

June 29, 2015

Curriculum Vitae
J. Scott Bunch

ENG 404
Department of Mechanical
Engineering
Division of Materials Science
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Boston University
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Current Research Interests

Experimental Nanomechanics of 2D Materials

- Molecular Transport through Atomically Thin Membranes
- Adhesion and Mechanical Properties of 2D Materials

Education

Cornell University
Ph.D. in Physics, 2008.
M.S. in Physics, 2004.

Florida International University
B.S. in Physics Magna Cum Laude, 2000

Employment

6/2014-present	Faculty Member, Boston University Photonics Center
2/2014-present	Assistant Professor (secondary appointment), Department of Physics, Boston University
9/2013-present	Assistant Professor, Department of Mechanical Engineering, Boston University
9/2013-present	Assistant Professor, Division of Materials Science and Engineering, Boston University
9/2013-8/2014	Adjunct Assistant Professor, Department of Mechanical Engineering, University of Colorado at Boulder
12/2012-9/2013	Fellow, Materials Science and Engineering Program, University of Colorado at Boulder

8/2008-9/2013	Assistant Professor, Department of Mechanical Engineering, University of Colorado at Boulder
5/2008–7/2008	Postdoctoral Research Associate, Advisor: Professor Harold Craighead and Professor Jeevak Parpia, LASSP, Cornell University
12/2007-8/2008	Adjunct Assistant Professor, Department of Mechanical Engineering, University of Colorado, Boulder
8/2000–5/2008	Graduate Research Assistant, Advisor: Professor Paul McEuen, Department of Physics, Cornell University
6/2000 - 8/2000	Senior Technical Associate, Advisor: Dr. Nikolai Zhitennev, Lucent Technologies Bell Laboratories
6/1999 - 8/1999	Undergraduate Research, Advisor: Professor Ward Plummer, University of Tennessee at Knoxville and Oak Ridge National Lab
1999–2000	Undergraduate Research, Advisor: Professor Nongjian Tao, Department of Physics, Florida International University

Awards and Honors

2011	NSF CAREER Award
2010	University of Colorado Department of Mechanical Engineering Outstanding Graduate Education Award (2009-2010)
2008	DARPA MTO Young Faculty Award
2000	Lucent Technologies Bell Laboratories Graduate Fellowship

Publications (4074 - Google scholar citations): (* denotes corresponding author)

Journal Articles:

Submitted or in Preparation:

L. W. Drahushuk, L. Wang, S. P. Koenig, and **J. S. Bunch**, and M.S. Strano*,
*Mathematical Analysis of Time-varying, Stochastic Gas Transport through
Graphene Membranes, to be submitted*, (2015).

Accepted:

L. Wang, L. W. Drahushuk, L. Cantley, S. P. Koenig, X. Liu, J. Pellegrino, M.S. Strano and **J. S. Bunch***, *Molecular valves for controlling gas phase transport made from discrete angstrom-sized pores in graphene*, **to appear**, Nature Nanotechnology, (2015).

Published:

X. Liu, J. W. Suk, N.G. Boddeti, L. Cantley, L. Wang, J. M. Gray, H. J. Hall, V. M. Bright, C. T. Rogers, M.L. Dunn, R. S. Ruoff and **J. S. Bunch***, *Large Arrays and Properties of 3-Terminal Graphene Nanoelectromechanical Switches*, Advanced Materials, **26**, 1571-1576 (2014).

N.G. Boddeti, X. Liu, R. Long, J. Xiao, **J. S. Bunch**, and M.L. Dunn*, *Graphene Blisters with Switchable Shapes Controlled by Pressure and Adhesion*, Nano Letters, **13**, 6216-6221 (2013).

N.G. Boddeti, S. P. Koenig, R. Long, J. Xiao, **J. S. Bunch**, and M. L. Dunn*, *Mechanics of Adhered, Pressurized Graphene Blisters*, Journal of Applied Mechanics, **80**, 040909 (2013).

X. Liu, N.G. Boddeti, M.R. Szpunar, L. Wang, M.A. Rodriguez, R. Long, J. Xiao, M.L. Dunn, and **J. S. Bunch***, *Observation of Pull-in Instability in Graphene Membranes under Interfacial Forces*, Nano Letters, **13**, 2309-2313 (2013).

S.P. Koenig, L. Wang, J. Pellegrino, and **J. S. Bunch***, *Selective Molecular Sieving through Porous Graphene*, Nature Nanotechnology **7**, 728-732 (2012).
(This work was featured in the University of Colorado news and MRS Bulletin)

J. S. Bunch* and M.L. Dunn, *Adhesion Mechanics of Graphene Membranes (invited review article)*, Solid State Communications, **152**, 1359-1364 (2012).

L. Wang, J.J. Travis, A.S. Cavanagh, X. Liu, S.P. Koenig, P.Y. Huang, S.M. George and **J. S. Bunch***, *Ultrathin Oxide Films by Atomic Layer Deposition on Graphene*, Nano Letters, **12**, 3706-3710 (2012).

S.P. Koenig, N. G. Boddeti, M. L. Dunn, and **J. S. Bunch***, *Ultrastrong adhesion of graphene membranes*, Nature Nanotechnology **6**, 543-546 (2011).
(This work was featured in the University of Colorado news.)

C.-C. Lee, G. Acosta, **J. S. Bunch**, and T. R. Schibli*, *Ultra-Short Optical Pulse Generation With Single Layer Graphene*, Journal of Nonlinear Optical Physics & Materials **19**, 767-771 (2010).

J. S. Bunch, S. S. Verbridge, J.S. Alden, A. M. van der Zande, J. M. Parpia, H. G. Craighead, and P. L. McEuen*, *Impermeable Atomic Membranes from Graphene Sheets*, Nano Letters **8**, 2458-2462 (2008).

(This work was featured in numerous press articles including MSNBC, New Scientist, and Slashdot)

P. Sundqvist, F. J. Garcia-Vidal, F. Flores, M. Moreno-Moreno, C. Gomez-Navarro, **J. S. Bunch**, and J. Gomez-Herrero*, *Voltage and Length-Dependent Phase Diagram of the Electronic Transport in Carbon Nanotubes*, Nano Letters **7**, 2568-2573 (2007).

J. S. Bunch, A. M. van der Zande, S. S. Verbridge, I. W. Frank, D. M. Tanenbaum, J. M. Parpia, H. G. Craighead, and P. L. McEuen*, *Electromechanical Resonators from Graphene Sheets*, Science **315**, 490-493 (2007).

(This work was featured in numerous press articles including Materials Today, New Scientist, Nature Nanotechnology, and the Cornell Chronicle.)

J. S. Bunch, Y. Yaish, M. Brink, K. Bolotin, and P. L. McEuen*, *Coulomb oscillations and Hall effect in quasi-2D graphite quantum dots*, Nano Letters **5**, 287-290 (2005).

(This work was featured in Physics Today)

J. S. Bunch, T. N. Rhodin*, and P. L. McEuen, *Noncontact-AFM imaging of molecular surfaces using single-wall carbon nanotube technology*, Nanotechnology **15**, S76-S78 (2004).

Y. G. Li, Y. D. Tseng, S. Y. Kwon, L. D'Espaux, **J. S. Bunch**, P. L. McEuen, and D. Luo*, *Controlled assembly of dendrimer-like DNA*, Nature Materials **3**, 38-42 (2004).

C. Shu, C. Z. Li, H. X. He, A. Bogozzi, **J. S. Bunch**, and N. J. Tao*, *Fractional conductance quantization in metallic nanoconstrictions under electrochemical potential control*, Physical Review Letters **84**, 5196-5199 (2000).

C. Z. Li, H. X. He, A. Bogozzi, **J. S. Bunch**, and N. J. Tao*, *Molecular detection based on conductance quantization of nanowires* Applied Physics Letters **76**, 1333-1335 (2000).

Conference Proceedings:

H.J. Hall, L. Wang, **J. S. Bunch**, S. Pourkamali, and V.M. Bright*, *Optical control and tuning of thermal-piezoresistive self-sustained oscillators*, 2014 IEEE 27th International Conference on Micro Electro Mechanical Systems (MEMS), (2014).

H.J. Hall, D.E. Walker, L. Wang, R.C. Fitch, **J. S. Bunch**, S. Pourkamali, and V.M. Bright*, *Mode Selection Behavior of VHF Thermal-Piezoresistive Self-Sustained Oscillators*, Transducers (2013).

C. C. Lee, G. Acosta, **J. S. Bunch**, T. R. Schibli*, *Ultra-short optical pulse generation with single layer graphene*, paper O-11 on The International Conference on Nanophotonics, Tsukuba Japan (2010). (best student presentation award for C. C. Lee)

C. Lee, G. Acosta, **S. Bunch**, T. R. Schibli*, *Mode-Locking of an Er:Yb:Glass Laser with Single Layer Graphene*, paper TuE29 in International Conference on Ultrafast Phenomena, OSA Technical Digest (CD) (Optical Society of America, 2010).

Other Publications :

J. S. Bunch*, *Putting a damper on nanoresonators (News and Views)*, Nature Nanotechnology, **3**, 331-332 (2011).

Invited Scientific Presentations (51 total, 48 as Faculty Member):

Upcoming

1. “TBD” – Keynote Lecture at 2016 Materials Research Society Spring Meeting and Exhibit – Carbon Nanofluidics special symposium, Phoenix, AZ.

2015

2. “Graphene Membranes” – Plenary Lecture at the 5th National Membrane Congress, Mexico City, Mexico.
3. “Atomic and Molecular Separation through Porous Graphene” – Plenary Lecture at the New England Section of the American Physical Society Meeting, Boston, MA.
4. “Atomic Membrane Balloons” – MIT/Lincoln Lab Materials Science Seminar at MIT/Lincoln Laboratory, Arlington, MA.

2014

5. “Atomic Membrane Balloons” – UNC Materials Research Society Seminar at University of North Carolina, Chapel Hill, NC.

6. “Atomic Membrane Balloons” – Centre Européen de Calcul Atomique et Moléculaire (CECAM) workshop on graphene's strain engineering, ETH Zurich, Switzerland.
7. “Graphene Mechanical Wonders” – Photonics Forum at Boston University, Boston, MA.

2013

8. “Graphene Mechanical Wonders” – Condensed Matter Seminar Series at National University of Singapore, Singapore.
9. “Graphene Mechanical Wonders” – Colorado Nanofabrication Lab Summer Seminars at University of Colorado, Boulder, CO.
10. “Graphene Mechanical Wonders” – Physics Colloquium at Oregon State University, Corvallis, OR.
11. “Graphene Mechanical Wonders” – Mechanical Engineering Department Seminar at University of Minnesota, Minneapolis, MN.
12. “Selective Molecular Sieving through Atomically Thin Films” – Seminar at the 245th annual ACS National Meeting, New Orleans, LA.
13. “Graphene Mechanical Wonders” – Seminar in Department of Mechanical Engineering, Boston University, Boston, MA.
14. “Graphene Adhesion” – Seminar at the Adhesion Society Annual Meeting and Expo, Daytona Beach, Florida.
15. “Graphene Mechanical Wonders” – Seminar in Department of Mechanical Engineering and Applied Mechanics, University of Pennsylvania, Philadelphia, PA.

2012

16. “Graphene Mechanical Wonders” – Seminar at MIT, Cambridge, MA.
17. “Graphene Mechanical Wonders” – Physics Colloquium at Boston University, Boston, MA.
18. “Graphene Mechanical Wonders” – Seminar at Colorado School of Mines, Golden, Colorado.
19. “Graphene Mechanical Wonders” – Seminar at Technical University of Denmark (DTU), Copenhagen, Denmark.

20. Graphene Mechanical Wonders” – Seminar at Carbonhagen 2012, Copenhagen, Denmark.
21. Ultrastrong Adhesion, Semipermeable Atomic Membranes, and other Graphene Mechanical Wonders” – Seminar at the 26th International Winterschool on Electronic Properties of Novel Materials (IWEPNM), Kirchberg, Austria.
22. Ultrastrong Adhesion, Semipermeable Atomic Membranes, and other Graphene Mechanical Wonders” – Seminar in the Department of Mechanical Engineering, Boston University, Boston, Massachusetts.
23. Ultrastrong Adhesion, Semipermeable Atomic Membranes, and other Graphene Mechanical Wonders” – Seminar at McMaster University, Ontario, Canada.

2011

24. “Ultrastrong Adhesion, Semipermeable Atomic Membranes, and other Graphene Mechanical Wonders” – Seminar at Naval Research Laboratory, Washington DC.
25. “Ultrastrong Adhesion, Semipermeable Atomic Membranes, and other Graphene Mechanical Wonders” – James Edward West Symposium, Department of Electrical and Computer Engineering, Johns Hopkins University, Baltimore, Maryland.
26. “Ultrastrong Adhesion, Semipermeable Atomic Membranes, and other Graphene Mechanical Wonders” – Seminar at NIST, Gaithersburg, MD.
27. “Ultrastrong Adhesion, Semipermeable Atomic Membranes, and other Graphene Mechanical Wonders” – Liquid Crystal MRSEC Seminar Series, Department of Physics, University of Colorado, Boulder, Colorado.
28. “Ultrastrong Adhesion, Semipermeable Atomic Membranes, and other Graphene Mechanical Wonders” – Seminar at Cornell University, Ithaca, NY.
29. “Ultrastrong Adhesion, Impermeable Atomic Membranes, and other Graphene Mechanical Wonders” – Seminar at Columbia University, New York, NY.
30. “Ultrastrong Adhesion, Impermeable Atomic Membranes, and other Graphene Mechanical Wonders” – Seminar at GE Research, Albany, NY.
31. “Impermeable Atomic Membranes, Ultrastrong van der Waals Adhesion, and other Graphene Mechanical Wonders” – Seminar at Ball Aerospace, Boulder, CO.

32. “Impermeable Atomic Membranes, Ultrastrong van der Waals Adhesion, and other Graphene Mechanical Wonders” – Seminar in the Department of Mechanical Engineering at University of Colorado, Boulder, CO.
33. “Graphene Membranes and Switches” – Seminar at Rocky Mountain MRS Meeting, Boulder, Colorado.
34. “Impermeable Atomic Membranes, Ultrastrong van der Waals Adhesion, and other Graphene Mechanical Wonders” – Seminar in the Department of Chemistry and Biochemistry (Physical Chemistry Seminar Series) at University of Colorado, Boulder, Colorado.

2010

35. “Graphene Membranes” – Seminar at the Fifth International Meeting on Polymer Derived Ceramics and Related Materials, at University of Colorado, Boulder, Colorado.
36. “Graphene NEMS” – Seminar in the Department of Mechanical and Nuclear Engineering at Kansas State University, Manhattan, Kansas.
37. “Graphene NEMS” – Mechanics of Solids, Structures and Materials Seminar, at University of Texas, Austin, Texas.

2009

38. “Graphene NEMS” – Seminar in the Department of Physics and Astronomy at University of Manitoba, Winnipeg, Canada.
39. “Graphene NEMS” – Seminar at the Nanoelectronic Devices for Defense and Security Conference, Ft. Lauderdale, Florida.
40. “Graphene NEMS” – Seminar in the Department of Physics (Condensed Matter Lunch Series) at University of Colorado, Boulder, Colorado.
41. “Graphene NEMS” – Seminar at the 10th US National Congress on Computational Mechanics, Columbus, Ohio.
42. “Graphene NEMS” – Seminar in the Department of Applied Sciences at Delft University of Technology, Delft, the Netherlands.
43. “Graphene NEMS” – Seminar in the Department of Engineering at Cambridge University, Cambridge, England.
44. “Graphene NEMS” – Seminar at Graphene Week Conference for the European Science Foundation, Innsbruck, Austria.

45. “Graphene NEMS” – Seminar in the Division of Engineering at Brown University, Providence, RI.

2008

46. “Graphene NEMS” – Seminar at Nanoelectronics Conference for the Canadian Institute for Advanced Research, Halifax, Nova Scotia.
47. “Graphene NEMS” – Seminar in the Department of Mechanical Engineering at University of Colorado, Boulder, CO.
48. “Graphene NEMS” – Seminar in the Department of Mechanical Engineering at University of Wyoming, Laramie, WY.

Before 2008

49. “Electromechanical Resonators from Graphene Sheets” – Seminar in the Department of Mechanical Engineering at University of Colorado, Boulder, CO (2007).
50. “Electromechanical Resonators from Graphene Sheets” – Seminar in the Department of Physics at Columbia University, New York, NY (2007).
51. “Carbon Nanoelectronics” – Seminar in the Department of Physics at the Universidad Autonoma de Madrid, Madrid, Spain (2006).

Department Service:

Boston University:

Member of the Graduate Committee (Fall 2013 – present)

University of Colorado:

Advisor for the University of Colorado at Boulder chapter of the American Society of Mechanical Engineers (Fall 2009 – Spring 2013)

Chair of the Instructor Search Committee (Fall 2012 – Spring 2013)

Member of the Faculty Search Committee (Fall 2010 – Spring 2011)

Chair of MEMS Prelim Exam Committee (Fall 2009 – Spring 2011)

Member of the Undergraduate Committee (Fall 2008 – Fall 2010, Fall 2011 – Spring 2013)

Member of MEMS Prelim Exam Committee (Fall 2008 – Spring 2013)

Professional Service:

Track Committee: IEEE Nano 2014 “Nanoelectronics: Carbon Based Nanoelectronics”.
Eaton Chelsea Hotel, Toronto, Canada from August 18 - 21, 2014.

Symposium organizer “Mechanical Properties of Carbon and Related Nanomaterials” and
“Low-dimensional materials: growth mechanisms, electronic properties, and
nanomechanical response of graphene, nanotubes, and nanowires.”

The Joint Society of Engineering Science 50th Annual Technical Meeting and ASME-
AMD Annual Summer Meeting, Brown University School of Engineering, July 28-31,
2013.

Courses Taught:Boston University:

EK 301	Engineering Mechanics: Statics	Spring 2015
EK 100	Advised 12 students	Fall 2014
EK 301	Statics (2 Sections)	Fall 2013

University of Colorado:

MCEN 2043	Dynamics	Spring 2013
MCEN 4045	ME Design Project (3 Teams)	Fall 2010, Spring 2011, Fall 2011, Spring 2012
MCEN 5636	MEMS 1	Fall 2009, Fall 2010
GEEN 1400	First Year Engineering Projects	Fall 2010, Spring 2011, Fall 2011, Fall 2012