Daniel Tamayo

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Professional Experience

2018-pres Princeton University Princeton, NJ, USA	NASA Hubble Fellowship Program Sagan Fellow
2014-2018 University of Toronto Toronto, CA	Postdoctoral Fellow Centre for Planetary Sciences Canadian Institute for Theoretical Astrophysics
2008-2014 Cornell University Ithaca, NY, USA	Ph.D.: Astronomy & Space Science Minor Concentration: Physics Advisors: Joseph A. Burns and Philip D. Nicholson
2005 University of Michigan Ann Arbor, MI, USA	B.S. Physics B.S. Mathematical Physics B.S. Philosophy

Fellowships and Awards (Research)

Princeton Society of Fellows	2021-2023
Lyman Spitzer Jr. Fellowship (Princeton University)	2021-2023
NASA Sagan Fellowship (Space Telescope Science Institute)	2018-2021
Jeffrey L. Bishop Fellowship (Canadian Institute Theoretical Astrophysics)	2015
Centre for Planetary Sciences Fellowship	2014-2018
Z. Carter Patten Graduate Fellowship in Astronomy	2013
NASA Space Grant Fellowship	2013
AAS Division of Dynamical Astronomy Student Stipend Award	2010
Cornell University First Year Fellowship	2008

Fellowships and Awards (Teaching)

Knight Award for Writing Exercises, Cornell Knight Institute	2014
Awarded to the best writing exercise across university's first-year writing seminars	
Buttrick-Crippen Fellowship, Cornell Knight Institute	2014
One of two awarded across all Cornell depts to develop & teach a first-year writing seminar	
Outstanding Teaching Assistant Award, Cornell University Dept of Astronomy	2010

Research Grants Awarded

Collaborator: Understanding Free Normal Modes and Irregular Structures on the Edges of Saturn's Rings. ($324,988)	2016
Science PI: Galactic Background Calibrations for OT1_ddan01_1 ($20,300) *Herschel Space Observatory* Open Time Proposals Rd 2 *(Obs. not executed)*	2012
Science PI: Detecting the Largest Rings in the Solar System— Dust Rings from the Irregular Satellites ($54,000) *Herschel Space Observatory* Open Time Proposals Rd 1	2011

Mentoring

Graduate Students		
Roberto Tejada Arevalo	Resonant Dynamics of Young Systems	2021-pres.
Samuel Yee	Exoplanet Systems' Proximity to the Stability Limit	2020-pres.
Miles Cranmer	Deep Learning Predictions of Orbital Stability	2018-pres.
Alysa Obertas	Dynamics of tightly packed planetary systems	2015-pres.
Christian Gilbertson	Stability Constrained Exoplanet Characterization	2019-2020.
Ari Silburt	A hybrid integrator for simulating close encounters	2015-2017
Ryan Cloutier	Moon Retention during planetary encounters	2014-2015
Undergraduate Students		
Ana Luisa Tió Humphrey	Dynamical Effects of Atmospheric Mass Loss	2021-pres.
Fahim Jenetto	A Search for New Moons of Jupiter	2021-pres.
Juan Hermo	A Search for New Moons of Jupiter	2021-pres.
Noah Ferich	Radiation Effects on Asteroid Dynamics	2021-pres.
Stanley Baronett	Tidal star-planet interactions	2020-pres.
Alexandros Papamatthaiou	Discovering Jovian irregular satellites	2019-2020
Loic Nassif-Lachapelle	Imaging swarms of debris around exoplanets	2018-2020
Naireen Hussain	Instability time distributions of chaotic systems	2017-2020
Jahnavi Shah	Modeling debris disks from colliding satellites	2016-2017
Christopher Simbulan	Explaining the observed exoplanet distribution	2015-2016
Morgan Bennett	Orbital stability of multi-planet Kepler systems	2015
Alice Chen	Resonant stability With planet-disk interactions	2015
Caden Armstrong	Photometric signatures of exoplanetary rings	2015
Pengshuai (Sam) Shi	Gen. relativity corrections to N-body simulations	2015-2016
Sunny-Sum Chen	Chaos indicators in simulations of planetary systems	2014
Stephen Markham	Phoebe ring observations with the Cassini spacecraft	2013-2015
Heming Ge	Visualization software for dynamical simulations	2013

Leadership

Chair: American Astron. Society's Division on Dynamical Astronomy	2022-2023
Vice-Chair: American Astron. Society's Division on Dynamical Astronomy	2021-2022
Proposed and Co-organized Conference on Numerical Dynamics ($6,000)	2017
American Astr. Society Division on Dynamical Astronomy Committee	2016-2018
Planetary Junior Visitor Coordinator	2015-2016
Planetary Lunch Coordinator	2014-2018
NASA Proposal Review Panelist	2014-pres
Manuscript Referee, *Astrophysical Journal, Icarus, MNRAS, PNAS, Science*	2012-pres
President, Astronomy Grads Network, *Cornell University*	2010-2012

Teaching Training

Writing 7100: Teaching Writing, *Cornell University*	2013
ALS 6015: Teaching in Higher Education, *Cornell University*	2012
Center for Astronomy Education Teaching Excellence Workshop, *PSU, PA*	2011
Writing 7101: Writing in the Majors, *Cornell University*	2009

Selected Talks

Colloquium, Institute for Astrophysics, Göttingen, Germany	Jun 2021
Machine Learning in Science & Engineering (Invited), Columbia	Dec 2020
COMPUTE Seminar, Lund Observatory, Sweden	Sep 2020
NASA Hubble Fellowship Symposium	Sep 2020
Physics Seminar, California Polytechnic at Pomona	Feb 2020
Physics Colloquium, University of Texas at Dallas	Dec 2019
Physics & Astronomy Seminar, Western Washington University	Apr 2019
Astrophysics Seminar, Rutgers University	Oct 2018
Machine Learning in Science & Engineering (Invited), Carnegie Mellon	Jun 2018
Vanderbilt University Data Science Colloquium	Apr 2018
Center for Exoplanets and Habitable Worlds Seminar, Penn State	Apr 2018
University of Pennsylvania Astronomy Seminar	Mar 2018
Exoplanets and Planet Formation Conference (Invited), Shanghai	Dec 2017
Joint eps/ciera Seminar, Northwestern University	Nov 2017
Harvard Center for Astrophysics Stars & Planets Seminar	Nov 2017
Caltech Planetary Science Seminar	Oct 2017
Berkeley Center for Integrative Planetary Science Seminar	Oct 2017
University of Arizona Theoretical Astrophysics Program Colloquium	Sep 2017
(35+ additional colloquia, seminars and conference talks)	

Teaching

U. of Toronto Toronto, ON	Taught Undergraduate Intro to Machine Learning Crash Course	2016-2018
	Co-Organized and Taught Monthly Machine Learning Workshop *Attended by Undergraduates, Graduate Students, Postdocs and Faculty.*	2016
Cornell Astronomy Dept. Ithaca, NY	Designed and Taught First-Year Writing Seminar: *Are We Alone in the Universe?* (Buttrick-Crippen Fellowship)	2014
	Teaching Assistant, ASTRO 1102, *Our Solar System*	2011
	Designed and Taught 5-week middle-school science course: *Figuring Out Our Place in the Universe!*	2011
	Head Teaching Assistant, ASTRO 1101, *Nature of the Universe*	2010
	Teaching Assistant, ASTRO 1102, *Our Solar System*	2010
	Designed and Taught 5-week middle-school science course: *Mind-Blowing Science–From Relativity to Alien Biology*	2009
	Teaching Assistant, ASTRO 2201, *The History of the Universe*	2009
Peace Corps Otjimbingwe Namibia	Mathematics Teacher (Grades 8-10) Physical Science Teacher (Grades 8-9) Founded Computer Lab & Chess Club Renovated School Library	2005-2007
Princeton Review Ann Arbor, MI	Math, Science, Reading and English Teacher for ACT Test	2003-2005

Selected Outreach

Co-hosted: Public Astronomical Observing Night for Spanish Speakers 2019
Collaborator: One Sky: 12-hour sonification of the night sky ($45,000) 2018
Annual Nuit Blanche festival, Toronto, Canada
Co-I: SYSTEM Sounds:Bringing the Music of the Spheres Down to Earth (€7969.5) 2017
Co-launched system-sounds.com: Sonifications of astrophysical phenomena 2017
Interviewed on popular science radio show Quirks & Quarks 2017
Canadian Broadcasting Corporation, Toronto, Canada
Co-organized Canada 150 anniversary Public astronomy event ($\sim$ 600 people) 2017
University of Toronto at Scarborough
Co-proposed and helped build km-scale model of the Solar System ($10,000) 2017
University of Toronto at Scarborough
Co-Organized Lunar Eclipse Public Event ($\sim$ 500 people) 2015
University of Toronto at Scarborough
Reviewed Neal Stephenson novel Seveneves 2015
Science Vol 348, 6241, pp. 1310-1311
Organized Astro Career Day (2-day event for 80 local middle-school students) 2014
Cornell Department of Astronomy, Ithaca NY
Organized Museum in the Dark (Astronomy Halloween Event $\sim$ 100 children) 2011
Museum of the Earth, Ithaca, NY
Co-launched Ask An Astronomer At Cornell Podcast 2011
Cornell Department of Astronomy, Ithaca NY
Organized a book drive to send astronomy materials to a planetarium in Ghana 2010
Gathered and shipped over 100 textbooks
Co-Organized Observe the Moon Night ($>$ 300 children and families) 2009
Fuertes Observatory, Ithaca, NY

Refereed Publications

36	**Tamayo, D.**, Murray, N., Tremaine, S., Winn, J.N., A Criterion for the Onset of Chaos in Compact, Eccentric Multiplanet Systems. *submitted to the Astronomical Journal*. (preprint)	2021
35	Cranmer, M.*, **Tamayo, D.**, et al., A Bayesian neural network predicts the dissolution of compact planetary systems, *submitted to the Proceedings of the National Academy of Sciences*. (preprint)	2021
34	Yee, S.*, **Tamayo, D.**, Hadden, S., Winn, J.N., How Close Are Compact Multi-Planet Systems to the Stability Limit?, *accepted in the Astronomical Journal*. (preprint).	2021
33	Kostov, V., et al. (including **Tamayo, D.**), TIC 454140642: A Compact, Coplanar, Quadruple-lined Quadruple Star System Consisting of Two Eclipsing Binaries, *accepted in the Astrophysical Journal*. (preprint)	2021
32	**Tamayo, D.**, Gilbertson, C.*, Foreman-Mackey, D. Stability Constrained Characterization of Multiplanet Systems, *Monthly Notices of the Royal Astronomical Society*, Vol. 501(4), p. 4798-811 (preprint)	2020
31	Masuda, K., **Tamayo, D.**, Revisiting the architecture of the KOI-89 system, *Astronomical Journal* Vol. 160.5, 224. (preprint)	2020
30	**Tamayo, D.**, Cranmer, M.*, et al., Predicting the long-term stability of compact multiplanet systems, *Proceedings of the National Academy of Sciences* Vol. 117(31), 18194-18205. (preprint)	2020
29	Nassif-Lachapelle, L.*, **Tamayo, D.** Direct Imaging of irregular satellite discs in scattered light, *Monthly Notices of the Royal Astronomical Society*, Vol. 492(4), p. 5709-20. (preprint)	2020
28	Hussain, N.*, **Tamayo, D.** Fundamental Limits From Chaos On Instability Time Predictions in Compact Planetary Systems, *Monthly Notices of the Royal Astronomical Society*, Vol. 491(4), p. 5258-67. (preprint)	2020
27	**Tamayo, D.**, Rein, H., Shi, P.* reboundx: A Library for Adding Conservative and Dissipative Forces to Otherwise Symplectic N-body Integrations, *Monthly Notices of the Royal Astronomical Society*, Vol. 491 (2), p. 2885-901. (preprint)	2019
26	Rein, H., Brown, G.*, **Tamayo, D.**, On the Accuracy of Symplectic Integrators for Secularly Evolving Planetary Systems, *Monthly Notices of the Royal Astronomical Society*, Vol. 490.4, pp. 5122-5133. (preprint)	2019
25	Rein, H., **Tamayo, D.**, Brown, G.*, High-order Symplectic Integrators for Planetary Dynamics and Their Implementation in rebound, *Monthly Notices of the Royal Astronomical Society*, Vol. 489 (4), p. 4632-4640. (preprint)	2019
24	Vinson, A.M.*, **Tamayo, D.**, Hansen, B. The Chaotic Nature of TRAPPIST-1 Planetary Spin States, *Monthly Notices of the Royal Astronomical Society*, Vol. 488 (4), p. 5739-5747. (preprint)	2019
23	Rein, H., Hernandez, D.M., **Tamayo, D.**, et al. Hybrid symplectic integrators for planetary dynamics, *Monthly Notices of the Royal Astronomical Society*, Vol. 485 (4), p. 5490-5497. (preprint)	2019
22	Rein, H., **Tamayo, D.**, Hamiltonian Splittings with Jacobi and Democratic Heliocentric Coordinates, *Research Notes of the American Astronomical Society*, Vol. 3 (1). (preprint)	2019
21	Silburt, A.*, et al., including **Tamayo, D.**. Lunar crater identification via deep learning, *Icarus*, Vol. 317, p. 27-38. (preprint)	2019
20	Rein, H., **Tamayo, D.**, Vokrouhlický, D. The random walk of cars and their collision probabilities with planets, *Aerospace*, Vol 5.2 p.57. (preprint)	2018

19	Jackson, A., **Tamayo, D.**, Hammond, N., Ali-Dib, M., Rein, H. Ejection of rocky and icy material from binary star systems: Implications for the origin and composition of 1I/'Oumuamua, *Monthly Notices of the Royal Astronomical Society Letters*, Vol. 478.1, L49-53. (preprint)	2018
18	Rein, H., **Tamayo, D.**. JANUS: A bit-wise reversible integrator for N-body dynamics, *Monthly Notices of the Royal Astronomical Society*, Vol. 473.3, p. 3351-3357. (preprint)	2018
17	**Tamayo, D.**, Rein, H., Petrovich, C., Murray, N. Convergent Migration Renders TRAPPIST-1 Long-lived., *Astrophysical Journal Letters*, Vol. 840.2, L19. (preprint)	2017
16	Rein, H., **Tamayo, D.**. A new paradigm for reproducing and analyzing N-body simulations, *Monthly Notices of the Royal Astronomical Society*, Vol. 467.2, p. 2377-2383. (preprint)	2017
15	Simbulan, C.*, **Tamayo, D.**, Petrovich, C., Rein, H., Murray, N. Connecting the HL Tau System to the Observed Exoplanet Population, *Monthly Notices of the Royal Astronomical Society*, Vol. 469.3, p. 3337-3346. (preprint)	2017
14	Obertas, A.*, van Laerhoven, C., **Tamayo, D.**. The stability of tightly-packed and evenly-spaced planetary systems, *Icarus*, Vol 293, p. 52-58. (preprint)	2017
13	**Tamayo, D.**, Silburt, A.*, et al. A Machine Learns to Predict the Stability of Tightly Packed Planetary Systems, *Astrophysical Journal Letters*, Vol. 832.2. L22 (preprint)	2016
12	**Tamayo, D.**, Markham, S.R.*, Hedman, M.M, Burns, J.A., Radial profiles of the Phoebe ring: A vast debris disk around Saturn. *Icarus*, Vol. 275, p. 117-131. (preprint)	2016
11	Tiscareno, M. et al. (including **Tamayo, D.**). Observing Planetary Rings and Small Satellites with the James Webb Space Telescope: Science Justification and Observation Requirements, *Publications of the Astronomical Society of the Pacific*, Vol. 128.959, pp. 018008. (preprint)	2016
10	Rein, H., **Tamayo, D.**. Second-order Variational Equations for N-body Simulations. *Monthly Notices of the Royal Astronomical Society*, Vol. 459.3 p. 2275-2285. (preprint)	2016
9	Kostov, V.B., Moore, K.*, **Tamayo, D.**, Jayawardhana, R., Rinehart, S.A. Tatooine's Future: The Eccentric Response of Kepler's Circumbinary Planets to Common-Envelope Evolution of Their Host Stars, *Astrophysical Journal*, Vol 832.2. (preprint)	2016
8	**Tamayo, D.**, Triaud, A.H.M.J., Menou, K., Rein, H. Dynamical Stability of Imaged Planetary Systems in Formation: Application to HL Tau. *Astrophysical Journal*, Vol. 805 (2), 100. (preprint)	2015
7	Cloutier, R*., **Tamayo, D.**, Valencia, D., Could Jupiter or Saturn Have Ejected a fifth giant planet?. *Astrophysical Journal*, Vol. 813.1. (preprint)	2015
6	Rein, H., **Tamayo, D.** WHFAST: A fast and unbiased implementation of a symplectic Wisdom-Holman integrator for long-term gravitational simulations. *Monthly Notices of the Royal Astronomical Society*, Vol. 452.1 p. 376-388. (preprint)	2015
5	**Tamayo, D.**, Hedman, M.M., Burns, J.A. First Observations of the Phoebe Ring in Optical Light. *Icarus*, Vol. 233, p. 1-8. (preprint)	2014
4	**Tamayo, D.** Consequences of an Eccentric Orbit for Fomalhaut b. *Monthly Notices of the Royal Astronomical Society*, Vol. 438, Issue 4, p. 3577-3586. (preprint)	2014
3	**Tamayo, D.**, Burns, J.A., Hamilton, D.P. Chaotic Dust Dynamics and Implications for the Hemispherical Color Asymmetries of the Uranian Satellites. *Icarus*, Vol. 226, Issue 1, p. 655-662. (preprint)	2013
2	**Tamayo, D.**, Burns, J.A., Hamilton, D.P., Nicholson, P.D. Dynamical Instabilities in High-Obliquity Systems. *Astronomical Journal*, Vol. 145, Issue 3, id. 54, 12 pp. (preprint)	2013
1	**Tamayo, D.**, Burns, J.A., Hamilton, D.P., Hedman, M.M. Finding the Trigger to Iapetus' Odd Global Albedo Pattern: Dynamics of Dust from Saturn's Irregular Satellites. *Icarus*, Volume 215, Issue 1, p. 260-278. (preprint)	2011

* Student

References

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