016-Present	Associate Professor, UCD School of Physics
2014-Present	Conway Fellow, UCD Conway Institute
2014-2016	Senior Lecturer, UCD School of Physics
2012-2014	Lecturer, UCD School of Physics
2009-2012	Lecturer in Nanoscience, UCD Conway Institute
2007-2008	Alexander von Humboldt Research Fellow, Max Planck Institute of Microstructure Physics, Halle, Germany
2005-2007	Postdoctoral Fellow, Materials Science & Technology Division and Center for Nanophase Materials Sciences, Oak Ridge National Laboratory, USA
1998-2005	Teaching Assistant (98-00), Research Assistant (99-03), Postdoctoral Fellow (03-05), Department of Physics, North Carolina State University, USA
1997-1998	Assistant Research Associate, Electronic Materials Center, Kobe Steel USA Inc.

History of Mentoring & Supervision

Current: Gender-balanced group of 2 Postdocs, 6 PhDs (2 co-supervised), 1 Research Engineer, 2 MSc (Taught), 1 Research Assistant

Previous: 2 Postdocs, 9 PhDs (4 co-supervised), 2 Res. Assistants, 9 MSc (Taught), 7 Interns

- Students and postdocs under my supervision have gone on to secure impressive positions in Academia (Max Planck Institute for Polymer Research, Germany; Johns Hopkins University, USA; UCD; Vrije University, Amsterdam; Oak Ridge National Laboratory, USA; University of Strathclyde, UK) and Industry (Boston Scientific, Ireland; Zendesk, Ireland; Ernst & Young, UK; Creganna Medical, Ireland; Marks & Clerk, UK; Infinera, Sweden) and started a company (Ourobotics, Ireland).
- At the time of graduation, my PhD students have on average an h-index of 5 and 65 citations

Innovation & Commercialisation Activity

- Patent granted: Time- and bias resolved spatial mapping of electronic, ionic and electrochemical processes at the solid-liquid interface: Electrochemical force microscopy, US Patent US20160025773; Notice of Allowance: 3202.1; 138974.163922-US
- Patent under review: A method, system and device for three dimensional additive manufacturing in a liquid phase, UK Patent Application filed, 2015 (GB1519730.4)
- Industry collaborations: Vornia (1 publication), Fibralign (1 publication), Fujitsu Ltd (5 publications), Asylum Research (8 publications), Inostek (2 publications)
- Joint industry-academic funding: Vornia Ltd, MSC Software, Fibralign, InSphero, Nanotec, Bosch, Intel, Adama Innovations
- Due diligence consulting for Irrus Investments
- Graduate of DCU Ryan Academy SFI/TIDA Get Started Technology Venture Programme 2014

Other Information

Editorial Board: Scientific Reports

Journal Reviewer: Nature Communications, Advanced Materials, Nano Letters, ACS Nano, Journal of the American Chemical Society, Advanced Functional Materials, International Materials Reviews, ChemComm, Nanoscale, Acta Biomaterialia, ACS Applied Materials & Interfaces, Scientific Reports, Langmuir, Acta Materialia, Applied Physics Letters, Biophysical Journal, Journal of Structural Biology,

IEEE Electron Device Letters, Journal of Physics D, Journal of Physics: Condensed Matter, Journal of Applied Physics, Micron, Journal of Micromechanics and Microengineering, Journal of the European Ceramics Society, Solid State Sciences, Archives of Oral Biology, Biotech. Bioprocess Eng., Phase Transitions, Materials Research Society Proceedings, PLOS ONE, Tissue Engineering C, BioTechniques, Materials, Applied Sciences

Grant Reviewer: European Commission H2020 (ERC), US Department of Energy, French National Research Agency, National Science Centre Poland, Czech Science Foundation, Estonian Science Foundation, UEFISCDI (Romania), Comisión Nacional de Investigación Científica y Tecnológica (Chile), Center for Nanophase Materials Sciences, ORNL (US)

External Examiner: Served as Extern for 4 PhD and 1 MSc vivas

Workshop Organizer: Electromechanics in Biosystems, Dublin (13); Electrically Active Materials for Medical Devices, Limerick (15) (Co-chair), Mechanics and Electromechanics of Biomaterials (16)

Conference and Symposium Organizer: European Society of Biomaterials (11), Symp. QQ, Materials Research Society (MRS) (F11); Symp. BBB, MRS Spring (S14); Symp. ES3, MRS Fall (17)

Symposium Chair: MRS (S09, S11, S14, F17), Piezoresponse Force Microscopy (09)

Tutorials Given: MRS Spring (11), COST Training School (12), Piezoresponse Force Microscopy (13)

Poster Session Chair: International Symposium on the Applications of Ferroelectrics (06)

Poster Session Judge: International Symposium on the Applications of Ferroelectrics (06), UK SPM (13)

Professional Societies: MRS, Royal Microscopy Society, IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society, ACS, American Association for the Advancement of Science

Funding

- Secured €2.3M in funding as PI or co-PI including Science Foundation Ireland, EU FP7 Marie Curie Initial Training Network, and H2020 Marie Skłodowska-Curie RISE grants.
- Currently coordinating the H2020 MCSA RISE Action, MATRIXASSAY: Novel Cell Migration Assay Based on Microtissue Technology and Tissue-Specific Matrices (€216k of €1M to PI).
- Irish PI of a tri-national US-Ireland-Northern Ireland project supported by SFI, the US National Science Foundation (NSF), and the Department for Employment and Learning of Northern Ireland. This proposal was peer-reviewed through the NSF. The SFI-funded portion of this project totals €315,761 of over €900k in total.
- PI of a commercialisation project funded by Enterprise Ireland in the amount of €261,806.

Publications & Presentations: 160 publications (*Nat Mat*, *Nat Comms*, *PNAS*, *PRL*, 12 book chapters); >5410 citations, h-index: 42 (Google Scholar); 72 peer-reviewed journal publications since joining UCD in 2009; 1 publication with 300 citations, 3 publications with >200 citations, 10 with >100 citations; 21 invited talk presentations (and 21 invited seminars in 13 countries; >30 contributed presentations).

Awards & Honours: RMIT Foundation International Research Exchange Fellowship (2010), Alexander von Humboldt Fellowship (2007), UT Battelle Director's Award for Outstanding Team Accomplishment (2006) and Team Award for Scientific Research (2006), MRS Poster Award (2008, 2005, 2001)

Management Committees: Quality Review Committee, Chair, UCD School of Physics; Royal Microscopy Society – SPM, 2014-present; IOP Juno Project, UCD Vice Chair, 2014-present; Conway Institute Imaging Steering Committee, 2012-present; Oak Ridge National Laboratories CNMS Proposal Review Committee, 2010-present; ESF COST Action MP0904 Management Committee & Working Group Vice Chair; member of Cost Actions CA15107, IC1208 & MP1308

Selected Active Collaborations: External: S Habelitz (UCSF), K Gallo (KTH), S Kalinin (ORNL), A Kholkin (Aveiro), A Pandit (NUIG), N Bassiri-Gharb (Georgia Tech), D Zeugolis (NUIG), A Kumar (QUB), J Ihlefeld (Sandia), V. Silberschmidt (Loughborough). Internal: S Jarvis, J Rice, E Reynaud, G Lee, J Simpson, G Redmond, S Quinn, V Buchete, G Morgan, K Dawson, S Kelleher, K Murphy, D Brougham, W Wang

Selected Senior Author Publications

1. *D. Kilinc, A. Blasiak, M.A. Baghban, N.C. Carville, A. Al-Adli, R.M. Al-Shammari, J.H. Rice, G.U. Lee, K. Gallo, Brian J. Rodriguez, "Charge and topography patterned lithium niobate provides physical cues to fluidically isolated cortical axons," *Applied Physics Letters* **110**, 053702 (2017).
2. *N.C. Carville, S.M. Neumayer, M. Manzo, K. Gallo, Brian J. Rodriguez, "Biocompatible gold nanoparticle arrays photodeposited on periodically proton exchanged lithium niobate," *ACS Biomaterials Science & Engineering* **2**, 1351 (2016).
3. *S. Almohammed, S.O. Oladapo, K. Ryan, A.L. Kholkin, J.H. Rice Brian J. Rodriguez, "Wettability gradient-induced alignment of peptide nanotubes as templates for biosensing applications," *RSC Advances* **6**, 41809 (2016).
4. *S.M. Neumayer, M. Manzo, A.L. Kholkin, K. Gallo, Brian J. Rodriguez, "Interface modulated currents in periodically proton exchanged Mg doped lithium niobate," *Journal of Applied Physics* **119**, 114103 (2016).
5. *N.C. Carville, S.M. Neumayer, M. Manzo, M.-A. Baghban, I.N. Ivanov, K. Gallo, Brian J. Rodriguez, "Influence of annealing on the photodeposition of silver on periodically poled lithium niobate," *Journal of Applied Physics* **119**, 054102 (2016).
6. *S.M. Neumayer, E. Strelcov, M. Manzo, K. Gallo, I.I. Kravchenko, A.L. Kholkin, S.V. Kalinin, Brian J. Rodriguez, "Thickness, humidity, and polarization dependent ferroelectric switching and conductivity in Mg doped lithium niobate," *Journal of Applied Physics* **118**, 244103 (2015)
7. *S.M. Neumayer, I.N. Ivanov, M. Manzo, A.L. Kholkin, K. Gallo, Brian J. Rodriguez, "Interface and thickness dependent domain switching and stability in Mg doped lithium niobate," *Journal of Applied Physics*, **118**, 224101 (2015).
8. *K. Ryan, J. Beirne, G. Redmond, J. Kilpatrick, J. Guyonnet, N.-V. Buchete, A.L. Kholkin, Brian J. Rodriguez, "Nanoscale piezoelectric properties of self-assembled Fmoc-FF peptide fibrous networks," *ACS Applied Materials & Interfaces* **7**, 12702 (2015).
9. *L. Collins, S. Jesse, J.I. Kilpatrick, A. Tselev, M.B. Okatan, S.V. Kalinin, Brian J. Rodriguez, "Kelvin Probe Force Microscopy in liquid using electrochemical force microscopy," *Beilstein Journal of Nanotechnology* **6**, 201 (2015).
10. *N.C. Carville, L. Collins, M. Manzo, K. Gallo, B.I. Lukasz, K.K. McKayed, J.C. Simpson, Brian J. Rodriguez, "Biocompatibility of ferroelectric lithium niobate and the influence of polarization charge on osteoblast proliferation and function," *Journal of Biomedical Materials Research Part A* **103**, 2540 (2015).
11. *D. Denning, J.I. Kilpatrick, T. Hsu, S. Habelitz, A. Fertala, Brian J. Rodriguez, "Piezoelectricity in collagen type II fibrils measured by scanning probe microscopy," *Journal of Applied Physics* **116**, 066818 (2014).
12. *L. Collins, S. Jesse, J.I. Kilpatrick, A. Tselev, O. Varenky, M.B. Okatan, S.A.L. Weber, A. Kumar, N. Balke, S.V. Kalinin, Brian J. Rodriguez, "Probing charge screening dynamics and electrochemical processes at the solid-liquid interface with electrochemical force microscopy," *Nature Communications* **5**, 3871 (2014). Featured on the Irish Times.
13. *L. Collins, J.I. Kilpatrick, I.V. Vlasiouk, A. Tselev, S.A.L. Weber, S. Jesse, S.V. Kalinin, Brian J. Rodriguez, "Dual harmonic Kelvin probe force microscopy at the graphene-liquid interface," *Applied Physics Letters* **104**, 133103 (2014).
14. *S.A.L. Weber, J.I. Kilpatrick, T.M. Brosnan, S.P. Jarvis, Brian J. Rodriguez, High viscosity environments: an unexpected route to obtain true atomic resolution with atomic force microscopy, *Nanotechnology* **25**, 175701 (2014).
15. *D. Denning, M.V. Paukshto, S. Habelitz, Brian J. Rodriguez, "Piezoelectric properties of aligned collagen membranes," *Journal of Biomedical Materials Research Part B* **102**, 284 (2014).
16. *L. Balobaid, N.C. Carville, M. Manzo, L. Collins, K. Gallo, Brian J. Rodriguez, "Photoreduction of metal nanostructures on periodically proton exchanged MgO-doped lithium niobate crystals," *Applied Physics Letters* **103**, 182904 (2013).

17. *L. Collins, J.I. Kilpatrick, S.A.L. Weber, A. Tselev, I.V. Vlasiouk, I.N. Ivanov, S. Jesse, S.V. Kalinin, Brian J. Rodriguez, "Open loop Kelvin probe force microscopy with single and multi-frequency excitation," *Nanotechnology* **24**, 475702 (2013).
18. *N.C. Carville, M. Manzo, D. Denning, K. Gallo, Brian J. Rodriguez, "Growth mechanism of photoreduced silver nanostructures on periodically proton exchanged lithium niobate: time and concentration dependence," *Journal of Applied Physics* **113**, 187212 (2013).
19. *L. Balobaid, N.C. Carville, M. Manzo, K. Gallo, Brian J. Rodriguez, "Direct shape control of photoreduced nanostructures on proton exchanged ferroelectric templates," *Applied Physics Letters* **102**, 042908 (2013).
20. *D. Denning, S. Alilat, S. Habelitz, A. Fertala, Brian J. Rodriguez, "Visualizing molecular polar order in tissues via electromechanical coupling," *Journal of Structural Biology* **180**, 409 (2012).
21. *N.C. Carville, M. Manzo, S. Damm, M. Castiella, L. Collins, D. Denning, S.A.L. Weber, K. Gallo, J.H. Rice, Brian J. Rodriguez, "Photoreduction of SERS-active metallic nanostructures on chemically-patterned ferroelectric crystals," *ACS Nano* **6**, 7373 (2012).
22. *D. Denning, M.T. Abu-Rub, D.I. Zeugolis, S. Habelitz, A. Pandit, A. Fertala, Brian J. Rodriguez, "Electromechanical properties of dried tendon and iso-electrically focused collagen hydrogels," *Acta Biomaterialia* **8**, 3073 (2012).
23. *Brian J. Rodriguez, S. Jesse, A.A. Bokov, Z.-G. Ye, S.V. Kalinin, "Mapping bias-induced phase stability and random fields in relaxor ferroelectrics," *Applied Physics Letters* **95**, 092904 (2009).
24. *Brian J. Rodriguez, S. Choudhury, Y.H. Chu, A. Bhattacharyya, S. Jesse, K. Seal, A.P. Baddorf, et al., "Unraveling deterministic mesoscopic polarization switching mechanisms: Spatially resolved studies of a tilt grain boundary in bismuth ferrite," *Advanced Functional Materials* **19**, 2053 (2009).
25. *Brian J. Rodriguez, S. Jesse, S. Habelitz, R. Proksch, S.V. Kalinin, "Intermittent contact mode piezoresponse force microscopy in a liquid environment," *Nanotechnology* **20**, 195701 (2009).
26. *Brian J. Rodriguez, X.S. Gao, L.F. Liu, W. Lee, I.I. Naumov, A.M. Bratkovsky, D. Hesse, M. Alexe, "Vortex polarization states in nanoscale ferroelectric arrays," *Nano Letters* **9**, 1127 (2009).
27. *Brian J. Rodriguez, Y.H. Chu, R. Ramesh, S.V. Kalinin, "Ferroelectric domain wall pinning at a bicrystal grain boundary in bismuth ferrite," *Applied Physics Letters* **93**, 142901 (2008).
28. *Brian J. Rodriguez, S. Jesse, J. Kim, S. Ducharme, S.V. Kalinin, "Local probing of relaxation time distributions in ferroelectric polymer nanomesas: Time-resolved piezoresponse force spectroscopy and spectroscopic imaging," *Applied Physics Letters* **92**, 232903 (2008).
29. *Brian J. Rodriguez, S. Jesse, K. Seal, A.P. Baddorf, S.V. Kalinin, "Direct measurement of periodic electric forces in liquids," *Journal of Applied Physics* **103**, 014306 (2008).
30. *Brian J. Rodriguez, S. Jesse, M. Alexe, S.V. Kalinin, "Spatially-Resolved Mapping of Polarization Switching Behavior in Nanoscale Ferroelectrics," *Advanced Materials* **20**, 109 (2008).
31. *Brian J. Rodriguez, C. Callahan, S.V. Kalinin, R. Proksch, "Dual-frequency resonance-tracking atomic force microscopy," *Nanotechnology* **18**, 475504 (2007).
32. *Brian J. Rodriguez, S. Jesse, K. Seal, A.P. Baddorf, S.V. Kalinin, P. Rack, "Fabrication, dynamics, and electrical properties of insulated scanning probe microscopy probes for electrical and electromechanical imaging in liquids," *Applied Physics Letters* **91**, 093130 (2007).
33. *Brian J. Rodriguez, S. Jesse, et al., "Controlling polarization dynamics in a liquid environment: Transition from localized to macroscopic switching," *Physical Review Letters* **98**, 247603 (2007).
34. *Brian J. Rodriguez, S. Jesse S.V. Kalinin, et al., "Polarization imaging and manipulation in Langmuir-Blodgett films of ferroelectric poly(vinylidene fluoride-trifluoroethylene) copolymers by piezoresponse force microscopy," *Applied Physics Letters* **90**, 122904 (2007).
35. *Brian J. Rodriguez, S. Jesse, A.P. Baddorf, S.V. Kalinin, "High resolution electromechanical imaging of ferroelectric materials in a liquid environment by piezoresponse force microscopy," *Physical Review Letters* **96**, 237602 (2006).
36. *Brian J. Rodriguez, S. Jesse, V. Meunier, S.V. Kalinin, "Scanning frequency mixing microscopy of high-frequency transport behavior at electroactive interfaces," *Applied Physics Letters* **88**, 143128 (2006).

37. *[Brian J. Rodriguez](#), S.V. Kalinin, J. Shin, S. Jesse, V. Grichko, T. Thundat, A.P. Baddorf, A. Gruverman, "Electromechanical imaging of biomaterials by scanning probe microscopy," *Journal of Structural Biology* **153**, 151 (2006).
38. *[Brian J. Rodriguez](#), R.J. Nemanich, A. Kingon, A. Gruverman, S.V. Kalinin, K. Terabe, X. Liu, K. Kitamura, "Domain growth kinetics in lithium niobate single crystals studied by piezoresponse force microscopy," *Applied Physics Letters* **86**, 012906 (2005).
39. *[Brian J. Rodriguez](#), W.-C. Yang, R.J. Nemanich, A. Gruverman, "Scanning probe investigation of surface charge and surface potential of GaN-based heterostructures," *Applied Physics Letters* **86**, 112115 (2005).
40. *[Brian J. Rodriguez](#), A. Gruverman, A.I. Kingon, R.J. Nemanich, J.S. Cross, "Investigation of the mechanism of polarization switching in ferroelectric capacitors by three-dimensional piezoresponse force microscopy," *Applied Physics A: Materials Science & Processing* **80**, 99 (2005).
41. *[Brian J. Rodriguez](#), A. Gruverman, A.I. Kingon, R.J. Nemanich, J.S. Cross, "3-Dimensional high-resolution reconstruction of polarization in ferroelectric capacitors by piezoresponse force microscopy," *Journal of Applied Physics* **95**, 1958 (2004).
42. *[Brian J. Rodriguez](#), A. Gruverman, A.I. Kingon, R.J. Nemanich, O. Ambacher, "Piezoresponse force microscopy for polarity imaging of GaN," *Applied Physics Letters* **80**, 4166 (2002).

Selected Senior Author Review Publications

1. *J.I. Kilpatrick, I. Revenko, [Brian J. Rodriguez](#), "Nanomechanics of cells and biomaterials studied by atomic force microscopy," *Advanced Healthcare Materials* **4**, 2456 (2015).
2. *S.V. Kalinin, A.N. Morozovska, L.-Q. Chen, [Brian J. Rodriguez](#), "Local polarization dynamics in ferroelectric materials," *Reports on Progress in Physics* **73**, 056502 (2010).

Selected Co-authored Publications

1. D. Zhou, L. Cutlar, Y. Gao, W. Wang, J. O’Keeffe-Ahern, S. McMahon, B. Duarte, F. Larcher, [Brian J. Rodriguez](#), U. Greiser, W. Wang, "The transition from linear to highly branched poly(β -amino ester)s: Branching matters for gene delivery," *Science Advances* **2**, e1600102 (2016).
2. I.M. Hermes, S.A. Bretschneider, V.W. Bergmann, D. Li, A. Klasen, J. Mars, W. Tremel, F. Laquai, H.-J. Butt, M. Mezger, R. Berger, [Brian J. Rodriguez](#), S.A.L. Weber, "Ferroelastic fingerprints in methylammonium lead halide perovskite," *Journal of Physical Chemistry Part C* **120**, 5724 (2016).
3. P. Kumar, A. Satyam, X. Fan, E. Collin, Y. Rochev, [Brian J. Rodriguez](#), A. Gorelov, et al., "Macromolecularly crowded in vitro microenvironments accelerate the production of extracellular matrix-rich supramolecular assemblies," *Scientific Reports* **5**, 8729 (2015).
4. K. Seal, [Brian J. Rodriguez](#), et al., "Anomalous photodeposition of Ag on ferroelectric surfaces with below bandgap excitation," *Advanced Optical Materials* **2**, 292 (2014).
5. Y. Lang, F. del Monte, L. Collins, [Brian J. Rodriguez](#), P. Dockery, D.P. Finn, A. Pandit, "Thiol-functionalization of the living diatom - tailoring the chemistry of the frustule during synthesis," *Nature Communications* **4**, 3683 (2013).
6. S.V. Kalinin, S. Jesse, [Brian J. Rodriguez](#), et al., "Probing the role of single defects on thermodynamics of electric-field induced phase transitions," *Physical Review Letters* **100**, 155703 (2008).
7. S. Jesse, [Brian J. Rodriguez](#), S. Choudhury, A.P. Baddorf, I. Vrejoiu, D. Hesse, M. Alexe, E.A. Eliseev, A.N. Morozovska, J. Zhang, L.Q. Chen, S.V. Kalinin, "Direct imaging of spatial and energy distribution of nucleation centres in ferroelectric materials," *Nature Materials* **7**, 209 (2008).
8. S.V. Kalinin, [Brian J. Rodriguez](#), S. Jesse, Y.H. Chu, T. Zhao, R. Ramesh, S. Choudhury, L.Q. Chen, E.A. Eliseev, A.N. Morozovska, "Intrinsic single-domain switching in ferroelectric materials on a nearly ideal surface," *Proceedings of the National Academy of Sciences* **104**, 20204 (2007).
9. S. Jesse, S.V. Kalinin, R. Proksch, A.P. Baddorf, [Brian J. Rodriguez](#), "Energy dissipation and band excitation method in scanning probe microscopy," *Nanotechnology* **18**, 435503 (2007).