HENRY ESHBAUGH

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SKILLS

- **Electronics:** Design for spaceflight. Analogue, digital, mixed-signal design. Calibration (characterisation of nonlinearity, frequency response, thermal variation). Schematic capture & layout: KiCAD, Altium, OrCAD. Fine-pitch SMD soldering and rework. Simulation (PSpice, LTSpice). High-speed design. Power systems design. FPGA programming. Inspection of PCBs to IPC-600-A and ECSS-Q-ST-70-08 and -12 specifications and handling to JESD625. MCAD integration. Precision DC measurement techniques. Reverse engineering of circuits with lost schematics.

- **Computing:** High-performance computing. Linux system administration. Data structures; compiler theory; networks; operating systems; bootloaders. Firmware. **Languages:** C(++), Python, Julia, MATLAB, Haskell, F#, OpenCL, Common Lisp/Scheme, Java, Bash, Assembly (x86, AVR, ARMv7).

- **Theoretical:** Wavelets and digital signal processing; optimisation; probability and stochastic processes.

RESEARCH INTERESTS

High-performance instrumentation and measurement, especially for space science applications. Leveraging of modern signal theory techniques to improve instrument performance and data analysis techniques. Instrument miniaturisation and power consumption optimisation. Energetic particles; radiation; magnetometry.

PUBLICATIONS AND CONFERENCE PRESENTATIONS

- J.P. Eastwood, P. Brown, **H. Eshbaugh**, A. Hirn, G. Marosy, D. Milankovich, P. Nemeth, D. Nolbert, T. Oddy, C. Palla, M. Tokarz, B. Zabori. *Space weather monitoring with the RADCUBE CubeSat.* Upcoming (solicited to publish by journal editors); coauthors alphabetical.

- C. Palla, J.P. Eastwood, P. Brown, **H. Eshbaugh**, T. Oddy. (2019). *Implementation of RadMag instrument package for space weather monitoring on RADCUBE mission.*

- C. Palla, P. Brown, **H. Eshbaugh**, T. Oddy, J. P. Eastwood, B. Zabori, D. Nolbert, G. Marosy. *Low resource magnetometer for space weather applications and implementation on RadCube.* In: European Space Weather Week, 2018.

- C. Palla, P. Brown, **H. Eshbaugh**, T. Oddy, J. P. Eastwood. *MAGIC: a miniaturised magnetometer for space weather monitoring with CubeSats.* In: Open Source CubeSat Workshop. 2018.

- C. Palla, P. Brown, **H. Eshbaugh**, T. Oddy, J. P. Eastwood, B. Zabori, D. Nolbert, G. Marosy. *MAGIC on RadCube: design and development of a miniaturised magnetometer for space weather monitoring.* In: European Cubesat Symposium. 2018.

EDUCATION

Imperial College London   *October 2015 - June 2019*
MEng & ACGI Electrical and Electronic Engineering
Department of Electrical and Electronic Engineering
Upper-second class honours.

Thesis: Digital anisotropic magnetoresistive magnetometry for space science applications. Earned the Student Centenary Award for Outstanding Project. Used techniques from compressive sensing to leverage sparsity of AMR flip signals to obtain massively-averaged field readings, improving sensitivity of space industry-standard AMR magnetometers by a factor of 100.

WORK EXPERIENCE

Space Magnetometer Laboratory, Imperial College London   July 2016 – November 2019
Instrument Engineer

· Began as undergraduate researcher working on the JUICE J-MAG fluxgate magnetometer, including real-time test data visualisation and electronics design of the instrument control unit simulator exported to co-investigator universities. Made additional contributions to Solar Orbiter.
· Electronics lead on the RadCube-MAGIC magnetometer, 2017 – 2019. Reported to senior instrument manager and principal investigator of the instrument. Responsible for electronics design and magnetometric test campaign, including schematic capture, parts kitting, PCB layout, EGSE development, performance profiling, and product/quality assurance compliant to ECSS & IPC specifications. The magnetometer obtains ¡1nT resolution at $\pm 65,000$ nT full range at 10 vectors/second, and will be the lowest power scientific magnetometer in orbit at ≈ 650 mW draw from the spacecraft.

Living Observatory Project, Tidmarsh Farms   November 2012 – August 2015
Intern

· Intern / junior research assistant for an ecological restoration project and hotbed of research activity.
· Acknowledged in Danielle Hare's master's thesis, "Hydrogeological control on spatial patterns of groundwater seepage in peatland," published in 2015.
· Duties included laying fiber-optic cable for OFDR distributed temperature sensing in streams (related to Hare's thesis), well-water isotope sampling, and firmware development for/assembly of mesh-networked ecological sensor platforms developed at the MIT Media Lab under Gershon Dublon and Brian Mayton.

ACADEMIC AWARDS

- 2019: Student Centenary Award for Outstanding Project in the Department of Electrical and Electronic Engineering.

- 2018: Student Activity Award in the City and Guilds College Union.

- 2017: BP UROP Award for AMR signal chain digitisation.

- 2015: National AP Scholar. AP Scholar with Distinction (2nd). President's Award for Academic Excellence. Outstanding Story (American Scholastic Press Association).

- 2014: Brown Book Award. MaFLA Distinguished Scholar Award. AP Scholar with Distinction (1st).

EXTRACURRICULAR ACTIVITY

- Chief Electronics Designer, Imperial College Students for the Exploration and Development of Space.

  – Lectured in electronics to students from other faculties; imparted skills in power system design, schematic capture and PCB layout, analogue and digital design techniques.

  – Led UKSEDS rover competition entries; our 2018 rover won first place at national competition.

- Music Editor, *The Felix*