Sean Bozkurt Ballinger

Cambridge, MA

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LINKS

- Personal website: sball.in
- LinkedIn: linkedin.com/in/**seanballinger**
- GitHub: github.com/**sballin**

EDUCATION

Massachusetts Institute of Technology Cambridge, MA *May 2022*
PhD in Applied Plasma Physics, department of Nuclear Science and Engineering
GPA: 4.8/5

Columbia University New York, NY *May 2016*
B.S. in Applied Physics with minor in Computer Science
Overall GPA: 3.72/4, Major GPA: 3.76/4
Dean's List 2012–2016

Phillips Academy Andover, MA *June 2012*
Honor Roll 2008–2012

WORK AND RESEARCH EXPERIENCE

MIT Plasma Science and Fusion Center September 2016 – May 2022
PhD Candidate, Research Assistant, Teaching Assistant *Cambridge, MA*

- Tokamak plasma edge simulations: used the UEDGE code to simulate conditions in the SPARC tokamak design and developed an automated pipeline to simulate past experiments in MIT's Alcator C-Mod tokamak for deeper analysis
- Collaboration with W7-X stellarator experiment in Greifswald, Germany: developed an FPGA controller for a gas puff system and analyzed data from thousands of experiments to understand a 1-2 kHz oscillation in the edge of the plasma
- Teaching Assistant for Introduction to Electronics
- Grader for Introduction to Plasma Physics

MIT Plasma Science and Fusion Center May – August 2015
Research Assistant funded by the Columbia University Egleston Scholarship *Cambridge, MA*

- Operated a high-speed camera imaging plasma turbulence in the X-point region
- Created tools in Python to subtract video background, filter image data, and perform Fourier, bicoherence, and correlation analysis
- Gave a Contributed Talk, "Fast Imaging of X-point Turbulence in Alcator C-Mod," at the American Physical Society Division of Plasma Physics (APS-DPP) 2015 conference

General Atomics DIII-D

U.S. Department of Energy National Undergraduate Fellow

June – August 2014

San Diego, CA

- Added a feedback plasma control system to a Matlab simulation of the KSTAR tokamak
- Automated the tuning of PID controller gain settings for plasma control systems
- Poster on "Optimizing Plasma Control in Superconducting Tokamaks" received the Outstanding Undergraduate Poster Award at the APS-DPP 2014 conference

Columbia Plasma Physics Laboratory

Undergraduate Research Assistant

January 2013 – Present

New York, NY

- Machined and assembled parts of a capacitor bank power supply for a magnetic coil
- Created a code in Python to reconstruct the plasma current in the High-Beta Tokamak experiment from magnetic sensor data and eddy current eigenmodes

NASA Ames Research Center

Intern funded by New York Space Grant

June – August 2013

Moffett Field, CA

- Created fluid simulations of the D8 "Double Bubble" aircraft concept
- Validated the new Launch Ascent and Vehicle Aerodynamics fluid code with wind tunnel simulations
- Used Star-CCM+, Pointwise, and Overflow; ran simulations on NASA's Pleiades supercomputer
- Wrote a 10-page report and gave a closing talk to the department

Stony Brook University MRSEC

High school Research Assistant

June – August 2011

Stony Brook, NY

- Characterized the effect of a gold nanoparticle catalyst for hydrogen fuel cell stacks
- Named a semifinalist in the 2011 Intel Science Talent Search competition

AWARDS

- National Science Foundation Graduate Research Fellowship Honorable Mention, 2016
- APS-DPP Outstanding Undergraduate Poster Award, 2014
- Robert Gross Scholarship in Applied Physics, 2014–16
- NASA Aeronautics Scholarship Undergraduate Awardee, 2013–15
- Columbia University Egleston Research Scholar, 2012–16
- Intel Science Talent Search Semifinalist, 2012
- National Merit Scholarship Finalist, 2012
- Massachusetts Regional Science Bowl Semifinalist, 2012

COURSEWORK AND SKILLS

Physics, Mathematics	Statistics, ODEs, PDEs, Plasma Physics, Applied Electrodynamics, Thermodynamics, Mechanics, Electrical Engineering, Linear Algebra, Cryptography, Quantum Mechanics
Computer Science	Advanced Programming (C, C++), Data Structures, Computer Science Theory, Machine Learning
Programming	Python, C, C++, Objective-C, AppleScript, Java, JavaScript, Bash, LaTeX, HTML, CSS
Software	Matlab, Mathematica, Autodesk Inventor, Xilinx Vivado
Hardware	Arduino, Raspberry Pi

LANGUAGES

Speak, Read, Write	English, French, Italian, Spanish, German
Speak, Read	Turkish

LEADERSHIP

- **MIT Plasma Science and Fusion Center:** tour guide, presenter, new student orientation (2017–2022)
- **MIT Edgerton House:** officer and webmaster (2017–2020)
- **Columbia Undergraduate Science Journal:** Editor in Chief (2015–16), Associate Editor (2012–15)

PUBLICATIONS

First author publications

[1] S. B. Ballinger *et al.*, "Fast camera imaging of plasmas in Alcator C-Mod and W7-X," *Nuclear Materials and Energy*, 2018.

[2] S. B. Ballinger *et al.*, "Dynamics and dependencies of the configuration-dependent 1–2 kHz fluctuation in W7-X," *Nuclear Materials and Energy*, vol. 27, p. 100 967, 2021.

[3] S. B. Ballinger *et al.*, "Simulation of the SPARC plasma boundary with the UEDGE code," *Nuclear Fusion*, 2021.

[4] S. Ballinger *et al.*, "Dependence of the boundary heat flux width on core and edge profiles in Alcator C-Mod," *Nuclear Fusion*, vol. 62, no. 7, p. 076 020, 2022.

[5] S. B. Ballinger, "Modeling of Boundary Transport and Divertor Target Heat Flux - Implications for Advanced Divertor Concepts," 2022.

Co-author publications

[1] J. L. Terry *et al.*, "Fast imaging of filaments in the X-point region of Alcator C-Mod," *Nuclear Materials and Energy*, Proceedings of the 22nd International Conference on Plasma Surface Interactions 2016, 22nd PSI, vol. 12, pp. 989–993, 2017.

[2] T. Klinger *et al.*, "Overview of first Wendelstein 7-X high-performance operation," *Nuclear Fusion*, vol. 59, no. 11, 2019.

[3] R. A. Tinguely *et al.*, "Neutron diagnostics for the physics of a high-field, compact, Q≥1 tokamak," *Fusion Engineering and Design*, vol. 143, pp. 212–225, 2019.

[4] A. J. Creely *et al.*, "Design study of a combined interferometer and polarimeter for a high-field, compact tokamak," *Physics of Plasmas*, vol. 27, no. 4, p. 042 516, 2020.

[5] A. J. Creely *et al.*, "Overview of the SPARC tokamak," *Journal of Plasma Physics*, vol. 86, no. 5, 2020.

[6] A. Q. Kuang *et al.*, "Divertor heat flux challenge and mitigation in SPARC," *Journal of Plasma Physics*, vol. 86, no. 5, p. 865 860 505, 2020.

[7] P. Rodriguez-Fernandez *et al.*, "Overview of the SPARC physics basis towards the exploration of burning-plasma regimes in high-field, compact tokamaks," *Nuclear Fusion*, vol. 62, no. 4, p. 042 003, 2022.