Matthew J. Bauer

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Summary

PhD Engineer who has contributed to furthering the scientific body of knowledge and developing intellectual property in numerous fields. With strong project management, collaboration, and automation skills, I am able to quickly prototype and optimize solutions to technical problems. I also have a strong mathematics and programming background.

Education

University of Florida (2016-Present)
Phd of Materials Science and Engineering
GPA: 3.90 / 4.00

Clarion University (2010-2014)
BSc with a dual major in Mathematics and Physics, and minors in Nanotechnology and Honors
GPA: 3.96 / 4.00

University of Florida (2014-2016)
MSc in Materials Science and Engineering
GPA: 3.90 / 4.00

Penn State University (2012)
Nanofabrication Manufacturing Technologies (NMT)
GPA: 4.00 / 4.00

Employment

Graduate Researcher at the University of Florida (2014-Present)
- Designed, fabricated, and tested novel passive magnetic field sensors utilizing magnetoelectric nanowires with magnetoelectric coefficients 1-2 orders of magnitude greater than bulk or thin film devices; leading a team of graduate and undergraduate researchers (2014-Present)
  - Fabricated Janus biphasic barium titanate/cobalt ferrite magnetoelectric nanowires (NWs) via electrospinning
  - Assembled these NWs into arrays with a bottom up AC electrical assembly technique
  - Formed upper electrical contacts with the NWs via lithography and electroplating
  - Built and utilized an automated magnetoelectric measurement system to characterize these arrays incorporating helmholtz coils, a function generator, a hall probe, a pickup coil, and an oscilloscope with the Python programming language
- Researched magnetoelectric antenna for ultra wide bandwidth applications (2018-present)
- Optimized a solenoid coil to provide a uniform magnetic field over a 24-well plate for use in cell growth experiments (2017)
  - Optimized the length, radius, wire gauge, and number of turns for a specified minimum field at a specified frequency for maximum uniformity
  - Found the inductance of the coil, maximum current which could be applied, and field at the individual well plates
  - Optimized the coil using a genetic algorithm (differential evolution)
  - Used Solidworks and 3D printing to construct the well plate holder and solenoid holders
- Researched barium titanate sol-gel electrospinning (2014-2016)
  - Achieved scalable alignment of barium titanate piezoelectric nanofibers
  - Found fiber diameter distribution to be multimodal lognormal rather than multimodal normal indicating that the main contributor to diameter variance was the polydispersity of the polymer binder used for electrospinning

Graduate Teaching Assistant at the University of Florida (2016-Present)
- Demonstrated knowledge of materials science concepts and communication skills through student instruction

Undergraduate Researcher at the Gregory Barnes Center (2011-2014)
- Led a team of three undergraduate students to fix a tube furnace and construct a medium industrial sized chemical vapor deposition chamber to be run with Labview (2012)
- Researched the purification and functionalization of carbon nanodiamonds (2011- 2014)
- Modified the surface of dental implants with a series of thin films to promote cell adhesion and enhance antimicrobial properties (2012-2014)

Undergraduate Researcher at the Penn State Physics and Interdisciplinary Materials REU (2013)
- Performed research related to aligning particles in solution by an electric field; Possible uses of this method include the fabrication of "DNA lab on a chip" and other sensors
  - Modeled the dielectrophoretic force in COMSOL resulting from parallel electrodes
  - Researched the effects of low temperature drying, lyophilization, and the addition of salt on maintaining order in electrically aligned nanoparticles during drying
  - Researched the effects of flow rate and electric field intensity on nanoparticle spacing

Patents
- Filed a patent on "Powerless Magnetic Field Sensing Using Magnetoelectric Nanowires" application number 62/585,198 (2017)

Publications
- **Bauer, M.J.**, Wen, X., Tiwari, P., Arnold, D.P., Andrew, J.S., "Magnetic Field Sensors Using Arrays of Electrospun Magnetoelectric Janus Nanowires", Nature Microsystems and Engineering, Submitted
- Chavez, B.L., Sosnowski, K.C., **Bauer, M.J.**, Budi, M.A.K., Andrew, J.S., Crawford, T.M., "Toward nanoscale multiferroic devices: Magnetic field-directed self-assembly and chaining in Janus nanofibers", AIP Advances, https://doi.org/10.1063/1.5007706 (2018)
- **Bauer, M.J.**, Snyder, C.S., Bowland, C.C., Uhl, A.M., Budi, M.A.K, Villancio-Wolter, M, Sodano, H.A., Andrew, J.S., "Structure−Property Relationships in Aligned Electrospun Barium Titanate Nanofibers", Journal of the American Ceramic Society, https://doi.org/10.1111/jace.14455 (2016)

Presentations
- **Oral Presentation**, "Arrays of Janus-Type Magnetoelectric Nanowires for Passive Magnetic Field Sensing", IEEE Nano Conference, July 23 - 26, 2018, Cork, Ireland
- **Oral Presentation**, "Passive Magnetic Field Sensors Using Magnetoelectric Janus Nanowires", Magnetism and Magnetic Materials Conference, November 6-10, 2017, Pittsburgh, PA, United States
- **Oral Presentation**, "Assembly of Magnetoelectric Nanowires into Magnetic Field Sensors", Electronic Materials Applications Conference, January 18-20, 2017, Orlando, FL, United States
- **Oral Presentation (Co-Presenter)**, Conference paper/presentation on silica nanowire synthesis at the PASSHE Undergraduate Research Conference in Science, Technology, Engineering and Mathematics, November 15-16, 2013, Slippery Rock, PA, United States
- **Poster Presentation**, "Maintaining Order in Electrically Aligned Nanoparticles During Drying", PACS Conference, 2013, Clarion University, PA, United States

Certifications and Professional Development
- Deep Learning Specialization (Artificial Intelligence, AI) - Coursera (2018) https://www.coursera.org/account/accomplishments/specialization/UXEK3F5PYRV8
  - A five course series taught by Andrew Ng, formerly head of Google Brain, which teaches the implementation and refinement of neural networks for solving problems related to healthcare, autonomous driving, sign language reading, music generation, and natural language processing
- Actuarial Exam P (2015)

Honors/Awards
- University of Florida Graduate School Fellowship Award (August 2014-Present)
- Full Board of Governors Scholarship (2010-2014)
- Paul Shank Physics Award (2012)

Campus and Community Activities
- Florida Running Club (2016-present) (running and volunteering activities)
- Habitat for Humanity (2015-2016)
- Clarion Recreational Outdoors Club (2012-2014)
- Student Honors Association, Co-Chair of Community Service (2010-2011)
- Physics Society (2012)
- Pi Mu Epsilon, Honorary Mathematics Society (2011-2014)

Technical Skills Supplement

Computer Skills
scientific computing ✻, automation ✺, process/logistics 🚚. UX 📱

Programming Languages

Python ✺✻	Matlab ✻	Mathematica ✻	R ✻
Java ✻📱	C# ✻📱	C++ 📱	Labview ✺📱
	TensorFlow ✻	Keras ✻	

Simulation Software

FEniCS (Finite Element Computational Software) ✻   COMSOL Multiphysics ✻   Arena (Discrete Event) 🚚

Computer Aided Design (CAD) and Image Analysis with Scripting

Solidworks	Rhinoceros	KLayout	ImageJ	Impact (Datalogic)

Scientific Instruments
used, automated ✺, wrote standard operating procedure/officially guided use of 📄

Lithography
Litho Process Suss Delta 80   Litho Process Karl Suss MA6
Karl Suss MJ3 Contact Aligner   SPDI UV Exposure and Culturing tool
Heidelberg DWL 66FS Laser Writer

Film Deposition/Etch
Sputter Deposition KJL CMS-18   Cooke CVE 301 Thermal Evaporator
March Jupiter III RIE dry etch tool   Technics Micro-RIE series 80

Electron/Optical Microscopy
SEM - FEI Nova 430 w/EDS & CL   FEI Phillips XL40 FEG SEM
Tescan Vega 3 Environmental SEM   Zeiss Ultra 55 FESEM
Phenom ProX SEM w/EDS 📄   Leitz Ergolux optical microscope

Scanning Probe Microscopy/Profilometry/Ellipsometry
Veeco diCP II AFM   Dektak 6M Profilometer   Gaertner L1155-8 Ellipsometer

Rapid Prototyping
Tomach CNC 770 Series III CNC mill 📄   MakerBot 2 3D printer   XYZ Davinci 1.0 3D printer

Electrical
Tektronics DPO2004B Oscilloscope ✺   Agilent 33220A Function Generator ✺   TTP4 cryogenic probe station

Miscellaneous
Brookhaven ZetaPlus   Perkin Elmer DTA 7 differential thermal analyzer   Panalytical XPert Powder X-Ray Diffractometer
FTIR   Raman Spectroscopy   UV Vis Spectroscopy