Dr. Steven P. Bennett, PhD

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EDUCATION

Northeastern University, Boston MA
Ph.D. – *Interdisciplinary [Materials Science & Electrical Engineering], 2013*
Northeastern University, Boston MA
Master of Science – *Materials Engineering, 2011*
Northeastern University, Boston MA
Bachelor of Science - *Mechanical Engineering, 2010*

EMPLOYMENT

The U.S. Naval Research Laboratory, Washington, D.C., *2016 – present*
Materials Science and Technology Division, Multifunctional Materials Branch (CODE 6350)
Position: Staff Research Scientist

Oak Ridge National Laboratory, Oak Ridge, TN, *2014 – 2016*
The Spallation Neutron Source (SNS), Quantum Condensed Matter Division, Thin Films and Nanostructures Group, (Dr. Valeria Lauter)
Position: Postdoctoral Fellow in Quantum Condensed Matter Neutron Beamline 4A

Northeastern University Boston, MA, *2010 – 2013*
Department of Electrical & Computer Engineering, Center for Microwave Magnetic Materials and Integrated Circuits, (Prof. Vince Harris)
Position: Ph.D. Student Researcher

Northeastern University, Boston, MA, *2005 – 2010*
Department of Physics,Nanoscale Semiconductor Research Laboratory, (Prof. Don Heiman)
Position: Undergraduate Researcher

Protonex, Southborough, MA, *2009 & 2011 – 2012*
UAV Fuel Cells Research Division
Position*: Consultant /* Full-time research co-op

Nantero, Woburn, MA, *2008*
Government Projects Division
Position: Full-time research co-op

SUNY - Stony Brook, Stony Brook, NY, 2004
Department of Materials Science and Engineering, (Prof. Gary Halada)
Position: Student research assistant

SELECTED PROFESSIONAL ACTIVITIES

Funding Awards:

- Awarded ~$1.0M over 2yr program titled: **Iron Nitride Permanent Magnets II** DLA Emergent III R&D BAA (FY23&24)
- Awarded ~4.0m over 3-4yr program titles: **Non-relativistic spin protection in Altermagnetsas a route towards ultra-high frequency electronics** (FY24 – FY27/28)
- Awarded ~$3.5m over 3-4yr program titled: **Metamagnetic FeRh: A Route Towards Fully Controllable Magnetic Ordering** through the Office of Naval Research, Basic Research Office (6.1 for FY20 – FY23/24)

Invited Seminars:

- United States Naval Academy Physics Department (April 2023)
- University of Notre Dame Physics Department (April 2022)
- TMRC The 30th Magnetic Recording Conference, The University of Minnesota, MN (July 2019)
- MMM-Intermag Joint Conference, Washington D.C. (Jan 2019)
- STIX meeting National Institute of Peace, Washington D.C. (Dec 2018)
- IEEE Nanomagnetism seminar at Northeastern University (Dec 2017)
- The University of the Philippians (National Institute of Physics) (Manila, Philippines Oct. 2015)
- The Army Research Laboratory (Weapons and Materials Directorate) (Aberdeen, Aug. 2015)
- Morgan State University Physics Department (Baltimore, Jan. 2016)
- NIST (National Institute of Standards and Technologies) (Washington D.C., Oct. 2013)
- The U.S. Air Force Research Lab (sensors division) (Oak Ridge, Nov. 2013)
- The Colonial Academic Alliance (Boston MA 2008)

SELECTED PUBLICATIONS

1- **Domain state exchange bias in a single layer FeRh thin film formed via low energy ion implantation**. Journal of Materials Chemistry C 11 (3), 903-909 (2023) [C. Cress et. Al]

2- **High-speed metamagnetic switching of FeRh through Joule heating**. Scientific Reports 12 (1), 22061 (2022) [N.A. Blumenschein et. Al]

3- **Helical spin ordering in room-temperature metallic antiferromagnet Fe3Ga4**. Journal of Alloys and Compounds 917, 165532 (2022) [B. Wilfong et. Al]

4- **Altering the magnetic ordering of Fe3Ga4 via thermal annealing and hydrostatic pressure**. Journal of Alloys and Compounds 894, 162421 (2022) [B. Wilfong et. Al]

5- **N+ Irradiation and Substrate-Induced Variability in the Metamagnetic Phase Transition of FeRh Films.** *Coatings* **2021**, *11* (6), 661 [Bennett, S. P.; LaGasse, S. W.; Currie, M.; Erve, O. V.; Prestigiacomo, J. C.; Cress, C. D.; Qadri, S. B.]

6- **Direct-Write of Nanoscale Domains with Tunable Metamagnetic Order in FeRh Thin Films,** *ACS Applied Materials and Interfaces* **2021**, *13* (1) [Cress, C. D.; Wickramaratne, D.; Rosenberger, M. R.; Hennighausen, Z.; Callahan, P. G.; Lagasse, S. W.; Bernstein, N.; Erve, O. M. V. 'T; Jonker, B. T.; Qadri, S. B.; Prestigiacomo, J. C.; Currie, M.; Mazin, I. I.; Bennett, S. P.]

7- **Spectral Reflectivity Crossover at the Metamagnetic Transition in FeRh Thin Films**, *Optical Materials Express **9**, 2870-2877*, (2019) [S.P. Bennett, M. Currie, O.M.J van't Erve. I.I. Mazin]

8- **Magnetoelastic Effects in Doubly Clamped Electroplated Co77Fe23 Microbeam Resonators**, Physical Review Applied **11**, (2019) [M. Staruch, S.P. Bennett, B.R. Matis, J.W. Baldwin, K. Bussmann, D.B. Gopman, Y. Kabanov, J.W. Lau, R.D. Shull, E. Langlois, C. Arrington, J. R. Pillars, and P. Finkel

9- **Magnetic Order Multilayering in FeRh Thin Films by He-Ion Irradiation**, Materials Research Letters **6**, 106-112, (2018) [Steven Bennett, Andreas Herklotz, Cory Cress, Anton Ievlev, Igor Mazin, Valeria Lauter]

10- **Magnetic Field Response of Doubly-Clamped Magnetoelectric MEMS Resonators**, Appl. Phys. Lett. **111**, 252903 (2017) [S. P. Bennett, J. W. Baldwin, M. Staruch, B. M. Matis, OMJ van't Erve, K. Bussman, W. Zappone, R. Lacomb, P. Finkel]

11- **Giant Controllable Magnetization Changes Induced by Structural Phase Transitions in a Metamagnetic Artificial Multiferroic,** *Scientific Reports* **6**, 22708 (2016) [S. P. Bennett, A. T. Wong, A. G. Glavic, A. Herklotz, C. Urban, I. Valmianski, M. Biegalski, H. Christen, T. Z. Ward, V. Lauter]

12- **Phase Concentration Determination of Fe16N2 Using State of the Art Neutron Scattering Techniques** *JOM* **68**, 1543-1851 (2016) [S. P. Bennett, M. Feygenson, Y. Jiang, B.J. Zande, X. Zhang, S.G. Sankar, J. P. Wang, V. Lauter]

13- **Direct Evidence of Anomalous Interfacial Magnetization in Metamagnetic Pd doped FeRh Thin Films**, *Scientific Reports* **5**, 9142 (2015) [Steven P. Bennett, Haile Ambaye, Hwachol Lee, Patrick LeClair, Gary Mankey, Valeria Lauter]

14- **Quantum Coherent Transport in SnTe Topological Crystalline Insulator Thin Films**, *Applied Physics Letters*, **105**, 102108 (2014) [B. A. Assaf, F. Katmis, P. Wei, B. Satpati, Z. Zhang, S. P. Bennett, V. G. Harris, J. S. Moodera, D. Heiman]

15- **Process optimization and properties of magnetically hard cobalt carbide nanoparticles via modified polyol method**, *Journal of Alloys and Compounds* **625**, 138-143. (2015) [M. Zamanpour, S. P. Bennett, L. Majidi, Y. Chen, V. G. Harris]

16- **Thermally driven large magnetoresistance and magnetostriction in multifunctional magnetic FeGa–Tb alloys** *Acta Materialia*, **73**, 19-26, (2014) [Trifon I. Fitchorova, Steven Bennett, Liping Jiang, Guangrui Zhangb, Zengqi Zhao, Yajie Chen, Vincent G. Harris]

17- **Nanostructured FeRh in metallic and insulating films** *Journal of Magnetism and Magnetic Materials*, 354, 284–289 (2014) [B. Kaeswurm, F. Jimenez-Villacorta, S.P. Bennett, D. Heiman, L.H. Lewis]

18- **Magnetic properties and large coercivity of Mn_xGa nanostructures** *Journal of Magnetism and Magnetic Materials*, 358-359, 259-262, (2014) [M.E. Jamer, B.A. Assaf, S.P. Bennett, L.H. Lewis, D. Heiman]

19- **The realization of a new band gap engineered photoferroelectric photovoltaic device with high photocurrent** ProQuest LLC, UMI Dissertation Publishing (2013) [Steven Bennett]

20- **Magnetocrystalline Anisotropy and FMR Linewidth of Zr and Zn-Doped Ba-Hexaferrite Films Grown on MgO(111)** *IEEE Transactions on Magnetics*, vol. **49**, no. 7, July (2013) [B. Hu, Y. Chen, Z. Su, S. Bennett, L. Burns, G. Uddin, K. Ziemer, and V. G. Harris]

21- **Crystallographically textured self-biased W-type hexaferrites for X-band microwave applications** *J. Appl. Phys.* 113, 17B305 (2013) [Zhijuan Su, Yajie Chen, Bolin Hu, Alexander S. Sokolov, Steven Bennett, Lee Burns, Xing Xing, Vincent G. Harris]

22- **Effect of Ambient Aging on Heat-Treated Mechanically Alloyed Mn-Al-C Powders** *IEEE Transactions on Magnetics*, vol. **49**, no. 7, (2013) [Ogheneyunume Obi, Lee Burns, Yajie Chen, Steven Bennett, Mathew Sawicki, Daniel Kaplan, Ana M. Arango, Laura H. Lewis, and Vincent G. Harris]

23- **Magnetic and Magnetotransport Characteristics of Nanostructures and Nanostructured Semiconductor Systems** ProQuest LLC, UMI Dissertation Publishing (2012) [Steven Bennett]

24- **Large Coercivity in Nanostructured Rare-earth-free MnxGa Films** *Appl. Phys. Lett.* **99**, 252506 (2011) [T. J. Nummy, S. P Bennett, T. Cardinal, and D. Heiman]

25- **Universal Properties of Linear Magnetoresistance in Strongly Disordered Semiconductors** *Phys. Rev. B* **82**, 085202 (2010) [H. G. Johnson, S. P. Bennett, R. Barua, L. H. Lewis, and D. Heiman]

26- **Determining magnetic nanoparticle size distributions from thermomagnetic measurements** *Appl. Phys. Lett.* **96**, 222506 (2010) [R. S. DiPietro, H. G. Johnson, S. P. Bennett, T. J. Nummy, L. H. Lewis, and D. Heiman]

27- **Negative Index Metamaterials Based on Metal-Dielectric Nanocomposites for Imaging Applications** *Appl. Phys. Lett.* **93**, 123117 (2008) [L. Menon, W. T. Lu, A. L. Friedman, S. P. Bennett, D. Heiman, and S. Sridhar]

28- **Magnetic Properties of GaMnAs Nanodot Arrays Fabricated using Porous Alumina Templates** *J. Appl. Phys.* **104**, 024309 (2008) [S. P. Bennett, L. Menon, and D. Heiman]

PATENTS

1- **"Multistate magnetic memory element using metamagnetic materials"** US Patent 11,605,410, 2023

2- **"Method for Pattern Writing of Magnetic Order for High Density Magnetic Memory Using Ion Irradiation of a Magnetic Phase Transitional Thin Film"** Navy Case #111253-US1, 2019

3- **"Method for multistate magnetic memory element using metamagnetic materials"** Navy case #107738-US1, 2019

4- **"Ultra-low power magnetoelectric field sensor"** Patent pub. # WO2018226284A3, 2018

5- **"Nanostructured hybrid-ferrite photoferroelectric device"** Patent pub. # US WO2015160816A1, 2015

6- **"Rare-earth-free or noble metal-free large magnetic coercivity nanostructured films"** Patent Pub. # US 20130236720 A1, 2013