

# Joseph Brown Tipton, Jr.

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## EDUCATION

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

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

**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

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1/2015 – present                      Lipscomb University                      Nashville, TN

### **DEPARTMENT OF MECHANICAL ENGINEERING**

- Associate Professor of Mechanical Engineering
- Chair of Mechanical Engineering Department as of 8/2017. Responsibilities are to:
  - plan, manage, and supervise the curriculum development and review process,
  - supervise and control all business and curricular affairs of the department,
  - manage and monitor quality and continuous improvement in the department,
  - preside over departmental meetings,
  - manage the human resource function for the department,
  - manage and monitor the student advising process for all declared majors.

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.

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

### **DEPARTMENT OF MECHANICAL AND CIVIL ENGINEERING**

- Assistant Professor of Mechanical Engineering

8/2008 – 5/2009                      University of Tennessee                      Knoxville, TN

### **JERRY E. STONEKING ENGAGE ENGINEERING FUNDAMENTALS PROGRAM**

- Recognized by the National Science Foundation as one of the best and most innovative engineering education programs in the nation.
- Employed as Graduate Teaching Assistant with the University Honors Section.

- 8/2003 – 8/2008                      University of Tennessee                      Knoxville, TN  
**DEPARTMENT OF MECHANICAL, AEROSPACE, AND BIOMEDICAL ENGINEERING**
- Graduate Research Assistant in the Micro-Nano Scale Fluidics and Energy Transport (MINSFET) Laboratory.
  - Graduate Teaching Assistant for junior level instrumentation and measurement course.

- 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**

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### **ORNL HERE SUMMER FACULTY RESEARCH PROGRAM**

- 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<sup>®</sup> to model helium gas coolant flow with rib roughened surfaces to enhance heat transfer.
- Combined ANSYS CFX<sup>®</sup> with commercial optimization software (VR&D VisualDOC) to pursue optimal cooling configurations for the Fusion Nuclear Science Facility (FNSF) Spherical Tokamak centerpost.
- 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<sup>®</sup>.
- Simulated the Shattered Pellet Injection (SPI) concept for ITER Disruption Mitigation Systems using LS-DYNA<sup>®</sup> explicit finite element software.
- Designed and analyzed cooling effects on 140° miter bends for ITER high power electron cyclotron heating (ECH) transmission lines (TL).
- 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).
- Designed and analyzed water cooling concepts for the ORNL Material Plasma Exposure eXperiment (MPEX).

### **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 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**

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### **Refereed Journal Publications:**

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. 0, 2019, pp. 1-9, 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 *22<sup>nd</sup> 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) 24<sup>th</sup> 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 *10<sup>th</sup> 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**

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**ASSOCIATE PROFESSOR, LIPSCOMB UNIVERSITY**

- One of four mechanical engineering faculty in a department of about 100 students.
- Teaching courses across the Mechanical Engineering curriculum including: Introduction to Engineering, Dynamics, Computer Applications for Mechanical Engineers, Instrumentation & Measurement, Thermodynamics, Heat Transfer, Senior Capstone Design

**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 includes 70 honors students and comprises lectures, problem sessions, and team directed “design, build and test” projects.
- Duties include directing hands-on problem sessions that apply engineering principles learned in lecture, 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**

- 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 ([www.LUBisonBallistics.com](http://www.LUBisonBallistics.com)) and undergraduate CFD research.

**HONORS & AWARDS**


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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**


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Registered Engineer Intern (EIT), *State of Tennessee*  
 Tau Beta Pi Engineering Honor Society (TBPI)  
 Sigma Gamma Tau Aerospace Engineering Honor Society ( $\Sigma$ GT)  
 American Society of Mechanical Engineers (ASME)  
 American Society for Engineering Education (ASEE)  
 American Nuclear Society (ANS)  
 Council for Undergraduate Research (CUR), *Engineering Division Councilor*

## **SERVICE**

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- **Therapeutic Playground Project**, 2015-Present: Representing 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. Leading annual engineering mission trips to Trujillo. 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.
- **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 Christian ministries and community service organizations in and around Tegucigalpa, Honduras during the spring and summer semesters of 2003.

## **CONTINUING EDUCATION**

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- **Protecting Human Research Participants**, 28 June 2017, *National Institutes of Health (NIH) Office of Extramural Research*, Certification Number 2442079.
- **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.