Mark Dodici

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SELF

Second-year Ph.D. student in astronomy & astrophysics with interests in dynamics at all scales, currently focusing on stellar/compact object dynamics in galactic centers.

EDUCATION

University of Toronto, Toronto, ON **2022 – Present**
Ph.D. Student, Department of Astronomy & Astrophysics and CITA
Advisors: Yanqin Wu & Scott Tremaine

Princeton University, Princeton, NJ **2018 – 2022**
A.B. Astrophysical Sciences, *magna cum laude*; Certificate in Planets and Life

RESEARCH TALKS

Breaking up a denser, primordial Neptunian scatter belt to provide material for the cold, classical Kuiper belt. Oct 2023. AAS Division for Planetary Science 55. San Antonio, TX.

Breaking up a denser, primordial Neptunian scatter belt to provide material for the cold, classical Kuiper belt. Aug 2023. CITA Planet Day. Toronto, ON.

Finding a distribution of stellar obliquities for newly-formed planets in binary systems. Jun 2023. Emerging Researchers in Exoplanet Science Symposium VIII. New Haven, CT.

Finding a distribution of stellar obliquities for newly-formed planets in binary systems. Nov 2022. Great Lakes Exoplanets Area Meeting. Columbus, OH.

A Trojan Horse for White Dwarfs: Evolution of co-orbital asteroids under post-main sequence mass loss and radiative effects. Jun 2022. AAS 240. Pasadena, CA.

PAPERS

Dodici, M. & Tremaine, S. In prep. Dynamical formation of binary systems in gas disks and stellar clusters.

Dodici, M. & Wu, Y. In prep. Breaking up a denser, primordial Neptunian scatter belt to supply material for the cold, classical Kuiper Belt.

Hensley, B., Murray, C., **Dodici, M.** 2022. Polycyclic Aromatic Hydrocarbons, Anomalous Microwave Emission, and their Connection to the Cold Neutral Medium. ApJ, 929, 23.

SELECT PROJECTS

Binary capture in presence of dynamical friction **Apr 2023 – Present**

Using Hill's approximation to study the formation of binaries through two-body interactions in gaseous disks and seas of smaller bodies. Results are fully generalizable and can apply to, e.g., black hole binaries in AGN disks or planetesimal binaries in protoplanetary disks.

Collisional evolution of a belt of rocky bodies **Oct 2022 – Present**

Studying evolution of size, eccentricity distribution of a belt of small, rocky bodies. Created semi-analytic code to track evolution of such a belt through collisions of constituent bodies. Found that a reasonable approximation of a primordial Neptune scatter belt could yield source material for cold Kuiper belt, allowing it to form later than expected in solar system history.

Causes of Spin-Orbit Misalignments, *Undergraduate Thesis* **Sep 2021 – May 2022**

Analytically studying the cause of misalignments between host star spin axis and planetary orbital planes. Found distribution of expected stellar obliquities for newly-formed planets around stars with a distant binary companion.

Post-Main Sequence Dynamics of Small Bodies **Aug 2020 – Aug 2021**

Used `REBOUND` to simulate evolution of Trojan-like asteroids and irregular satellites in a Sun-Jupiter-like system. Submitted 3-minute video explaining work to Princeton Research Day 2021; won award for presentation quality.

GRADUATE COURSES

Princeton • Dynamics of Stellar & Planetary Systems • Computational Geophysics
Toronto • Planet Formation • Stars • Radiation • Astrostatistics • Galactic Dynamics

SELECT OUTREACH

- Astrobites, *Author & Education Study Team Member* — Jan 2023 – Present
- Cosmos from your Couch (Astronomy video series), *Editor* — Feb 2023 – Present
- ComSciCon Canada (Science Communication Workshop), *Attendee* — Jul 2023
- Age of the Universe (HS workshop), *Co-organizer & Speaker* — Mar 2023 – Jul 2023