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Curriculum Vitae
J. Scott Bunch

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Department of Mechanical
Engineering
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Current Research Interests

Experimental Nanomechanics of 2D Materials

- Molecular Transport through Atomically Thin Membranes
- Adhesion and Optomechanical 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

5/2017-present	Associate Professor, Department of Mechanical Engineering, Division of Materials Science and Engineering, Department of Physics (secondary), Boston University
6/2014-present	Faculty Member, Boston University Photonics Center
2/2014-5/2017	Assistant Professor (secondary appointment), Department of Physics, Boston University
9/2013-5/2017	Assistant Professor, Department of Mechanical Engineering, Boston University
9/2013-5/2017	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 Zhitenev, 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

Languages

English and Spanish

Citizenship

USA

Publications (13,160 - Google scholar citations): (* denotes corresponding author)

Journal Articles:

Published:

M. Calis*, D. Lloyd*, N.G. Boddeti and **J.S. Bunch**, Adhesion of 2D MoS₂ to Graphite and Metal Substrates Measured by a Blister Test, *Nano Letters*, **23**, 2607–2614 (2023).

L. Cantley*, J.L. Swett, D. Lloyd, D. A. Cullen, K. Zhou, P. V. Bedworth, S. Heise, A. J. Rondinone, Z. Zhu, S. Sinton, and **J.S. Bunch**, Voltage gated inter-
action selective ion channels from graphene nanopores, *Nanoscale* **11**, 9856 (2019).

J.W. Christopher, M. Vutukuru, D. Lloyd*, **J. S. Bunch**, B. B. Goldberg, D. J. Bishop, A. K. Swan, *Monolayer MoS₂ strained to 1.3% with a
Microelectromechanical System*, *IEEE Journal of Microelectromechanical
Systems* **28**, 254 (2019)

R. J. Dolleman, D. Lloyd*, **J.S. Bunch**, H. S. J. van der Zant, and P. G. Steeneken, *Transient thermal characterization of suspended monolayer MoS₂*, *Physical
Review Materials* **2**, 114008 (2018).

Z. Lin, Y. Lei, S. Subramanian, N. Briggs, Y. Wang, C-L. Lo, E. Yalon, D. Lloyd*, S. Wu, K. Koski, N. Guisinger, R. Clark, S. Das, R. M. Wallace, T. Kuech, **J. S. Bunch**, X. Li, Z. Chen, E. Pop, V. H. Crespi, J. A. Robinson, and M. Terrones, *Recent progresses on 2D materials beyond graphene: From Ripples, Defects, Intercalation, and Valley Dynamics, to Straintronics, Power dissipaters and Borophene*, *APL Materials* **6** (8), 080701 (2018).

D. Lloyd, X. Liu, N.G. Boddeti, L. Cantley, R. Long, M.L. Dunn, and **J.S. Bunch***, Adhesion, Stiffness and Instability in Atomically Thin MoS₂ Bubbles, *Nano Letters*, **17**, 5329–5334 (2017).

D. Akinwande, C. Brennan, **J. S. Bunch**, P. Egberts, J. Felts, H. Gao, R. Huang*, J. Kim, T. Li, Y. Li, K. M. Liechti*, N. Lu, H. Park, E. Reed, B. I. Yakobson, T. Zhang, Y.W. Zhang, Y. Zhou, Y. Zhu *A Review on Mechanics and Mechanical Properties of 2D Materials – Graphene and Beyond*, *Extreme Mechanics Letters*, **13**, 42-72 (2017).

D. Lloyd, X. Liu, J. Christopher, L. Cantley, A. Wadehra, B. Kim, A.K. Swan, B.B. Goldberg, and **J.S. Bunch***, *Band Gap Engineering with Ultra-Large*

Biaxial Strains in Suspended Monolayer MoS₂, Nano Letters, **16**, 5836-5841 (2016).

L. W. Drahushuk, L. Wang, S. P. Koenig, **J. S. Bunch**, and M.S. Strano*, *Mathematical Analysis of Time-varying, Stochastic Gas Transport through Graphene Membranes*, ACS Nano, **10**, 786–795 (2016).

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*, Nature Nanotechnology **10**, 785-790 (2015).

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. Bogozi, **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. Bogozi, **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).

S.S Verbridge, D.F. Shapiro, **J.S. Bunch**, A.M. van der Zande, P.L. McEuen, J. M. Parpia, H.G. Craighead*, "*An all-optical actuation and detection scheme for studying dissipation and materials properties of NEMS resonators*," in Lasers and Electro-Optics Society, 2007. LEOS 2007. The 20th Annual Meeting of the IEEE, vol., no., pp.838-839, 21-25 Oct. 2007

Other Publications :

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

Invited Scientific Presentations (66 total):

2019

1. "Voltage gated inter-cation selective ion channels from graphene nanopores" – Invited Seminar at the MRS Fall Meeting, Boston, MA.
2. "Cornell's McEuen Lab: The early years." Talk at McEuen Fest, a celebration of Paul McEuen".–Cornell University, Ithaca, NY, July 26-28, 2019.

2018

1. "Atomic Membranes" – Seminar at the International Workshop on "Localization, Interaction, and Superconductivity" at the Landau Institute, Chernogolovka, Russia.

2017

2. “Atomic Membranes” – Seminar in Department of Physics, RWTH Aachen University, Aachen, Germany.
3. “Atomic Membranes” – Seminar in Department of Physics, Delft University of Technology, Delft, Netherlands.
4. “Atomic Membranes for Filtration and Stretchable Electronics” – Invited Lecture at 5th annual Workshop on 2D materials entitled “Graphene and Beyond: From Atoms to Applications” Penn State University, State College, PA.
5. “2D Material Mechanics” – Invited Lecture at Graphene Workshop, National Intelligence Council’s (NIC’s) Science and Technology Expert Partnership (STEP) Program, Bethesda, MD.

2016

6. “Atomic and Molecular Membranes” – Seminar in Department of Physics, Boston College, Newton, MA.
7. “Atomic and Molecular Membranes” – Seminar at the U.S. Army Natick Soldier Research, Development and Engineering Center (NSRDEC), Natick, MA.
8. “Atomic and Molecular Membranes” – Squishy Physics Seminar at School of Engineering and Applied Sciences, Harvard University, Cambridge, MA.
9. “Blister Testing Atomic Membranes” – Invited Lecture at Workshop on Surface activity driven by material geometry and elasticity, University of Massachusetts, Amherst, MA.
10. “2D Material Mechanics” – Invited Lecture at Summer School on 2D Materials, University of Minnesota, Minneapolis, MN.
11. “Blister Testing Atomic Membranes: A route towards understanding 2D materials” – Invited Lecture at 2016 at AmeriMech Symposium: *Mechanical Behavior of 2D Materials - Graphene and Beyond*, Austin, TX.
12. “Controlling Ionic and Gas Transport through Porous Graphene” – Keynote Lecture at 2016 Materials Research Society Spring Meeting and Exhibit – Carbon Nanofluidics special symposium, Phoenix, AZ.
13. “Atomic Membranes” – Nanoscience Seminar at Arizona State University, Phoenix, AZ.

14. “Atomic Membranes” – Department of Physics Seminar at Florida International University, Miami, FL.

2015

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

2014

18. “Atomic Membrane Balloons” – UNC Materials Research Society Seminar at University of North Carolina, Chapel Hill, NC.
19. “Atomic Membrane Balloons” – Centre Européen de Calcul Atomique et Moléculaire (CECAM) workshop on graphene's strain engineering, ETH Zurich, Switzerland.
20. “Graphene Mechanical Wonders” – Photonics Forum at Boston University, Boston, MA.

2013

21. “Graphene Mechanical Wonders” – Condensed Matter Seminar Series at National University of Singapore, Singapore.
22. “Graphene Mechanical Wonders” – Colorado Nanofabrication Lab Summer Seminars at University of Colorado, Boulder, CO.
23. “Graphene Mechanical Wonders” – Physics Colloquium at Oregon State University, Corvallis, OR.
24. “Graphene Mechanical Wonders” – Mechanical Engineering Department Seminar at University of Minnesota, Minneapolis, MN.
25. “Selective Molecular Sieving through Atomically Thin Films” – Seminar at the 245th annual ACS National Meeting, New Orleans, LA.
26. “Graphene Mechanical Wonders” – Seminar in Department of Mechanical Engineering, Boston University, Boston, MA.

27. “Graphene Adhesion” – Seminar at the Adhesion Society Annual Meeting and Expo, Daytona Beach, Florida.
28. “Graphene Mechanical Wonders” – Seminar in Department of Mechanical Engineering and Applied Mechanics, University of Pennsylvania, Philadelphia, PA.

2012

29. “Graphene Mechanical Wonders” – Seminar at MIT, Cambridge, MA.
30. “Graphene Mechanical Wonders” – Physics Colloquium at Boston University, Boston, MA.
31. “Graphene Mechanical Wonders” – Seminar at Colorado School of Mines, Golden, Colorado.
32. “Graphene Mechanical Wonders” – Seminar at Technical University of Denmark (DTU), Copenhagen, Denmark.
33. “Graphene Mechanical Wonders” – Seminar at Carbonhagen 2012, Copenhagen, Denmark.
34. “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.
35. “Ultrastrong Adhesion, Semipermeable Atomic Membranes, and other Graphene Mechanical Wonders” – Seminar in the Department of Mechanical Engineering, Boston University, Boston, Massachusetts.
36. “Ultrastrong Adhesion, Semipermeable Atomic Membranes, and other Graphene Mechanical Wonders” – Seminar at McMaster University, Ontario, Canada.

2011

37. “Ultrastrong Adhesion, Semipermeable Atomic Membranes, and other Graphene Mechanical Wonders” – Seminar at Naval Research Laboratory, Washington DC.
38. “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.
39. “Ultrastrong Adhesion, Semipermeable Atomic Membranes, and other Graphene Mechanical Wonders” – Seminar at NIST, Gaithersberg, MD.

40. “Ultrastrong Adhesion, Semipermeable Atomic Membranes, and other Graphene Mechanical Wonders” – Liquid Crystal MRSEC Seminar Series, Department of Physics, University of Colorado, Boulder, Colorado.
41. “Ultrastrong Adhesion, Semipermeable Atomic Membranes, and other Graphene Mechanical Wonders” – Seminar at Cornell University, Ithaca, NY.
42. “Ultrastrong Adhesion, Impermeable Atomic Membranes, and other Graphene Mechanical Wonders” – Seminar at Columbia University, New York, NY.
43. “Ultrastrong Adhesion, Impermeable Atomic Membranes, and other Graphene Mechanical Wonders” – Seminar at GE Research, Albany, NY.
44. “Impermeable Atomic Membranes, Ultrastrong van der Waals Adhesion, and other Graphene Mechanical Wonders” – Seminar at Ball Aerospace, Boulder, CO.
45. “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.
46. “Graphene Membranes and Switches” – Seminar at Rocky Mountain MRS Meeting, Boulder, Colorado.
47. “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

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

2009

51. “Graphene NEMS” – Seminar in the Department of Physics and Astronomy at University of Manitoba, Winnipeg, Canada.

52. “Graphene NEMS” – Seminar at the Nanoelectronic Devices for Defense and Security Conference, Ft. Lauderdale, Florida.
53. “Graphene NEMS” – Seminar in the Department of Physics (Condensed Matter Lunch Series) at University of Colorado, Boulder, Colorado.
54. “Graphene NEMS” – Seminar at the 10th US National Congress on Computational Mechanics, Columbus, Ohio.
55. “Graphene NEMS” – Seminar in the Department of Applied Sciences at Delft University of Technology, Delft, the Netherlands.
56. “Graphene NEMS” – Seminar in the Department of Engineering at Cambridge University, Cambridge, England.
57. “Graphene NEMS” – Seminar at Graphene Week Conference for the European Science Foundation, Innsbruck, Austria.
58. “Graphene NEMS” – Seminar in the Division of Engineering at Brown University, Providence, RI.

2008

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

Before 2008

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