

Joseph Brown Tipton, Jr.

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EDUCATION

Ph.D. in Mechanical Engineering :: August 2009
The University of Tennessee, Knoxville, TN
Dissertation: Unique Characteristics of Liquid Metal Extended Meniscus Evaporation

M.S. in Mechanical Engineering :: May 2006
The University of Tennessee, Knoxville, TN
Non-Thesis, Thermal Sciences Concentration, GPA 3.88 / 4.00

B.S. in Aerospace Engineering, University Honors Scholar :: August 2002
The University of Tennessee, Knoxville, TN
Magna Cum Laude Honors, GPA 3.73 / 4.00

WORK EXPERIENCE

6/2020 – Present *Oak Ridge National Laboratory* *Oak Ridge, TN*
SPALLATION NEUTRON SOURCE (SNS) SECOND TARGET STATION (STS)

- Engineering Analyst, STS Target Systems
- Researching fatigue failure modes for tantalum clad tungsten blocks subject to proton pulses.
- Using Abaqus® software to simulate dynamic thermostructural effects on target blocks.

2/2020 – 6/2020 *Boston Government Services* *Oak Ridge, TN*
CONSULTANT

- ORNL Material Plasma Exposure eXperiment (MPEX) High Heat-Flux Components
- Analyzed and designed cooling systems for the MPEX helicon launcher assembly.

1/2015 – 5/2020 *Lipscomb University* *Nashville, TN*
DEPARTMENT OF MECHANICAL ENGINEERING

- Associate Professor of Mechanical Engineering (1/2015 – 5/2020)
- Chair of Mechanical Engineering Department (8/2017 – 5/2020). Achievements included:
 - managed enrollment growth with fixed resources
 - managed budget for faculty development and student support
 - supervised faculty personal growth and development
 - established a diverse department advisory board with a focus toward student engagement
 - managed continuous improvement process including a new, hands-on FE exam preparation review for seniors
 - shepherded curriculum development to form a “design spine” throughout the ME curriculum

2010 – 2019 (*intermittent*) *Oak Ridge National Laboratory* *Oak Ridge, TN*

HIGHER EDUCATION RESEARCH EXPERIENCES (HERE) FOR FACULTY

- U.S. Department of Energy program to provide research opportunities and associated activities for higher education faculty.
- Performed design and simulation of thermofluid effects in the cooling of fusion reactor components (details listed below in Work Experience).

8/2009 – 12/2014 *University of Evansville* *Evansville, IN*

DEPARTMENT OF MECHANICAL AND CIVIL ENGINEERING

- Assistant Professor of Mechanical Engineering

1/1999 – 2/2000 *United Technologies Corp.* *W. Palm Beach, FL*

PRATT & WHITNEY MILITARY ENGINES & LIQUID SPACE PROPULSION

- Co-op student for three semesters during sophomore and junior years.
- Assisted engineers in the Rotor Lifting and Fracture Mechanics and Rocket Aerothermal Design groups.
- Awarded a Pratt & Whitney Appreciation Award for excellent work.

**RESEARCH
EXPERIENCE**

ORNL SPALLATION NEUTRON SOURCE (SNS) SECOND TARGET STATION (STS)

- Designing and analyzing fatigue effects on a tantalum clad tungsten targets under repeated proton pulses.

ORNL HERE SUMMER FACULTY RESEARCH PROGRAM

- Designed and analyzed water cooling concepts for the ORNL Material Plasma Exposure eXperiment (MPEX), combining both ANSYS Mechanical® and CFX®.
- Performed thermal-structural analysis of outboard diverter tile assemblies in support of the Princeton Plasma Physics Laboratory (PPPL) National Spherical Torus Experiment Upgrade (NSTX-U) using ANSYS Mechanical®.
- Designed and analyzed cooling effects on 140° miter bends for ITER high power electron cyclotron heating (ECH) transmission lines (TL) using ANSYS Mechanical® and CFX®.
- Simulated the Shattered Pellet Injection (SPI) concept for ITER Disruption Mitigation Systems using LS-DYNA® explicit finite element software.
- Performed a preliminary cooling design and analysis for a protective scraper element in the Wendelstein 7-X Stellarator in Greifswald, Germany. Modeled twisted tape heat transfer enhancement using ANSYS CFX®. Applied ASME V&V 20 framework for uncertainty characterization.
- Combined ANSYS CFX® with commercial optimization software (VR&D VisualDOC) through Python programming to pursue optimal cooling configurations for the Fusion Nuclear Science Facility (FNSF) Spherical Tokamak centerpost.
- Performed research on design of the Dual Cooled Lithium Lead (DCLL) Thermal Blanket Module (TBM) for an experimental fusion reactor to extract heat for power generation and to breed the hydrogen isotope tritium for fuel production. Used ANSYS CFX® to model helium gas coolant flow with rib roughened surfaces to enhance heat transfer.

MICRO-NANO SCALE FLUIDICS AND ENERGY TRANSPORT (MINSFET) LAB

- Past research dealt with experimental studies of nanofluid droplet evaporation using a microheater array as well as nanoparticle thermophoresis.
- Dissertation research focused on the understanding and numerical modeling (in FORTRAN) of high temperature, liquid metal, thin film evaporation.
- Research was funded in part by NASA and the Air Force Office of Research.

NASA REDUCED GRAVITY STUDENT FLIGHT OPPORTUNITY PROGRAM

- Served during 2001-2002 as project manager for an undergraduate two-phase flow, microgravity experiment that flew aboard NASA's KC-135 "Weightless Wonder."
- Accomplished research that simulated forced convection film boiling in microgravity and ascertained how static mixer geometries affected heat transfer to fluid.

PUBLICATIONS

REFEREED JOURNAL PUBLICATIONS:

Arnold Lumsdaine, Saikat Chakraborty Thakur, **Joseph Tipton**, Michael Simmonds, Juan F. Caneses Marin, Richard Goulding, Dean McGinnis, George Tynan, Juergen Rapp, and John Burnett, "Testing and analysis of steady-state helicon plasma source for the Material Plasma Exposure eXperiment (MPEX)," *Fusion Engineering and Design*, Vol. 160, 2020, 112001, doi: 10.1016/j.fusengdes.2020.112001

Arnold Lumsdaine, **Joseph B. Tipton Jr.**, Dennis Youchison, Venu Varma, Kirby Logan, and Juergen Rapp, "High Heat-Flux Target Design for the Materials Plasma Exposure eXperiment," *Fusion Science and Technology*, Vol. 75, 2019, pp. 674-682, doi: 10.1080/15361055.2019.1637239

Joseph B. Tipton Jr., Arnold Lumsdaine, Charles Schaich, and Gregory R. Hanson, "Design and Analysis of 140-Degree Miter Bend for High Power Electron Cyclotron Heating Transmission Lines," *Fusion Science and Technology*, Vol. 72, 2017, pp. 616-622, doi: 10.1080/15361055.2017.1350486

H. Yi, **J. Tipton**, K.D. Kihm, D.M. Pratt, A.D. Swanson, and S. Rawal, "Effect of Disjoining Pressure (II) on Multi-scale Modeling for Evaporative Liquid Metal (Na) Capillary," *International Journal of Heat and Mass Transfer*, Vol. 78, 2014, pp. 197-149, doi: 10.1016/j.ijheatmasstransfer.2014.06.042

A. Lumsdaine, J. Boscary, E. Clark, K. Ekici, J. Harris, D. McGinnis, J.D. Lore, A. Peacock, **J. Tipton**, and J. Tretter, "Modeling and Analysis of the W7-X High Heat-Flux Divertor Scraper Element," *IEEE Transactions on Plasma Science*, Vol. 42, 2014, pp. 545-551, doi: 10.1109/TPS.2014.2304695

J.D. Lore, T. Andreeva, J. Boscary, S. Bozhenkov, J. Geiger, J.H. Harris, H. Hoelbe, A. Lumsdaine, D. McGinnis, A. Peacock, and **J. Tipton**, "Design and Analysis of Divertor Scraper Elements for the W7-X Stellarator," *IEEE Transactions on Plasma Science*, Vol. 42, 2014, pp. 539-544, doi: 10.1109/TPS.2014.2303649

A. Lumsdaine, **J. Tipton**, J. Lore, D. McGinnis, J. Canik, J. Harris, A. Peacock, J. Boscary, J. Tretter, and T. Andreeva, "Design and Analysis of the W7-X Divertor Scraper Element," *Fusion Engineering and Design*, Vol. 88, 2013, pp. 1773-1777, doi: 10.1016/j.fusengdes.2013.05.075

Arnold Lumsdaine, **Joseph Tipton**, and Martin Peng. "Thermal Fluid Multiphysics Optimization of Spherical Tokamak Centerpost," *Fusion Engineering and Design*, Vol. 87, 2012, pp. 1190-1194, doi: 10.1016/j.fusengdes.2012.02.096

Joseph B. Tipton Jr., Kenneth D. Kihm, and David M. Pratt, "Modeling Alkaline Liquid Metal (Na) Evaporating Thin Films Using Both Retarded Dispersion and Electronic Force Components," *Journal of Heat Transfer*, Vol. 131, 2009, 121015 (9 pages), doi: 10.1115/1.4000022

Chanhee Chon, Sokwon Paik, **Joseph B. Tipton Jr.**, and Kenneth D. Kihm, “Effect of Nanoparticle Sizes and Number Densities on the Evaporation and Dryout Characteristics for Strongly Pinned Nanofluid Droplets,” *Langmuir*, Vol. 23, 2007, pp. 2953-2960, doi: 10.1021/la061661y (Experimental images from this research were selected as the journal cover page.)

C.H. Chon, S.W. Paik, **J.B. Tipton Jr.**, and K.D. Kihm, “Evaporation and Dryout of Nanofluid Droplets Heated by a Microheater Array,” *Journal of Heat Transfer*, Photo Gallery, Vol. 128, 2006, p. 735, doi: 10.1115/1.2221298

CONFERENCE PAPERS:

Joseph B. Tipton, Jr., "Opportunities for Faith & Learning Integration in a Mechanical Engineering Instrumentation & Measurement Course," Proceedings of the 2019 Christian Engineering Conference, 11-13 July 2019, Sioux Center, IA, pp. 22-33.

V. Naoumov, M. Parang, C. Shough, and **J. Tipton**, “Droplet Entrainment in Two-Phase Flow Under Reduced Gravity,” in *45th Aerospace Sciences Meeting and Exhibit, Reno, Nevada, 8-11 January 2007*, AIAA 2007-743, doi: 10.2514/6.2007-743

M. Parang, **J.B. Tipton**, and J.D. Garth, “Two-Phase Flow Heat Transfer Under Microgravity Condition,” in *41st Aerospace Sciences Meeting and Exhibit, Reno, Nevada, 6-9 January 2003*, AIAA 2003-1302, doi: 10.2514/6.2003-1302

CONFERENCE POSTERS & PRESENTATIONS:

Joseph B. Tipton Jr., Arnold Lumsdaine, Charles Schaich, and Gregory R. Hanson, “Design and Analysis of Miter Bends for High Power Electron Cyclotron Heating Transmission Lines,” Poster presented at the *22nd Topical Meeting on the Technology of Fusion Energy (TOFE)*, Philadelphia, PA, 21-25 August 2016.

Joseph B. Tipton Jr., “Faith and Learning Integration in a Mechanical Engineering Thermodynamics Course,” Presented at the *Christian Scholars’ Conference*, Nashville, TN, 8 June 2016.

J.D. Lore, T. Andreeva, J. Boscary, J.M. Canik, J. Geiger, J.H. Harris, A. Lumsdaine, D. McGinnis, A. Peacock, and **J. Tipton**, “Heat Flux and Design Calculations for the W7-X Divertor Scraper Element,” Presented at the *International Atomic Energy Agency (IAEA) 24th Fusion Energy Conference*, San Diego, CA, 8-13 October 2012.

Joseph B. Tipton, Jr., Arnold Lumsdaine, Jeffrey H. Harris, Alan Peacock, and Jean Boscary, “CFD Modeling of Twisted Tape Cooling for Fusion Reactor Components,” Presented at the *ASME Verification and Validation Symposium*, Las Vegas, Nevada, 2-4 May 2012.

J.D. Lore, J.M. Canik, J.H. Harris, **J. Tipton**, A. Lumsdaine, T. Andreeva, and J. Geiger, “Coupled Heat Flux and Heat Transfer Design Calculations for the W7-X Divertor Scraper Element,” Presented at the *18th International Stellarator/Heliotron Workshop & 10th Asia Pacific Plasma Theory Conference*, Canberra, Australia, 29 January – 3 February 2012.

Jeffrey Harris, Arnold Lumsdaine, John Canik, Jeremy Lore, Dean McGinnis, Alan Peacock, Fred Hurd, Jean Boscary, Joachim Geiger, and **Joseph Tipton**, “Design of Divertor Scraper Elements for the W7-X Stellarator,” Presented at the *53rd Annual Meeting of the APS Division of Plasma Physics*, Salt Lake City, UT, 14-18 November 2011.

A. Lumsdaine, **J. Tipton**, and M. Peng, "Thermal Fluid Multiphysics Optimization of Spherical Torus Centerpost," Poster presented at the *10th International Symposium on Fusion Nuclear Technology*, Portland, OR, 11-16 September 2011.

J. Tipton, A. Lumsdaine, E. Marriott, M. Sawan, M. Dagher, and C. Wong, "Thermal Transfer of Helium Cooled, Roughened Surfaces for Fusion Test Blanket." Poster presented at the *19th Topical Meeting on the Technology of Fusion Energy*, Las Vegas, NV, 7-11 November 2010.

A. Lumsdaine, **J. Tipton**, S. Sharafat, A. Ayoama, M. Dagher, E. Marriott, M. Sawan, C. Wong, and M. Ulrickson, "Thermomechanical Modeling of Blanket Systems," Presented at the *Fusion Nuclear Science and Technology Annual Meeting*, UCLA, 2-6 August 2010.

RESEARCH REPORTS (REFEREED):

J.B. Tipton, Jr., "Calculation for the Thermo-mechanical Design for the ITER ECH Waveguide 90-Degree Miter Bend Mirror - EXPORT CONTROL", *US ITER Technical Report US_D_22VMX3 v1.0*, May 2017.

J.B. Tipton, Jr., "Calculation for Thermo-mechanical Design for the ITER ECH Waveguide 140 Degree Miter Bend Mirror - EXPORT CONTROL", *US ITER Technical Report US_D_22TV8G v1.0*, March 2017.

J.B. Tipton, Jr., "Preliminary Calculation for the Thermo-mechanical Design for the ITER ECH Waveguide 140° Miter Bend Assembly", *US ITER Technical Report US_D_233A3A v1.0*, March 2016.

J. Tipton, and A. Lumsdaine, "Potential for Copper Corrosion in ITER Secondary Cooling System", *US ITER Technical Report 1050200-TD0002-R00*, July 2013.

TEACHING EXPERIENCE

ASSOCIATE PROFESSOR, LIPSCOMB UNIVERSITY

- One of four mechanical engineering faculty in a department of about 100 students.
- Taught courses across the Mechanical Engineering curriculum including: Introduction to Engineering, Dynamics, Computer Applications for Mechanical Engineers, Instrumentation & Measurement, Thermodynamics, Heat Transfer, Senior Capstone Design
- Awarded funding and advised 3 years of student competitions with the NASA Undergraduate Student Launch Initiative.
- Co-developed an Intro to Engineering course redesign centered around humanitarian engineering.

ASSISTANT PROFESSOR, UNIVERSITY OF EVANSVILLE

- Taught courses across the Mechanical Engineering curriculum including: Intro to Engineering, Dynamics, Numerical Methods, Thermofluids Lab, Thermodynamics, Heat Transfer, Instrumentation & Measurement, Advanced Fluid Mechanics.
- Participated in Spring 2013 ASEE *Virtual Community of Practice* to enhance undergraduate thermodynamics teaching using cognitive science and education theory.
- Advised over 9 hands-on, design/build/test projects that were integrated with under- and upper-classmen.

TEACHING ASSISTANT FOR FRESHMAN HONORS ENGINEERING**FUNDAMENTALS**

- UTK Fall 2008, Spring 2009
- Program included 70 honors students and included lectures, problem sessions, and team directed “design, build and test” projects.
- Duties included directing hands-on problem working sessions, grading homework, special instruction on team projects, and participation in the advising process.

INSTRUCTOR FOR INSTRUMENTATION & MEASUREMENT (AE/ME 345)

- UTK Summer 2004, Fall 2004, Spring 2005, Summer 2005, Summer 2008
- Independently taught a junior-level course for five semesters total with classes ranging in size from twelve to fifty students. Lectures focused on experimental measurement techniques and statistics for engineers.

LAB INSTRUCTOR FOR INSTRUMENTATION & MEASUREMENT (AE/ME 345)

- UTK Fall 2003, Spring 2004, Summer 2008
- Taught for three semesters total with classes of twelve students.
- Directed students in experiments including thermometry, flow measurement, statistical uncertainty, digital data collection, electronic filtering, first and second order systems, and strain measurement.

FUNDING & GRANTS**PROVOST’S FACULTY SUMMER GRANT, *LIPSCOMB UNIVERSITY***

- June-August 2019: \$8,865
- One of 5-6 grants awarded each summer "to encourage active attempts at professional growth on the part of the faculty."

TENNESSEE SPACE GRANT CONSORTIUM

- 2020-2024: \$84,000 (*projected*)
- 2019-2020: \$15,000
- 2017-2019: \$29,000
- National Space Grant College and Fellowship Program (SPACE Grant) Training Grant
- Used to support aerospace opportunities for undergraduate students including the NASA Undergraduate Student Launch Initiative and undergraduate CFD research.

HONORS & AWARDS

Lipscomb College of Engineering Inaugural Dean’s Award	2019
Lipscomb Overall Scholar Designation	2017, 2018
UE Dean’s Outstanding Teacher Award	2014
UT College of Engineering Fellowship	2005-2007
Tennessee Space Grant Consortium Scholarship.....	2000-2002, 2004
UT MABE Outstanding Senior Award.....	2002
UT Christian Student Center, <i>President</i>	2000-2001
UT Marching Band, <i>Tuba</i>	1997-1998, 2000
National Merit Scholarship	1997-2002
UT Bicentennial Scholarship	1997-2002
Boy Scouts of America Eagle Award	1997

SOCIETY MEMBERSHIPS

Registered Engineer Intern (EIT), *State of Tennessee*
 Tau Beta Pi Engineering Honor Society (TBPI)
 Sigma Gamma Tau Aerospace Engineering Honor Society (Σ GT)
 American Society of Mechanical Engineers (ASME)
 American Nuclear Society (ANS)

CONTINUING EDUCATION

- **Python for Data Science and Machine Learning Bootcamp**, Nov 2019, Udemy, Credential ID UC-Q7YB87NE.
- **Introduction to Engineering for Global Development**, 27 June 2017, *IEEE Educational Activities Certificates*, 1 CEU/10 PDH.
- **Thermodynamics Virtual Community of Practice**, Spring 2013, *American Society for Engineering Education (ASEE)*: Participated in a "Virtual Community of Practice" to enhance undergraduate thermodynamics teaching using best practices in cognitive science and education theory. Faculty from about 26 colleges and universities were selected to attend and collaborate on weekly virtual meetings throughout the Spring 2013 semester.
- **Spanish Language Immersion**, 27 February 2003, *Instituto de Lengua Española, San José, Costa Rica*, Certificate of completion of 300 hours of classes in Spanish as a second language.

SERVICE

- **Little Hands Big Hearts (LHBH)**, 2020-present: Elected to the Board of Directors for this 501c(3) nonprofit that supports the *Manos Chicas, Corazones Grandes* NGO in Trujillo, Honduras. LHBH runs a preschool and health programs for special needs children and their families.
- **Therapeutic Playground Project**, 2015-2019: Represented Lipscomb University in part of a 3 year project to plan, prepare, and construct a therapeutic playground park specifically for disabled and special needs children at the Little Hands, Big Hearts ministry in Trujillo, Honduras. Led engineering construction trips to Trujillo over several years. Transformed "Introduction to Engineering" freshman lab course in 2017 to focus on human-centered design process through Engineers for Change (E4C) to design therapy equipment for the playground.
- **Council for Undergraduate Research (CUR)**, 2018-2020: Elected twice as an Engineering Division Councilor. Participated in annual business meetings. Served on various subcommittees and review panels for student work.
- **UE Engineering Explorers Post**, 2012-2014: Co-led a program from the Learning for Life Corporation and Boy Scouts of America. The program was open to local high school students and met on Monday nights every third week. We offered hands-on activities that introduced the students to career options in engineering.
- **Dominican Republic Solar Thermal Hot Water Senior Design**, 2009-2010: Served as a faculty advisor to a group of UE students who designed and installed a solar hot water heater at a NGO in Santiago, Dominican Republic.
- **High School Introduction to Engineering Systems (HITES) Program**, July 2008: Developed and taught a hands-on introduction to engineering course to minority students for the UT College of Engineering Diversity Program.
- **Mechanical Engineering Senior Capstone Design**, 2004-2006: Initiated research in microgravity two-phase flow droplet entrainment and advised student teams in their senior capstone design for the NASA Reduced Gravity Student Flight Opportunity Program.
- **Baxter Bible College, Tegucigalpa, Honduras**, 2003: Volunteered with several community service organizations during the spring and summer semesters of 2003.