

Huan Q. Bui

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Education

B.A., Colby College ('21), Waterville, ME

Majors: Physics and Mathematics

Minor: Statistics

GPA: 4.17/4.30, Class rank: 1/560

Summer school, Perimeter Institute for Theoretical Physics, June 2020

Topics in Theoretical Physics: Quantum Information & Thermodynamics, Numerical Methods & Condensed Matter Physics, Path Integrals, Symmetries

Relevant Coursework: (*) denotes "Independent Study"

- **Physics:** experimental atomic physics (thesis), quantum field theory*, quantum information, massive gravity*, classical field theory*, quantum mechanics, general relativity, experimental soft matter physics, classical mechanics, E&M, thermo & statmech
- **Mathematics:** applied mathematics/mathematical physics/analysis and ODE (thesis), functional analysis, real analysis, complex analysis, algebraic geometry, abstract algebra, matrix analysis, linear algebra, ordinary differential equations, partial differential equations, probability theory, vector calculus, honors calculus
- **Statistics:** mathematical statistics/statistical inference, statistical modeling, applied longitudinal data analysis

Theses

Honors in Physics, Colby College (*in preparation*)

Advisor: Charles Conover

Title:

Honors in Mathematics, Colby College (*in preparation*)

Advisor: Evan Randles

Title:

Research

Undergraduate Researcher, Perimeter Institute for Theoretical Physics, May–Aug 2020

- Area(s): Quantum information, Condensed matter physics
- Principal Investigator: Timothy Hsieh
- Quantum many-body physics on quantum hardware.
 - Studied variational simulation of non-trivial quantum states (QAOA-based, $\mathcal{O}(N)$ time)
 - Studying measurement-assisted algorithms as a candidate for sublinear depth simulation

Research Assistant, Colby College Dept. of Mathematics & Statistics, Oct 2019–Present

- Area(s): Applied mathematics, Analysis, ODEs
- Principal Investigator: Evan Randles
- Convolution powers of complex functions on \mathbb{Z}^d whose attractors involve oscillatory integrals.
 - Computed convolution powers & associated attractors that are highly oscillatory integrals
 - Generated examples indicative of a new local limit theorem
 - Studying surface measures of level sets of polynomials associated with these attractors
 - Proving a new local limit theorem (in preparation)

Research Assistant, Joint Quantum Institute, College Park, Summer 2019, Jan 2020

- Area(s): Experimental atomic physics
- Principal investigator: Steven Rolston
- Studying infinite-range interactions and finding evidence of superradiance and super-superradiance between two Rb ensembles trapped around an optical nanofiber via measuring their collective decay.

Research Assistant, Colby College Dept. of Physics & Astronomy, Nov 2017–Present

- Area(s): Experimental atomic physics
- Principal Investigator: Charles Conover
- Precision measurements on ultracold ^{39}K in Rydberg states, 2017-2019
- Lifetime measurements of ultracold $4p\ ^{39}\text{K}$, 2019–

Conferences/
Presentations

Perimeter Institute Undergrad Intern Symposium, July 2020

Measurement-assisted variational simulation of non-trivial quantum states

DAMOP 20, May 2020

Measurements of f -, g -, and h -state quantum defects in Rydberg states of potassium

CLAS (Colby Liberal Arts Symposium) 2020, May 2020

Massive Gravity (*canceled due to COVID-19*)

CLAS 2020, May 2020

Topics in Quantum Information (*canceled due to COVID-19*)

DAMOP 19, May 2019

Millimeter-wave precision spectroscopy of d - d transitions in ^{39}K Rydberg states

CLAS 2019, May 2019

Matrices in Quantum Computing: A 2-qubit entanglement circuit

CUSRR2018, Jul 2018

Precision measurement of potassium energy levels at highly excited states

Projects

Personal Website/Archive, [GitHub](#), [huanqbui.com](#), Oct 2019 –Present

Notes from class and independent readings plus other projects.

Applied Mathematics, Advisor: Evan Randles, Sep 2019 –Present

Convolution powers of complex functions & harmonic analysis

Experimental Physics, Advisor: Charles Conover

Lifetime measurements of ultracold potassium $4p$, Jan 2018 –Present

Classical Field Theory, Advisor: Robert Bluhm, Feb 2019 –May 2020

Theoretical aspects of Massive Gravity

Awards/
Honors/
Fundings

Williams A. Rogers Prize in Physics and Astronomy, Colby College, May 2020

Phi Beta Kappa, April 2020

Mu Sigma Rho, *April 2020*

Honorable Mention, COMAP Mathematical Contest in Modeling, *S'20*

Linda K. Cotter Internship Fund, *Jan 2020*

for Jan 2020 internship at the Joint Quantum Institute (JQI), College Park, MD

Phi Beta Kappa Scholastic Achievement Award, *Sep 2019*

Julius Seelye Bixler Scholar, *Sep 2018, Sep 2019*

Meritorious Winner, COMAP Mathematical Contest in Modeling, *S'19*

Top 8% out of more than 10,000 teams

Dean's List, *F'17, S'18, F'18, S'19, F'19, (S'20)*,

Teaching Assistantship

Teaching Assistant, Colby College Dept. of Physics & Astronomy

- Current course: Quantum Mechanics
- Instructor: Kelly Patton
- Grade weekly problem sets
- Past courses: 2×Modern Physics II (quantum; instructor: Robert Bluhm), 2×Modern Physics I (relativity & early quantum; instructor: Duncan Tate), Introduction to Electricity-Magnetism & Optics (instructor: Charles Conover), Introduction to Mechanics (instructor: Jonathan McCoy)

Teaching Assistant, Colby College Dept. of Mathematics & Statistics

- Current course: Linear Algebra
- Instructor: Leo Livshits
- Grade problem sets & hold weekly TA sessions
- Past courses: Linear Algebra (instructor: Otto Bretscher), Ordinary Differential Equations (instructor: Evan Randles)

Mathematics & Physics Tutor, Colby College Deans of Studies

- Provide academic assistance through reviewing course material and solving problems

Skills

Physics research: quantum simulation, condensed matter physics, massive gravity, general relativity, optics, precision atomic spectroscopy, Ramsey spectroscopy, fabricating & polarization control in optical nanofibers, magneto-optical & optical dipole trapping, constructing external-cavity diode lasers & frequency-stabilizing electronics, programming arbitrary waveform generators, data acquisition & analysis

Mathematics research: measure theory (elementary), real analysis, numerical integration in Python & Mathematica of highly oscillatory integrals, computing convolution powers of complex-valued functions on \mathbb{Z}^d in Python, general relativity in Mathematica (xACT, xPert)

Programming/Scripting Languages: R, Python, MATLAB, Mathematica, HTML & CSS, \LaTeX

Softwares: IGOR Pro, MATLAB, NI-MAX, PicoHarp & TimeHarp (photon-counting modules), MS Office, Adobe Illustrator, Adobe Lightroom

Languages

English (fluent), Vietnamese (native),

Other

Activities

Math Mentor, Colby Dept. of Mathematics & Statistics

Colby Society of Physics Students, Photography, Ultimate Frisbee, Classical guitar

References

[Professor Robert Bluhm](#)

Department of Physics & Astronomy

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[Professor Charles Conover](#)

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[Professor Evan Randles](#)

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