

WELLESLEY



students, faculty and
opportunities for collaboration

James Battat
(on behalf of my colleagues)

Wellesley College (founded 1870)



13 miles west of Boston

Undergrad liberal arts college

“provide an excellent liberal arts education to women who will make a difference in the world.”

2,400 students

Need-blind admissions
50% students of color
25% first-gen
20% low-income

Cross-registration

MIT
Olin (engineering)
Babson (business)

Emerging Research Institution

ERI, but not an MSI
Eligible for DOE RENEW & FAIR

New Science Center/Complex (2022)



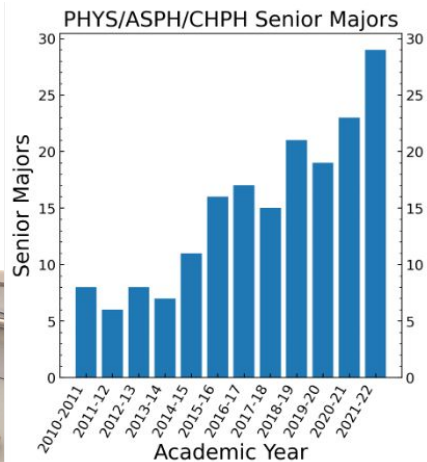
Wellesley physics students, then and now



Growing physics major

2012: 6 majors/yr

2022: 29 majors/yr



Bachelors degrees, women in physics, per year (2017-2021)

	Institution	Highest Degree	Women per year
1	University of Washington	PhD	35
2	UC Berkeley	PhD	28
3	MIT	PhD	24
4	Illinois Urbana/Champaign	PhD	24
5	UCLA	PhD	20
6	Wellesley College	Bachelors	18
7	UC Santa Cruz	PhD	18
8	Rutgers	PhD	17
9	U. Texas, Austin	PhD	16
10	Colorado School of Mines	PhD	16

Bachelors degrees, women in physics, per year (2017-2021)

	Institution	Highest Degree	Women per year	Total per year
1	University of Washington	PhD	35	177
2	UC Berkeley	PhD	28	125
3	MIT	PhD	24	73
4	Illinois Urbana/Champaign	PhD	24	146
5	UCLA	PhD	20	78
6	Wellesley College	Bachelors	18	18
7	UC Santa Cruz	PhD	18	69
8	Rutgers	PhD	17	76
9	U. Texas, Austin	PhD	16	90
10	Colorado School of Mines	PhD	16	65

Wellesley physics alumnae you may know



Persis Drell '77

2017 - 2023 Provost, Stanford
2014 - 2017 Dean of Engineering,
Stanford
2007 - 2012 Director, SLAC



Pam Melroy '83

2021 - now NASA
Deputy
Administrator

Astronaut
2007 STS-120 Mission
Commander
2002 STS-112 Pilot
2000 STS-92 Pilot



Nergis Mavalvala '90

2020 - Dean MIT School of Science
2010 MacArthur Fellow

Leading member of LIGO

Recent alums (e.g.)

12 of my lab alumnae who graduated in the past 4 years joined grad programs in physics/STEM:
Berkeley, U. Chicago (2),
Harvard, Michigan State,
U. Minnesota, MIT, Stanford,
Tufts, Virginia Tech,
U. Wisconsin & Yale.

... also one Fulbright fellowship
(astroparticle physics, University of Tokyo)



Wellesley physics, astronomy and engineering faculty





Wellesley Solar Lab

PI: Rebecca Belisle

Assistant Professor

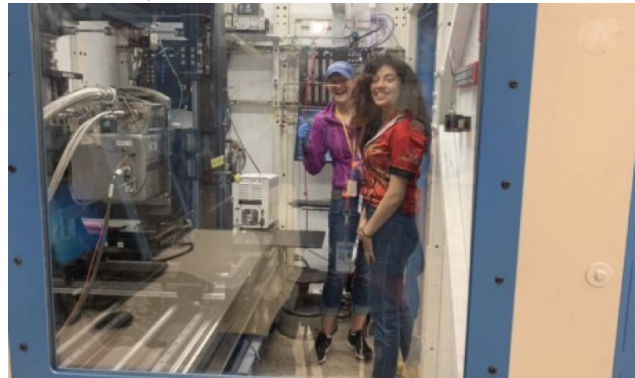
rbelisle@wellesley.edu

Developing wide bandgap perovskites for tandem solar cells.

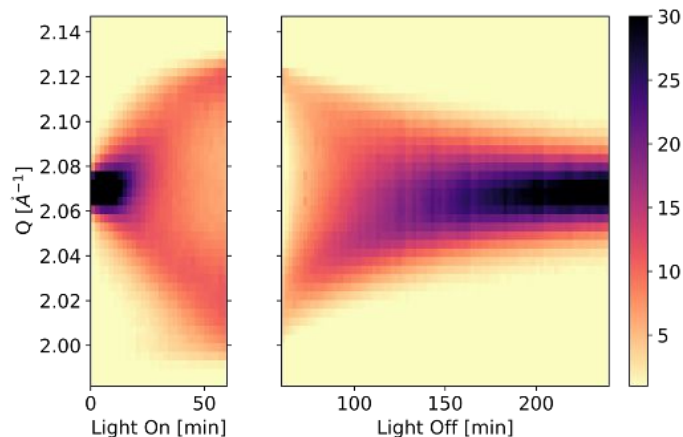
Uses *in situ* Grazing-Incidence Wide-Angle X-ray Scattering to characterize crystallization and degradation of perovskites.

Currently working at SSRL, and would be interested in expanding work to NSLS II (11-BM).

Wellesley students working at SSRL



GIWAXS data collected on mixed halide perovskites under illumination at SSRL beamline 11-3





Samantha Lewis

Assistant Professor

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Axion haloscope cavities

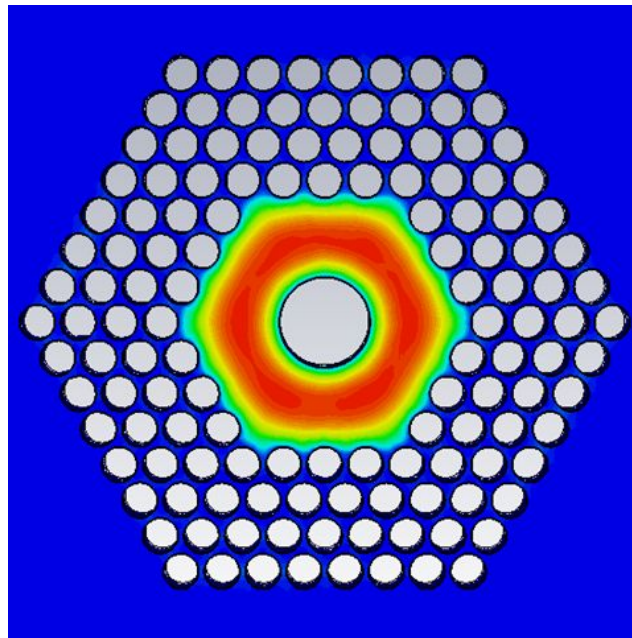
Novel resonator designs for axion haloscopes

Advanced accelerator cavities

Developing cavities to enable high gradient particle accelerators

Quantum sensing

Impact of ionizing radiation on superconducting qubit errors; interested in applying qubits to axion dark matter searches



Simulated electric field of tunable photonic band gap resonator prototype for HAYSTAC axion search.



Samantha Lewis

Assistant Professor

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Background:

- a) BS/PhD in Nuclear Science and Engineering (MIT, Berkeley, FNAL)
- b) Experience with many accelerator systems, electron sources
- c) Instructor at USPAS (US Particle Accelerator School) January 2023, previous attendee

Would like to learn more about:

- BNL accelerator R&D, potential collaboration opportunities for cavity and/or electron source development
- Any low temperature or high magnetic field test facilities
- Resources for developing nuclear physics and particle accelerator coursework



Zach Addison

Assistant Professor

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Future work in Quantum Information Theory

Topologically protected
computing algorithms to be
explored through the
dynamical braiding of
anyon excitations

TITLE	CITED BY	YEAR
Spatially dispersive circular photogalvanic effect in a Weyl semimetal EJMRA Zhurun Ji, Gerui Liu, Zachariah Addison, Wenjing Liu, Peng Yu, Heng ... Nature Materials 18 (9), 955-962	116	2019
Quadrupole topological photonic crystals L He, Z Addison, EJ Mele, B Zhen Nature communications 11 (1), 3119	93	2020
Floquet Chern Insulator of Light BZ L He, Z Addison, J Jin, EJ Mele, SG Johnson Nature Communications 10, 4194	59 *	2019
Plasmon reflections by topological electronic boundaries in bilayer graphene BY Jiang, GX Ni, Z Addison, JK Shi, X Liu, SYF Zhao, P Kim, EJ Mele, ... Nano letters 17 (11), 7080-7085	58	2017
Intrinsic Fermi-surface contribution to the bulk photovoltaic effect L Gao, Z Addison, EJ Mele, AM Rappe Physical Review Research 3 (4), L042032	28 *	2021
Optically Controlled Orbitronics on a Triangular Lattice EJM Võ Tiến Phong, Zachariah Addison, Seongjin Ahn, Hongki Min, Ritesh Agarwal Physical Review Letters 123 (23), 236403	26	2019
Twist, slip, and circular dichroism in bilayer graphene Z Addison, J Park, EJ Mele Physical Review B 100 (12), 125418	19	2019

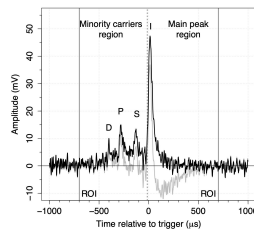
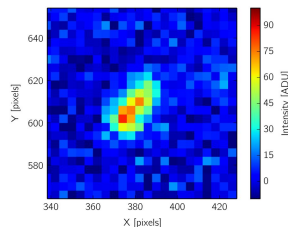
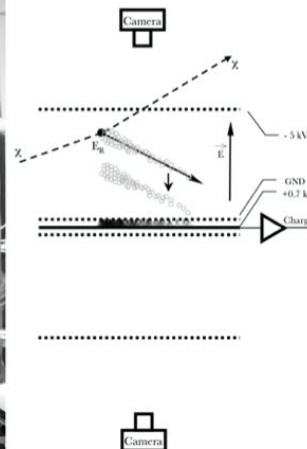


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Dark matter detection (directional) Gas-based Time Projection Chambers

DMTPC
electron drift (CF_4), CCD imaging

DRIFT
negative-ion drift (SF_6), wire readout





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arXiv:2206.00125

IEEE TRANSACTIONS ON INSTRUMENTATION AND MEASUREMENT, VOL. 71, 2022

2006612

Digital Wire Analyzer of Mechanical Tension, Electrical Continuity, and Isolation

Sebastien Prince¹, Pratyush Anand², **James Battat³**, Russell Farnsworth⁴, Nathan Felt⁵, Roxanne Guenette⁶, Shion Kubota⁷, Austin Li⁸, Em Murdock⁹, John Oliver¹⁰, Chris Stanford¹¹, and Jackson Weaver¹²

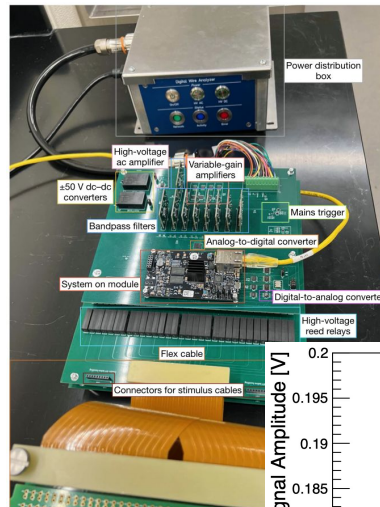


Neutrino detection

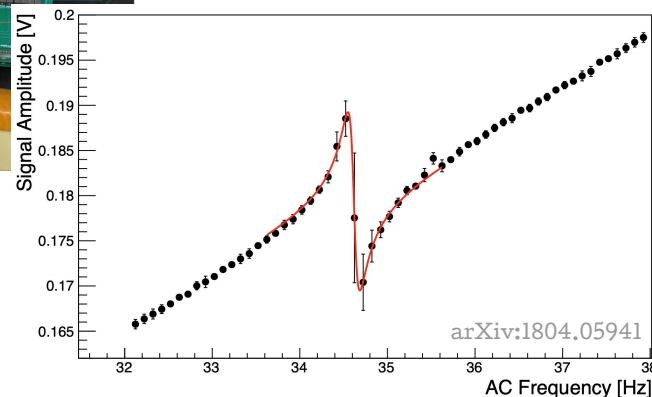


Wellesley joined DUNE in 2019
First LAC member (to my knowledge)

Far detector Anode Plane Assembly
wire tension measurements



$$\text{tension} \propto \text{frequency}^2$$



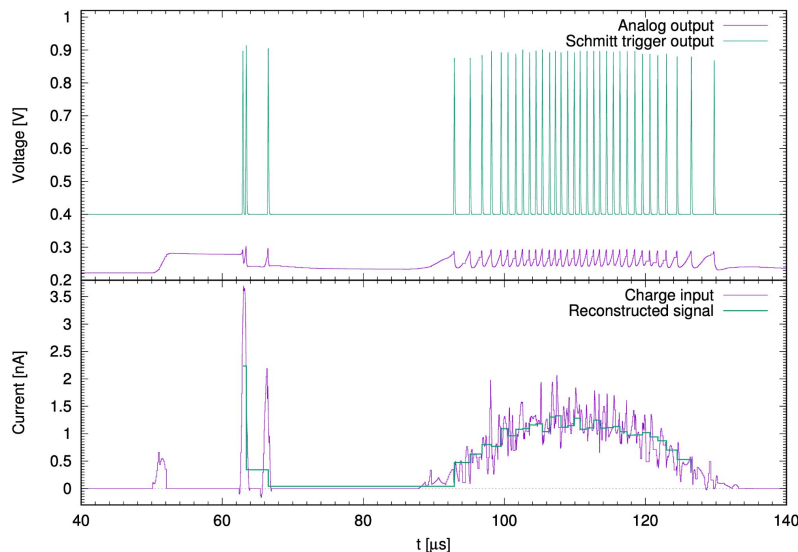
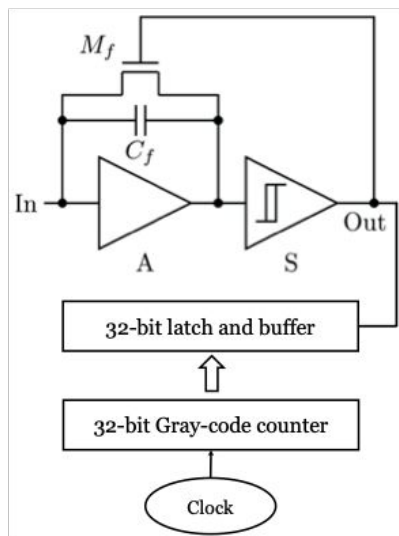


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Q-Pix consortium



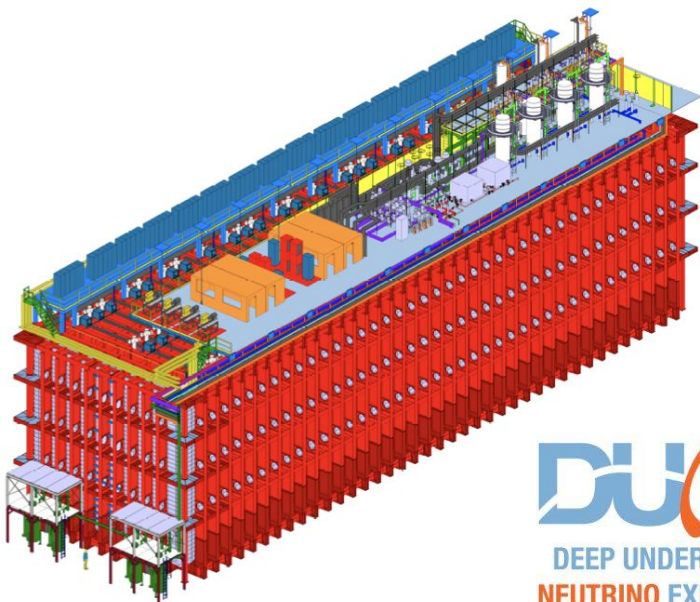
Pixelated Readout for LAr detectors





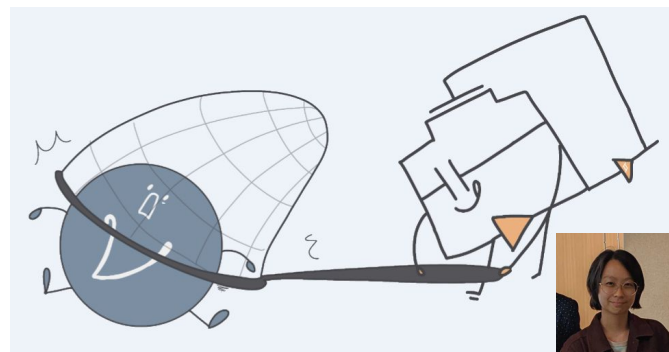
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Pixelated Readout for LAr detectors



DUNE
DEEP UNDERGROUND
NEUTRINO EXPERIMENT

Q-Pix consortium



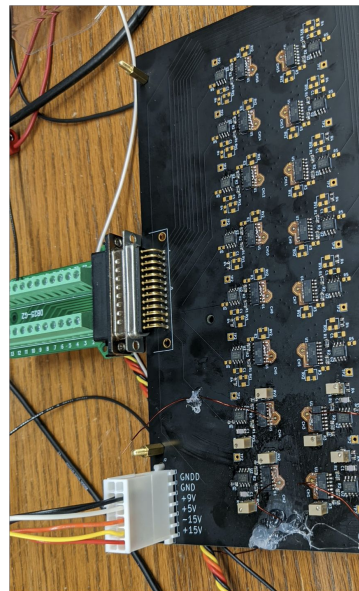
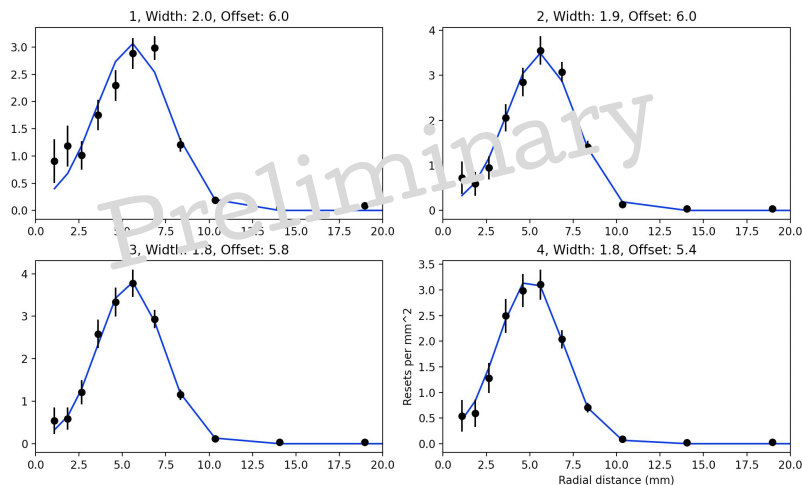


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Q-Pix consortium



Measurement of e^- diffusion in gas using Q-Pix prototype at Wellesley





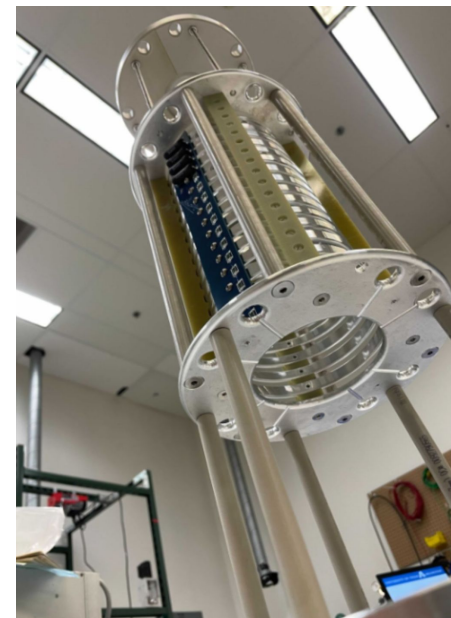
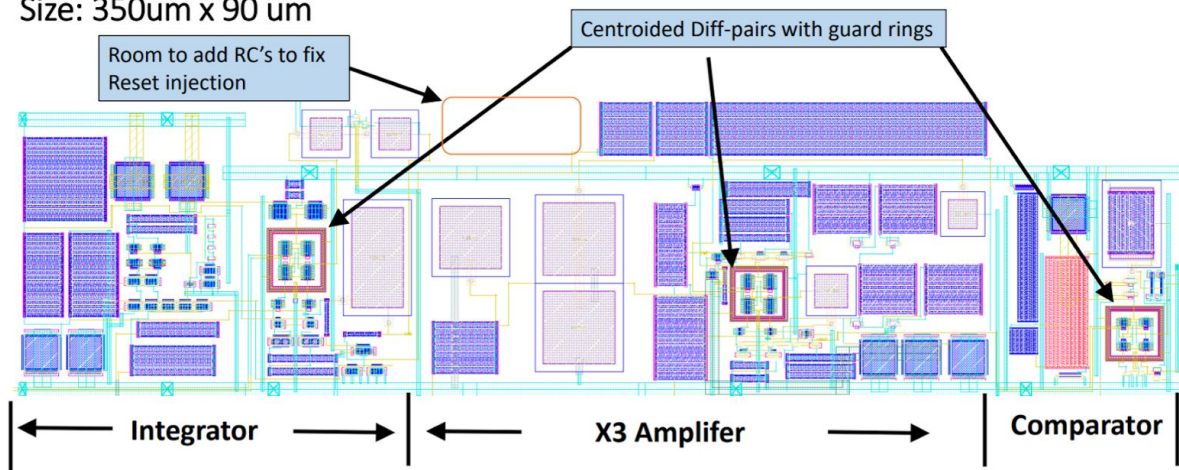
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Q-Pix consortium



Q-Pix ASIC now exists – time to test

QPIX Layout: Integrator + Amplifier + Comparator
Size: 350um x 90 um



Quantum Information



Katie Hall



Robbie Berg



Expand research and hands-on curricular opportunities related to quantum information and devices.

Currently our students are:

- 1) building entangled photon sources, measuring single photon interference, measuring optically detected magnetic resonance with nitrogen vacancies in diamond



CENTER for INTEGRATED
QUANTUM MATERIALS

Quantum Information Science and Technology



Co-PIs
Dr. Tina Brower-Thomas
Dr. Kimberly Jones
Howard University

- 2) Investigating applications for non-classical states of light (with Dr. Jon Habib at USC's ISI in Waltham, MA)

Actively pursuing projects and partnerships to increase opportunities for our students in these fields and to help grow the quantum workforce.



We look forward to continued conversations and future collaborations!



Advertisement:

**Wellesley and Boston College
Conference for Undergraduate
Women in Physics
(CUWiP)
January 19-21, 2024**

