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Andrew O'Connor

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Research experience

May 2023 – present **Civil servant in Materials Science and Metallurgy Branch**, *NASA Marshall Space Flight Center (NASA/MSFC)*, Huntsville, AL

- Served as technical lead for report on Integrated Computational Materials Engineering (ICME) in microgravity materials science
- Coordinated NASA/MSFC personnel and resources to support successful parabolic flight demonstration of vacuum laser beam welding in collaboration with the Ohio State University
  `nasa.gov/centers-and-facilities/marshall/nasa-to-transform-in-space-manufacturing-with-laser-beam-welding-collaboration/`
- Serving as Principal Investigator (PI) for a suborbital laser beam welding flight experiment, demonstration of laser forming in thermal vacuum, and demonstration of laser beam welding in thermal vacuum

Aug 2019 – May 2023 **Predoctoral Fellow**, *Materials Design & Prototyping Laboratory (MDPL)*, Gainesville, FL

- Supported by NASA fellowship to develop "A Lightweight, Multifunctional Hybrid Metal Matrix Composite for Neutron Shielding"
- Collaborated with NASA/LaRC Advanced Materials and Processing Branch
- Fabricated metal matrix composites (MMCs) using:
  - an innovative stir casting process in an inert atmosphere glovebox
  - vacuum hot pressing at NASA/LaRC
- Characterized MMCs by metal-ceramic interfaces and mechanical properties
- Simulated and then experimentally measured neutron absorption of MMCs
- Simulated space radiation shielding through advanced composites
- Contributed to multiple technical proposals for NASA grants and funding

Aug 2017 – Jul 2019 **Graduate Research Associate**, *MDPL*, Gainesville, FL

- Cast and analyzed ternary alloys with neutron shielding functionalities
- Modeled and simulated betavoltaic power sources

Jun–Aug 2018 **Summer Intern**, *NASA Goddard Space Flight Center*, Greenbelt, MD
Mentor: Dr Harry Shaw

- Developed computerized models of betavoltaic power sources
- Designed exploration mission employing innovative radionuclide power sources

Jun–Aug 2016 **Summer Intern**, *NASA/MSFC*, Huntsville, AL
Mentor: Dr Dennis Tucker

- Processed perovskite semiconductors by calcination and direct current sintering
- Characterized high-temperature thermoelectrics through thermal diffusometry, differential scanning calorimetry, Seebeck testing, and electron microscopy

Jun–Aug 2015 **Research Associate (NASA Academy)**, *NASA/MSFC*, Huntsville, AL
Mentor: Dr Dennis Tucker
- Investigated aerosol conductive ink formulations for in-space printable electronics
- Supported processing of prototypical fuel element for nuclear thermal propulsion
- Gained insight into organizational and leadership practices of Federal agency

Jun–Aug 2014 **Summer Intern**, *NASA/MSFC*, Huntsville, AL
Mentor: Dr Dennis Tucker
- Examined thermomechanical properties and microstructure of spark plasma sintered cermet fuel for nuclear thermal propulsion
- Analyzed cyclic voltammetry of ionic liquid/carbon nanotube hybrid capacitor

Education

2017–2023 **Doctor of Philosophy in Materials Science and Engineering**, *University of Florida*, Gainesville, FL
Dissertation title: *An Aerospace Structural Neutron Absorbing Composite Consisting of a Lightweight Metal Matrix Reinforced by Absorbing Particles*
Major professor: Michele V Manuel, PhD, FASM, MNAE
Research collaborator: Cheol Park, PhD at NASA Langley Research Center (LaRC)

2013–2017 **Bachelors of Science in Nuclear Engineering**, *Purdue University*, West Lafayette, IN, with Distinction
Minor studies in Materials Science & Engineering and Engineering & Public Policy

Scholarly activity

Journal publications

[1] Andrew O'Connor, Cheol Park, James E Baciak, and Michele V Manuel. "Mitigating space radiation using magnesium(-lithium) and boron carbide composites". In: *Acta Astronautica* 216 (2024), pp. 37–43. ISSN: 1879-2030. DOI: 10.1016/j.actaastro.2023.12.013.

[2] Andrew O'Connor, Cheol Park, Wesley E Bolch, Andreas Enqvist, and Michele V Manuel. "Designing lightweight neutron absorbing composites using a comprehensive absorber areal density metric". In: *Applied Radiation and Isotopes* 206 (2024). ISSN: 1872-9800. DOI: 10.1016/j.apadiso.2024.111227.

[3] Dennis S. Tucker, Andrew O'Connor, Carly Romnes, Curtis Hill, X Zhu, and G Thompson. "Reprocessing Leader to Lower Thermal Conductivity of ZnO Thermoelectrics". In: *Journal of Materials Science & Nanotechnology* 6 (1 2018). ISSN: 2348-9812.

[4] Dennis S. Tucker, Andrew O'Connor, and Robert Hickman. "A Methodology for Producing Uniform Distribution of UO_2 in a Tungsten Matrix". In: *Journal of Physical Science and Application* (4 2015). ISSN: 2159-5348. DOI: 10.17265/2159-5348/2015.04.002.

Technical reports

[1] O'Connor et al. *Microgravity and reduced gravity Integrated Computational Materials Engineering (ICME)*. NASA/MSFC, 2025.

Conference presentations & publications

[1] Andrew O'Connor, Wesley E Bolch, Andreas Enqvist, Cheol Park, and Michele V Manuel. "Designing lightweight neutron absorbing composites using a comprehensive absorber areal density metric". In: *PHITS Workshop*. Tokai, Japan, Feb. 19, 2025. URL: https://phits.jaea.go.jp/workshop2025.html.

[2] Andrew O'Connor et al. "A Combined Computational Experimental and Technology Development Approach to In-Space Laser Manufacturing Maturation at NASA Marshall Space Flight Center". In: *AIAA SciTech 2025*. https://ntrs.nasa.gov/citations/20240015580 and https://ntrs.nasa.gov/citations/20250000018. Orlando, FL, Jan. 8, 2025.

[3] E Choi et al. "Laser Beam Welding for in-Space Joining Demonstrated Under Vacuum on the Ground and By Parabolic Flight Experiments". In: *TechConnect World 2024*. **Talk given by Andrew O'Connor**. National Harbor, MD, June 18, 2024. URL: https://ntrs.nasa.gov/citations/20240007238.

[4] Andrew O'Connor et al. "A Combined Computational Experimental and Technology Development Approach to In-Space Laser Manufacturing Maturation at NASA Marshall Space Flight Center". In: *Defense Manufacturing Conference 2024*. Austin, TX, Dec. 5, 2024. URL: https://ntrs.nasa.gov/citations/20240014307.

[5] Andrew O'Connor et al. "Maturation of In-space Welding in Reduced Gravity and Reduced Pressure Environments Through Progression to Suborbital Flight Experiments". In: *American Welding Society Professional Program*. Orlando, FL, Oct. 17, 2024. URL: https://ntrs.nasa.gov/citations/20240012884.

[6] Jeffrey W Sowards, Ellis Crabtree, Andrew O'Connor, and Christopher S Protz. "Computational and Physics-Based Modeling for the Development of in-Space Welding Technology". In: *American Welding Society Professional Program*. Orlando, FL, Oct. 15, 2024. URL: https://ntrs.nasa.gov/citations/20240012632.

[7] Jeffrey W Sowards, Andrew O'Connor, Fredrick Michael, Carly Romnes, Fernando Reyes Tirado, and Omar Mireles. "An Open-Source Numerical Model for Mitigating Refractory Alloy Hot Cracking Susceptibility". In: *TMS 2024*. **Talk given by Andrew O'Connor**. Orlando, FL, Mar. 4, 2024. URL: https://ntrs.nasa.gov/citations/20240002187.

[8] Andrew O'Connor, Cheol Park, and Michele V Manuel. "Employing a semi-quantitative system to elucidate particle spacing in particle-reinforced composite". In: *TMS 2022*. Anaheim, CA, Mar. 1, 2022.

[9] Andrew O'Connor, Harry C Shaw, and Michele V Manuel. "High-temperature Betavoltaic above the Cytherean Surface (HIBIsCuS)". In: *2022 Conference on Advanced Power Systems for Deep Space Exploration*. virtual, Sept. 1, 2022.

[10] Andrew O'Connor, Wesley E Bolch, and Michele V Manuel. "Lightweight Radiation Shielding Using Metal Matrix Composites". In: *TMS 2020*. San Diego, CA, Feb. 25, 2020.

[11] Andrew O'Connor, Michele Manuel, and Harry Shaw. "An extended-temperature, volumetric source model for betavoltaic power generation". In: *Transactions of the American Nuclear Society*. 30591. Refereed conference paper. Washington, DC, Nov. 19, 2019. DOI: 10.13182/T30591. PMID: PMC8269951.

[12] Dennis S. Tucker, Andrew O'Connor, Curtis Hill, and Carly Romnes. "High Temperature Oxide Thermoelectric Materials for RTGs". In: *Proceedings of Nuclear and Emerging Technologies for Space 2017*. 20550. **Talk given by Andrew O'Connor**. Orlando, FL, Feb. 27, 2017.

[13] Dennis S. Tucker, Andrew O'Connor, Robert Hickman, Jeramie Broadway, and Grace Belancik. "Methodology for Producing a Uniform Distribution of UO_2 in a Tungsten Matrix". In: *Proceedings of Nuclear and Emerging Technologies for Space 2015*. 5022. Talk given by Dennis S. Tucker. Albuquerque, NM, Feb. 23–26, 2015.

Other technical works

[1] Caleb Schenck, Andrew O'Connor, and Michele V Manuel. *Developing a metallography procedure to investigate compositional effects on the microstructure of lightweight metal matrix composites*. Poster presented at TMS 2023. San Diego, CA, Mar. 20, 2023.

[2] Andrew O'Connor. *Lightweight Neutron Radiation Shielding using Metal Matrix Composites*. Invited talk given at NASA/LaRC. Hampton, VA, Nov. 20, 2019.

[3] Andrew O'Connor and Harry C. Shaw. *Investigating the Utility of Betavoltaic Power Sources in the Space Environment*. Poster presented at NASA GSFC Intern Expo. Greentbelt, MD, Aug. 2, 2018.

[4] Andrew O'Connor, Carly Romnes, and Dennis S. Tucker. *High-temperature Oxide Thermoelectrics*. Poster presented at NASA MSFC Intern Expo. Huntsville, AL, Aug. 10, 2016.

[5] Andrew O'Connor and Dennis S. Tucker. *Novel Conductive Ink Formulations for In-Space Printable Electronics*. Poster presented at NASA MSFC Intern Expo. Huntsville, AL, Aug. 5, 2015.

[6] Andrew O'Connor and Dennis S. Tucker. *Characterizing SPS W/HfO_2 CERMET as Fuel Element Surrogate for Nuclear Thermal Propulsion*. Poster presented at NASA MSFC Intern Expo. Huntsville, AL, Aug. 6, 2014.

Pending publications

[1] Andrew O'Connor, Wesley E Bolch, Cheol Park, and Michele V Manuel. [redacted] In preparation. 2025.

[2] Andrew O'Connor, Cheol Park, and Michele V Manuel. [redacted] In preparation. 2025.

[3] Andrew O'Connor, Cheol Park, and Michele V Manuel [redacted] In preparation. 2025.

Service as a technical reviewer

2024 – present	Acta Astronautica,Welding in the World	*Peer reviewer*
2022 – present	American Nuclear Society Student Conference	*Paper reviewer*

[redacted] Teaching experience

Summer 2019 **Instructor**, *EGS1006: Introduction to Engineering*, Gainesville, FL
- Encouraged incoming undergraduate students to major in materials engineering through review of career prospects and hands-on demonstrations

Spring 2019 **Participant**, *STEM Teachers Learning Community*, Gainesville, FL
- Shared teaching best practices and reviewed STEM-specific pedagogy

Spring 2019 **Teaching Assistant**, *EMA3000L: Sophomore [Materials] Lab*, Gainesville, FL
- Guided undergraduate students in small groups to apply engineering principles through a design project

Fall 2018 **Teaching Assistant**, *EMA6313: Advanced Materials Principles 1*, Gainesville, FL
- Assisted graduate students in understanding materials science concepts

Honors and Awards

Mar 2025 NASA Biological and Physical Sciences (BPS) Exemplary Staff Tribute (BEST)

Sep 2022 1st place, American Nuclear Society's Nuclear Myth-busting competition $250

Apr 2019 awarded NASA Space Technology Research Fellowship $80,000 $p.a.$

Feb 2019 Semifinalist, U.S. DoD SMART Fellowship

Apr 2018 Top 200, National Defense Science and Engineering Graduate Fellowship

Mar 2017 awarded Dow Chemical Graduate Fellowship in Mat. Sci. and Eng. $5,000

Jan. 2017 awarded Graduate School Preeminence Award, University of Florida $30,200 $p.a.$

Apr 2016 Inducted into Alpha Nu Sigma (nuclear engineering honor society)

Aug 2014 3rd place poster in Materials & Test category, NASA/MSFC Intern Expo $150

Apr 2014 Emerging Leader Award, Purdue Student Activities & Organizations

2013–2017 Semester Honors and Dean's List, Purdue University *every semester*

Apr 2013 awarded Steven C. Beering Scholarship, Purdue University *full cost of attendance*

Service and leadership experience

2023 – 2024 **Volunteer reviewer**, *NASA TechRise Challenge*

Apr 2019 – Dec 2021 **Lab Safety & Hazardous Waste Manger**, *MDPL*, Gainesville, FL
- Ensured experimentation conducted safety maintained training records
- Monitored hazardous waste accumulation, storage, and disposal

Apr 2020 – Apr 2021 **Chair**, *Engineering Graduate Student Council*, Gainesville, FL
- Sustained activities of organization in virtual format during pandemic restrictions
- Organized mental health workshops tailored for engineering graduate students

Apr 2019 – Apr 2020 **Vice-Chair**, *Engineering Graduate Student Council*, Gainesville, FL
- Served as advisor to Chair
- Aligned governing documents of organization with university-wide requirements

Jul 2019 **Delegate**, *Nuclear Engineering Student Delegation*, Washington, DC
- Lobbied US Congress to continue funding for nuclear science education

Oct 2018 – Apr 2019 **Voting Member**, *Engineering Graduate Student Council*, Gainesville, FL
- Supported recruitment efforts for new engineering graduate students

Nov 2017 – May 2023 **STEM Engagement Volunteer**, *Howard Bishop Middle School*, Gainesville, FL
- Volunteered as a science fair judge for both local and regional levels annually
- Mentored student teams for the Exploravision and Future City competitions

Apr 2015 – May 2017 **Recording Secretary**, *Tau Beta Pi Engineering Honor Society (IN A)*, West Lafayette, IN
- Developed educational materials for school tours of nuclear training reactor
- Updated organization website to communicate with members & public

Jan 2014 – May 2017 **Student Ambassador**, *Purdue University Office of Admissions*, West Lafayette, IN
- Presented campus and activities to prospective students in an engaging manner

2014 – 2016 **Activity Head**, *Purdue Space Day*, West Lafayette, IN
- Captivated grades 3-8 students with hands-on STEM learning activities
- Supervised volunteers to ensure personalized engagement of each student

Jan 2015 – Dec 2016 **Treasurer**, *Beering Scholar Student Association*, West Lafayette, IN
- Coordinated general meetings and special events by improving mailing system

Mar 2011 **Supervisor**, *Eagle Scout Leadership Service Project*, Longview, TX
- Orchestrated the clearing, marking, and beautifying of half-mile-long nature trail involving 20 volunteers and fundraising

Mentoring experience

2024 – present **Intern Mentor**, *NASA/MSFC*, Huntsville, AL

Jun – Aug 2022 **Graduate Student Mentor**, *Summer Undergraduate Research at Florida (SURF)*, Gainesville, FL
- Prepared and planned a 10-week summer research experience in metallography for undergraduate student visiting from another institution
- Conducted weekly meetings and counseled student on progress and development
- Coordinated with postdoctoral researcher to provide additional experimental assistance for undergraduate

Affiliations

Aerospace
- Aerospace Institute of Aeronautics and Astronautics (AIAA)
- Lunar Surface Innovation Consortium (LSIC): Extreme Environments group, Radiation Environments subgroup
- Consortium for Space Mobility and ISAM Capabilities (COSMIC): Research & Technology focus area

Nuclear and radiological
- American Nuclear Society (ANS)
  - Aerospace Nuclear Science & Technology Division
  - Materials Science Technology Division

Materials and metals
- American Welding Society (AWS)
- The Minerals, Metals, and Materials Society (TMS)

Relevant skills and competencies

Research

- Arc melting
- Compression and tensile testing
- Design of experiments (DoE)
- Differential scanning calorimetry (DSC)
- Digital image correlation (DIC)
- Energy-dispersive x-ray spectroscopy (EDS)
- Electron probe micro-analysis (EPMA)
- Fourier-transform infrared spectroscopy (FTIR)
- Glovebox work: casting alloys and powder metallurgy
- Hardness testing (Brinell and Vickers indenters)
- Hot work: hydrogen-oxygen torch used for glass encapsulations
- Laser beam welding (LBW)
- Laser flash analysis of thermal diffusivity
- Laser forming (LF)
- Neutron absorption testing, foil activation and detector response
- Parabolic flight experiments
- Powder metallurgy, vacuum hot pressing (VHP) and direct current sintering (DCS)
- Raman spectrometry
- Scanning electron microscopy (SEM)
- Seebeck coefficient (thermopower) measurement
- X-ray diffraction (XRD), lab-scale & high-energy synchrotron

Computer and programming

- Touch typist capable in LaTeXand Microsoft Word
- Programming languages: ActionScript, C/C++, Java, LabVIEW, MATLAB, Python
- Mathematics packages: Mathematica, Minitab
- CAD/FEM: Abaqus FEA, Autodesk Inventor
- Nuclear codes: MCNP, PHITS, SCALE/NEWT, SRIM/TRIM
- Materials packages: GRANTA EduPack, Thermo-Calc (including DICTRA and TC-Prisma)