

# MATTHEW SOLOMON FELDMAN

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## EDUCATION

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### Princeton University

Ph.D., Mechanical and Aerospace Engineering

(expected) January 2017

M.A., Mechanical and Aerospace Engineering

2012

Advisor: Prof. Edgar Y. Choueiri

### California Institute of Technology

B.S., with Honors, Mechanical Engineering

2009

## RESEARCH

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Electric Propulsion and Plasma Dynamics Lab, Prof. Edgar Y. Choueiri

Princeton University

### Plasma-Antenna Momentum Coupling in a Direct Wave-Drive Thruster 2013 - present

- Analytically determined coupling between the wave-launching antenna and the plasma via Maxwell's equations and derived the general scaling laws for thrust and efficiency.
- Designed the first Direct Wave-Drive Thruster Proof-of-Concept experiment to take measurements using a diagnostic suit including a retarding potential analyzer, emissive probe, multiple Langmuir probes, and a torsion thrust stand.

### Particle Dynamics in the Magnetic Null Thruster 2012 - 2013

- Utilized a professional Particle-in-Cell code (LSP) to model ambipolar plasma motion across magnetic field lines and in the presence of a magnetic reversal.
- Derived single particle orbits for electron motion in a non-ideal magnetic reversal.

### Single-Stage Faraday Accelerator with Radio-frequency Assisted Discharge 2010 - 2011

- Designed a RF matching network and choke to allow pulsed high-power capacitive discharges and a RF plasma source signal to operate off a single antenna.

## TEACHING

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### Graduate Mentor

2012 - 2015

Electric Propulsion and Plasma Dynamics Lab

Princeton University

- Directed undergraduate summer interns and research assistants in laboratory and computational work.
- Advised undergraduate senior thesis
- Trained undergraduate assistants in experimental and diagnostic systems

### Assistant in Instruction

2011 - 2015

Thermodynamics (2013, 2014, 2015)

Integrated Engineering Science Laboratory (2012)

Thermodynamics Laboratory (2011)

Princeton University

- Prepared weekly precepts, graded problem sets and exams, and held office hours and review sessions.
- Assisted students in a thermodynamics, fluid mechanics, and electronic laboratory work.

### AP Tutor

2009 - 2010

H-Bar Tutoring

Pasadena, CA

- Professional tutor for high school AP students in Chemistry, Physics, and Calculus

- Designed weekly plans, including topics of study and practice problems, for student AP practice in one-on-one teaching sessions

**Teaching Assistant**

2007 - 2009

Engineering Design Laboratory  
Thermodynamics

California Institute of Technology

- Advised students in mechanical design decisions and provided hands-on assistance in mechanical design and fabrication.

**WORK EXPERIENCE**

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**Marketing**

2009 - 2010

H-Bar Tutoring

Pasadena, CA

- Established contacts with local schools' college counselors and newspapers to advertise tutoring services.

**Engineering Intern**

2007

Desktop Factory

Pasadena, CA

- Tested rapid-prototyping machine performance to determine working parameters and tolerances
- Developed method to improve finish of prototyped part by testing the effects of various potential interfaces to the support structure.
- Localized anomalies in prototype machine and eliminated the cause.

**ADDITIONAL TECHNICAL EXPERIENCE**

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**Instrumentation**

plasma diagnostics (Langmuir, emissive, and Mach probes, retarding potential analyzer), radio-frequency power matching and electronics, vacuum systems

**Computers**

Mathematica, MatLab, LabView, LSP Suite (particle-in-cell plasma code), Python, C, Microsoft Office, SolidWorks, POVRay (3d graphics code)

**PUBLICATIONS**

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- Feldman, M.S. and Choueiri, E.Y., "Thrust Scaling in a Direct Wave-Drive Thruster," 52nd AIAA Joint Propulsion Conference, AIAA-2016-4948, Salt Lake City, UT, 2016.
- Feldman, M.S. and Choueiri, E.Y., "Ion Energy Measurements in a Direct Wave-Drive Thruster," 51st AIAA Joint Propulsion Conference, AIAA-2015-3726, Orlando, FL, 2015.
- Feldman, M.S. and Choueiri, E.Y., "A Direct Wave-Drive Thruster using the Magnetosonic Mode," 34th International Electric Propulsion Conference, IEPC-2015-115, Kobe, Japan, 2015.
- Feldman, M.S. and Choueiri, E.Y., "The Direct Wave-Drive Thruster," 50th AIAA Joint Propulsion Conference, AIAA-2014-4025, Cleveland, OH, 2014.
- Feldman, M.S. and Choueiri, E.Y., "Proof of Concept Simulations of the Magnetic Null (MagNul) Thruster," 49th AIAA Joint Propulsion Conference, AIAA-2013-2882, San Jose, CA, 2013.
- Feldman, M.S. and Choueiri, E.Y., "Electron Dynamics in a Beating Electrostatic Wave magnetic Null Thruster," 48th AIAA Joint Propulsion Conference, AIAA-2012-4193, Atlanta, GA, 2012.
- Feldman, M.S. and Choueiri, E.Y., "Single Stage Faraday Accelerator with Radio-frequency Assisted Discharge," 32nd International Electric Propulsion Conference, IEPC-2011-220, Wiesbaden, Germany, 2011.

**AWARDS AND MEMBERSHIPS**

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- Jet Propulsion Laboratory Research Poster Award (2015)
- Caltech's ME72 Mechanical Design Competition Winner (2008)
- American Institute for Aeronautics and Astronautics - Student Member