

Keefe Edward Alden Mitman (Curriculum Vitae)

CONTACT INFORMATION

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RESEARCH INTERESTS

Gravitational Memory Effect, Numerical Relativity, and various Extended Theories of Gravity.

EDUCATION

California Institute of Technology (CalTech), Department of Physics

Ph.D. Candidate, Physics (second-year graduate student); GPA: 4.33/4.00.

- Dissertation Topic: Gravitational Memory (tentative).
- Advisor: Professor Saul Teukolsky.
- Rochus E. Vogt Graduate Fellow.

Columbia University in the City of New York

B.A. in Mathematics, B.A. in Physics, May 2019 (Cum Laude); GPA (Physics): 4.02/4.00

- Graduated with the Highest Honors in Physics.
- Erwin H. Leiwant Scholarship Recipient.
- Dean's List — every semester.

RESEARCH EXPERIENCE

Theoretical AstroPhysics Including Relativity and Cosmology (TAPIR), *Aug. 2019 - Present* California Institute of Technology, Simulating eXtreme Spacetimes Group (SXS)

Graduate Research Fellow in Theoretical Physics

- examining the resolution of gravitational memory in numerical relativity simulations using certain waveform extraction techniques: specifically, Cauchy-characteristic extraction.
- exploring the possibilities of incorporating extended theories of gravity, such as massive gravity, into SXS's Spectral Einstein Code (SpEC and SpECTRE).

European Organization for Nuclear Research (CERN), Columbia University, Heavy-Ion Group

Nov. 2015 - May 2019

Undergraduate Research Fellow in Experimental Physics

- conducted analyses on ultra-peripheral Pb+Pb, gamma+Pb, and gamma+gamma collisions under the advisement of Professor Brian Cole and Dr. Aaron Angerami.
- worked on the Large Hadron Collider in the summer of 2018 with the Zero Degree Calorimeters; in the following November, assisted with their installment for the 2018 Pb+Pb data run.

Columbia University, Independent Research with Professor Yuri Levin

Sep. 2018 - May 2018

Undergraduate Research Fellow in Theoretical Physics

- studied accretion in stellar binary systems under the Shakura-Sunyaev viscosity prescription through the computational modeling of diffusion equations.

PUBLICATIONS

- ❑ *Computation of Displacement and Spin Gravitational Memory in Numerical Relativity.* [arXiv:2007.11562](https://arxiv.org/abs/2007.11562). Accepted to Phys. Rev. D., October 2020.
- ❑ *Photo-nuclear dijet production in ultra-peripheral Pb+Pb collisions.* ATLAS Collaboration, [ATLAS-CONF-2017-011](https://arxiv.org/abs/1701.02643).
- ❑ *Photo-nuclear dijet production in ultra-peripheral Pb+Pb collisions.* ATLAS Collaboration, ATLAS-INT. July 2016.

- TALKS
- ❑ *Resolving Gravitational Memory in Numerical Relativity with Cauchy-characteristic Extraction*, APS April Meeting. April, 2020.
- TEACHING EXPERIENCE
- ❑ TA for Ph205A (Quantum Field Theory) with Professor Sergei Gukov. *Sep. 2020 - Dec. 2020*
California Institute of Technology.
 - ❑ TA for Ph129C (Complex Analysis) with Professor Hiroschi Oguri. *Mar. 2020 - Jun. 2020*
California Institute of Technology.
 - ❑ TA for GU4040 (General Relativity) with Professor Rachel Rosen. *Jan. 2019 - May 2019*
Columbia University.
- Additional Teaching Experience (tutoring):
- ❑ (public) CalTech Y – Rise Tutor. *Sep. 2019 - Present*
 - ❑ (public) CalTech Visiting Scientists Program –
Visiting Scientist at Madison Elementary School (Pasadena, CA). *Sep. 2019 - Present*
 - ❑ (public) Columbia One-to-One Tutoring – One-to-One Tutor. *Sep. 2015 - May 2019*
 - ❑ (private) Mathematics and Physics Tutor. *Oct. 2016 - Sep. 2019*
- HONORS/AWARDS
- ❑ Rochus E. Vogt Graduate Fellowship, *Sep. 2019 - Dec. 2019*
California Institute of Technology.
 - ❑ Erwin H. Leiwant Scholarship, *Sep. 2016 - May 2017*
Columbia University.
 - ❑ Outstanding Achievement in German Language and Literature, *Sep. 2015 - May 2016*
Columbia University, Department of Germanic Languages.
- GRADUATE COURSEWORK
- ❑ General Relativity II (CA)
 - ❑ Quantum Field Theory II (CA)
 - ❑ Mathematical Methods of Physics (homology/cohomology) (CA)
 - ❑ Quantum Field Theory I (CU)
 - ❑ Quantum Mechanics I (CU)
 - ❑ Quantum Effects in Gravity (CU)
 - ❑ Gravitational Waves (CA)
 - ❑ Quantum Field Theory III (CA)
 - ❑ Quantum Computation (CA)
 - ❑ General Relativity (CU)
 - ❑ Quantum Field Theory II (CU)
 - ❑ Quantum Mechanics II (CU)
 - ❑ Modern Geometry (CU)
- (CA – California Institute of Technology; CU – Columbia University)
- LEADERSHIP
- ❑ Columbia Outdoor Orientation Program, *Hiking Coordinator and Leader.* *Mar. 2016 - May 2019*
 - ❑ Columbia Science Review, *Treasurer and Member.* *Sep. 2015 - May 2019*
 - ❑ Columbia Outdoors Club, *Founder and Member.* *Sep. 2016 - May 2019*
 - ❑ Columbia Undergraduate Recruitment Committee, *Ambassador.* *Sep. 2017 - May 2018*
- ADDITIONAL EXPERTISE
- Languages: English (fluent), German (proficient), Spanish (elementary, but improving!)
- Computing: C/C++, Python (scipy, numpy), numerically solving PDEs, spectral methods, finite difference methods, ROOT, Matplotlib, Mathematica, LaTeX, Java/HTML.