

Caleb Amy

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Mission: to improve our tools so we can sustainably thrive

EDUCATION

2018-2020 (expected)



Massachusetts Institute of Technology

Ph.D. Candidate in Mechanical Engineering (GPA 5.00 (4.00))

Thesis Advisor: Asegun Henry

Research Area: Modeling and experimentation of extreme temperature liquid metal heat transfer systems for cost-competitive, sustainable energy conversion and storage

Courses: Economics and Regulation of Electricity, Energy Conversion, Sustainability, Fluids, Thermodynamics, Instrumentation, & Measurements

2015-2017



Georgia Institute of Technology

M.S. in Mechanical Engineering (GPA 4.00)

Thesis Advisor: Asegun Henry

Master's Thesis: Liquid Metal Pumps for Enabling Heat Transfer at Extreme Temperatures

2011-2015



University of Central Florida

BSME in Mechanical Engineering (GPA 4.00) (GRE Math 168 of 170)

Advisor: Subith Vasu

Research: Instrumentation for high temperature biofuel characterization

Projects: Led senior design team to develop efficient, compact electric vehicle with 50-mile range at 50mph on 1.5kWh of energy. Led two design teams that placed 2nd and 3rd of 200+ teams in engineering competitions

2007-2011

William R. Boone High School (GPA 4.00) (SAT Math 800 of 800)

PROFESSIONAL EXPERIENCE

2018-



Massachusetts Institute of Technology: Graduate Research Assistant

Research topics include: Techno-economic design and experimentation of thermal energy grid storage (TEGS) technology to compete with batteries and enable high penetration of intermittent sustainable energy; design of pumps, joints, seals, and heaters for liquid metal heat transfer at up to 2,400 °C. Led technical design and execution of \$1.5M lab build. Patents pending.

2015-2017



Georgia Institute of Technology: Graduate Research Assistant

Research topics include: Design of pumps, flow meters, joints, seals, and heaters for liquid metal heat transfer at up to 1,500 °C; fabrication and testing of high temperature concentrated solar receiver. Primary focus was the design, fabrication, and testing of a ceramic pump including thermal isolation and alignment. Led \$350K lab experiments. Patents pending.

2014-2015



Siemens Energy: Engineering Intern

Design of preliminary concepts for gas turbine components including modeling and documentation of casing components and 2D whole engine design tools. Aided in root cause analysis and managed instrumentation documentation to understand and resolve critical field issue.

2012-2013



University of Central Florida: Undergraduate Research Assistant

Research: Designed and fabricated/procured 700°C, 50 atm capable spherical vessel with instrumentation, pneumatics, and optics for biofuel characterization at realistic conditions. The custom vessel included a heating oven, optical and pneumatic ports, and supporting electronics within \$25K budget. Researched shock tube non-ideal diaphragm rupture.



2012-2013

Lockheed Martin/CWEP: Designer and Fabrication Technician
Designed, documented, and/or fabricated more than 100 tools to test electro-optical targeting and navigation systems for fixed wing aircraft. Designed thermal isolation cases to protect electronics in extreme environments. Designed and fabricated portable mechanical and thermal system to house large (>100 kW) simulated motor load electronics.

2010

Custom Fab: Accounting Intern. Received mail, processed and paid liabilities, and generated financial reports.







SKILLS





- Leadership
- Self-motivation
- Event Management
- Communication
- Modelling and Simulation in MATLAB, COMSOL, ANSYS, EES, and Excel
- NI Certified LabVIEW Associate Developer: measurement and control
- Modelling and documentation for manufacturing in SOLIDWORKS/CREO
- Fabrication of mechanical, thermal, and electrical systems including milling, lathing, water jetting, welding, cutting, soldering, and troubleshooting
- Heat Transfer
- Thermodynamics
- Material Science
- Procurement

AWARDS



- 2017 Georgia Tech Faces of Inclusive Excellence from Institute Diversity 
- 2017 Guinness World Record: Highest operating temperature liquid pump 
- 2015 ASME Charles T. Main Student Leadership Silver Award 
- 2015 NCEES Engineer in Training (EIT)  **NCEES**
- 2013-2016 ASME Foundation Scholarship (\$33,000) 
- 2015-2017 Georgia Tech President's Fellowship (\$16,500) 
- 2011-2015 University of Central Florida Provost Scholarship (\$20,000) 
- 2011-2017 Other scholarships including Walt Disney World Co. Design & Engineering, Frank Hubbard Endowed, Progress Energy, and Marjorie Roy Rothermel Scholarship totaling over \$30,000

Service

- 2019-2020 MIT Energy Conference Deputy Finance Director: oversee \$200K budget, strategy and execution of ticket sales, and sponsors. 
- 2017-2021 Director of ASME Human Powered Vehicle Challenge (HPVC): Lead the planning and execution of annual student-built bike race and conference 
- 2017 President of Energy Club at Georgia Tech: arranged weekly chats on various energy topics and secured funding. 
- 2016 Panelist of ASME Technology Advisory Panel: a global group of 20 selecting key technologies. 
- 2016-2017 Chair of Energy Expo Panel on trends in sustainable energy: selected and secured panel of 5 experts in key energy challenges including storage. 
- 2015-2017 Mentor to ten Georgia Tech undergraduate students and five Atlanta area high school students, encouraging advanced work in STEM and teaching engineering, fabrication, and career planning. 

- 2014 Chair of ASME Human Powered Vehicle Challenge (HPVC): 3-day student built bike race and conference with 400 attendees from 40 universities, \$11,000 budget 
- 2013-2015 Mentor to six incoming Provost Scholars (top students) at the University of Central Florida 
- 2012-2015 Student Chair of ASME Southeast (highest global student position): communicated opportunities across in 11 states (and Vice Chair) 
- 2011-2014 President of ASME Student Section with more than 200 members, \$15,000 budget (and Treasurer, competitor, and member) 
- 2010 Founding President of Engineering Club at Boone High School

Interests

- 2013- Travel: explored 35 countries on 6 continents. Typically hiking, overlanding, paddling, sailing, biking, or other outdoor activities. 
- 2005- DIY projects: miniature electric vehicles for human transport, 3D printing, electrical projects involving batteries and solar panels, and wood working. 

JOURNAL PUBLICATIONS:

1. Amy, C., Budenstein, D., Bagepalli, M., England, D., DeAngelis, F., Wilk, G., Jarrett, C., Kelsall, C., Hirschey, J., Wen, H., Chavan, A., Gilleland, B., Yuan, C., Chueh, W.C., Sandhage, K.H., Kawajiri, Y., Henry, A., 2017. Pumping liquid metal at high temperatures up to 1,673 kelvin. *Nature* 550, 199-203. <http://dx.doi.org/10.1038/nature24054>
2. Amy, C., Seyf, H.R., Steiner, M.A., Friedman, D.J., Henry, A., 2019. Thermal energy grid storage using multi-junction photovoltaics. *Energy & Environmental Science*. <http://dx.doi.org/10.1039/C8EE02341G>

INVITED BOOK CHAPTERS:

1. Amy, C., Kelsall, C.C., LaPotin, A., Pishahang, M., Henry, A., 2020. Ultra High Temperature Sensible Thermal Storage and Heat Transfer Fluids, in: Datas, A. (Ed.), *Ultra-High Temperature Energy Storage, Transfer and Conversion*. Elsevier, In Review.

CONFERENCE PRESENTATIONS:

1. Amy, C., Kelsall, C.C., Pishahang, M., Tan, X., Barari, B., Zhu, Q., Henry, A., 2019. Pumps to Enable Efficient High Temperature Heat Transfer, The Second Pacific Rim Thermal Engineering Conference, Maui, Hawaii, USA.
2. Amy, C., Kelsall, C.C., Pishahang, M., Henry, A., 2019. Thermal Energy Grid Storage (TEGS) Using Multi-Junction Photovoltaics (MPV) "Sun-in-a-Box", Joint Poster Session of ASME Energy Sustainability Conference and ASME Summer Heat Transfer Conference, Bellevue WA USA.
3. Amy, C., Kelsall, C.C., Pishahang, M., Henry, A., 2019. Thermal Energy Grid Storage (TEGS) Using Multi-Junction Photovoltaics (MPV) "Sun-in-a-Box": Techno-economics, Liquid Containment, and Pumping, ASME Summer Heat Transfer Conference, Bellevue WA USA.
4. Amy, C., Kelsall, C.C., Pishahang, M., Henry, A., 2019. Thermal Energy Grid Storage (TEGS) Using Multi-Junction Photovoltaics (MPV) "Sun-in-a-Box": Techno-economics, Liquid Containment, and Pumping, ASME Energy Sustainability Conference, Bellevue WA USA.
5. Amy, C., Henry, A., Pumping Liquid Metal at Extreme Temperatures. ASME Summer Heat Transfer Conference, 2017. Bellevue WA USA