Jack T. Dinsmore

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Education

Sept 2018 – May 2022	**Massachusetts Institute of Technology** BS in Physics; Minors in Astronomy and Mathematics; Concentration in Music GPA: 5.0/5.0
Sept 2022 – present	**Stanford University** PhD in Physics

Awards & Honors

May 2022	• Received Barret Prize for excellence in astrophysics research on recommendation from my advisor Tracy Slatyer.
May 2022	• Inducted into Phi Beta Kappa and Sigma Pi Sigma honors societies for excellence in academics with a humanities element (Phi Beta Kappa) and in physics (Sigma Pi Sigma).
March 2021	• Best pendulum experiment in Experimental Physics (8.13) section as ranked by section leader Prof. Phil Harris (MIT).
May 2020	• Accepted at competitive REU program at Lehigh University. See research with Prof. Pepper below.

Presentations

April 2022	• Solo presentation to Apophis T-7 Years on my research on extracting asteroid information from flybys. $\sim$ *200 in attendance*
Aug 2021	• Concluding solo research presentation to PRISM, an MIT undergraduate research conference, for my research on the Galactic Center Excess. $\sim$ *30 in attendance*
Aug 2020	• Final research presentation to conclude my REU at Lehigh University to REU faculty, students, and members of the public. $\sim$ *25 in attendance*

Research Experience

5. **June 2021–August 2022** Can asteroid density profiles be extracted from observed changes in their angular velocity, induced by tidal torques during flybys? This question is important because asteroid internal structures are rarely known, but they provide powerful insight into the evolution of the Solar System. I proposed it for a class project in the fall of 2020, and continued under Prof. Julien de Wit (MIT) with more detailed research to develop a method (called AIME) that constrains asteroid densities from tidal interactions, and test it in multiple scenarios [4].

4. **Sept 2020–April 2022** Could millisecond pulsars produce the Galactic Center Excess? This study is necessary because previous research on this Excess (which has been highlighted as a potential signal of dark matter annihilation) is sometimes contradictory. I analyzed models for the Excess from the literature with my advisor Prof. Tracy Slatyer (MIT), helping to resolve conflicts and highlight common attributes between different models [3].

3. **Summer 2020** Can the variability of unresolved stellar clusters be used to determine the clusters' age? Such a tool is useful since age-dating stellar clusters is difficult without high spatial- or spectral-resolution, yet cluster ages are vital to many astrophysical studies. Under Prof. Joshua Pepper (Lehigh University), I extracted the variations of unresolved stellar clusters from TESS (Transiting Exoplanet Survey Satellite) data and compared them to data obtained from more sensitive telescopes in which the clusters are resolved. Publication is expected within a year. *40 hours per week.*

2. **Summer 2019** Can machine learning algorithms improve analysis speed of Large Hadron Collider data? The LHC processes data at record rates, and was slated for a hardware upgrade that would increase the rate beyond the capacity of its analysis algorithms. Under Prof. Phil Harris (MIT) and graduate student Jeffery Krupa, I timed standard machine learning algorithms on different hardware types, then built dozens of models to perform a specific regression required in the High Level Trigger and timed them. I also built a server to demonstrate the ability to regress on data sent from client machines [2]. *40 hours per week.*

1. **Summer 2018** What thermodynamic properties do black holes in an expanding spacetime and low temperature solids have in common? Working with Prof. Jennie Traschen (UMass Amherst), I found a peculiar thermodynamic feature of Schwarzschild-de Sitter black holes embedded in her previous research into these black holes. She connected the feature to a quantum mechanical property of low temperature solids, which became the subject of Ref. [1]. *5 hours per week.*

Publications, Peer Reviewed

4. Jack T. Dinsmore and J. de Wit. Constraining the Interiors of Asteroids through Close Encounters. *Submitted to MNRAS*, 2022.

3. Jack T. Dinsmore and Tracy R. Slatyer. Luminosity functions consistent with a pulsar-dominated Galactic Center excess. *JCAP*, 06(06):025, 2022

2. Jeffrey Krupa et al. GPU coprocessors as a service for deep learning inference in high energy physics. *Mach. Learn. Sci. Tech.*, 2(3):035005, 2021

1. Jack Dinsmore, Patrick Draper, David Kastor, Yue Qiu, and Jennie Traschen. Schottky Anomaly of deSitter Black Holes. *Class. Quant. Grav.*, 37(5):054001, 2020

Teaching experience

Winter 2022	• TA for new MIT physics class on statistics under Prof. Phil Harris. In addition to TAing, I also designed three recitations. *4 hours per week*
Spring 2019	• Problem set grader for Physics I (8.012) under Prof. Phil Harris. *4 hours per week* • SAT Math section teacher for MIT ATI, a student organization that tutors local high school students on SAT prep. I designed and taught six one-hour lessons over the semester, each taught to three distinct classes of students. *7 hours per week*

Fall 2018	• SAT Math section teacher for MIT ATI. *7 hours per week*

Community Activities

Spring 2022	• Representative of my wing to the dorm's student government. *2 hours per week*
All 2021	• Chief copy editor for *The Tech*, MIT's student newspaper. *4 hours per week*
Jan–Mar 2020	• Build chief for Next Big Thing (Project canceled due to COVID-19). Next Big Thing was a medieval castle built temporarily in my dorm's courtyard to attract first-years to the dorm. I advised in the design and orchestrated the construction budget. *3 hours per week*
Spring 2020	• Cellist for MIT Chamber Music Society (audition required). *6 hours per week*
All 2019	• Cellist for MIT Symphonic Orchestra (audition required). *6 hours per week*
	• Build assistant in Next Haunt, an escape room designed, built, and haunted by students for Halloween. *1 hour per week*
Fall 2018	• Cellist for MIT Symphonic Orchestra (audition required). *6 hours per week*

Individual Projects

Various projects, such as building model wooden boats and writing small physics simulations. In particular,

2022	• Starfarer (Rust, GLSL) A space-themed video game using custom 3D graphics and physics engines I'm building using the Vulkan library.
	• Wikid (Rust, HTML). A blog-making program which compiles markdown-formatted posts into HTML files which can be viewed online.
2021	• Personal Website (HTML, Javascript). `jack-dinsmore.github.io`
	• Throrgan (Rust): A program to read notated music and compile it into an audio file. (Rust)
	• *The Fifth Empire* (English): a sci-fi novel.
2020	• Poetron (Python): A Discord chat bot that reads users messages, finds text that conform to various poetic meters, and repeats them with line breaks to match the meter. (Python)
	• Vokdh (C++): A word processor, dictionary, and translator for the spoken language *Fi Tobair* which I created.
	• My father's professional website (HTML). `people.umass.edu/dinsmore`

References are available upon request. Updated September 8, 2022