Ryota Nakano – Curriculum Vitae

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Education

Ph.D. student in Aerospace Engineering, Auburn University Aug. 2019 - Dec. 2024 (Expected)
GPA: 4.00/4.00

B.S., Aerospace Engineering, The University of Alabama in Huntsville May 2019
GPA: 3.99/4.00, Summa Cum Laude

Professional Experience

Graduate Research Assistant, STAR Lab, Auburn University Aug. 2019 - Present
Advisor: Prof. Masatoshi Hirabayashi

Graduate Teaching Assistant, Auburn University Aug. 2019 - May 2020

Undergraduate Research Assistant, UAHuntsville

- **Autonomous Tracking and Optical Measurements Lab** May 2018 - May 2019
  Advisor: Prof. Chang-kwon Kang
- **Plasma and Electrodynamics Research Lab** Oct. 2016 - Jul. 2018
  Advisor: Prof. Gabe Xu

Research Topics/Projects

Numerical investigation of Binary-YORP effect Jan. 2022 - Present

- Investigating the BYORP effect in unprecedented detail by combining the dynamical and thermophysical models
- Publications: (C3)

Thermophysical modeling of celestial bodies May 2020 - Present

- Developing a Finite Element Method approach 3D thermophysical model to investigate the Yarkovsky and YORP effects
- Publications: (J2)

Dynamics modeling of binary asteroid systems Aug. 2019 - Present

- Investigating how shape modification affects mutual body dynamics
- NASA/DART Dynamics Working Group member
- Publications: (J1),(J3)-(J7), (C1), (C2), (C5)

Structural analysis of small solar system bodies Aug. 2019 - Present

- Developed a semi-analytical model to predict the rotationally induced structural failure condition of small bodies
- Publications: (J8)-(J10), (C6), (C7)

Marsbee Project - NIAC 2018 Phase-I May 2018 - May 2019

- Role: Undergraduate Research Assistant
- Developed 6-DoF computational model that couples the flight dynamics and aerodynamics of insect-scale flapping wing vehicles

Development of a metronome thrust stand Aug. 2017 - Jul. 2018

- Proposed the metronome configuration as a unique design solution and archived significant reduction in size compared to traditional thrust stands
- Publications: (C8)

Development of cylindrical Hall effect thruster Oct. 2016 - Jul. 2018

- Developed a thruster for small satellites using 3D-printed materials
- Publications: (C8)

Awards/Fellowships

Small Body Assessment Group (SBAG) Meeting Participation Stipend Jun. 2022

- Awarded $2,000 from SBAG to attend 27th SBAG meeting in Washington D.C.

Division of Dynamical Astronomy (DDA) Supplemental Travel Grant Apr. 2022

- Awarded $750 from DDA to attend 53rd DDA meeting in Manhattan, NY.

NASA FINESST 2022 - 2024

- Proposal title: *BYORP's Nightmare Induced by Geophysical and Dynamical Properties of Binary Asteroids Revealed by FEM Approach*
- Total of $135,000 research funding (including supports for stipend, tuition, travel)

1st Place in NESF Student Poster Competition Jul. 2020

- Awarded for: *Mass-shedding Activities of Asteroid (3200) Phaethon Enhanced by Its Rotation* at NASA Exploration Science Forum

Presidential Graduate Research Fellowship 2019 – 2022

- Three-year full-funding for graduate study from Auburn University

Undergraduate Super Scholar Transfer Scholarship 2016 – 2018

- Two-year stipend funding for undergraduate study from UAHuntsville

Journal Publication

(J1) (Submitted) A. Cheng and 68 authors (**R. Nakano**, the 34th author), "Momentum Transfer from the DART Mission Kinetic Impact on Asteroid Dimorphos"

(J2) (Submitted) **R. Nakano** and M. Hirabayashi, "Finite Element Method Approach 3-Dimensional Thermophysical Model for YORP torque computation"

(J3) A. J. Meyer and 7 authors (**R. Nakano**, the 7th author), "Energy Dissipation in Synchronous Binary Asteroids," Icarus, 391, 2023, doi: 10.1016/j.icarus.2022.115323

(J4) T. S. Statler and 40 authors (**R. Nakano**, the 27th author), "After DART: Using the first full-scale test of a kinetic impactor to inform a future planetary defense mission," The Planetary Science Journal, 3, 244, 2022, doi:10.3847/PSJ/ac94c1

(J5) D. C. Richardson and 35 authors (**R. Nakano**, the 25th author), "Predictions for the Dynamical States of the Didymos System Before and After the Planned DART Impact," The Planetary Science Journal, 3, 157, 2022, doi:10.3847/PSJ/ac76c9

(J6) **R. Nakano** and 8 authors, "NASA/Double Asteroid Redirection Test (DART): Mutual Orbital Period Change Due to Reshaping in the Near-Earth Binary Asteroid System (65803) Didymos," The Planetary Science Journal, 3, 148, 2022, doi: 10.3847/PSJ/ac7566

(J7) M. Hirabayashi and 13 authors (**R. Nakano**, the 4th author), "Double Asteroid Redirection Test (DART): Structural and dynamic interactions between asteroidal elements of Binary Asteroid (65803) Didymos," The Planetary Science Journal, 3, 140, 2022, doi: 10.3847/PSJ/ac6eff

(J8) P. M. Jackson, **R. Nakano**, Y. Kim, and M. Hirabayashi, "Active Main-Belt Asteroid (6478) Gault – Constraint on Its Cohesive Strength and the Fate of Ejected Particles in the Solar System," The Planetary Science Journal, 3, 16, 2022, doi: 10.3847/PSJ/ac4031

(J9) M. Hirabayashi, **R. Nakano**, and 15 authors, "Spin-driven evolution of asteroids' top-shapes at fast and slow spins as seen from (101955) Bennu and (162173) Ryugu," Icarus, 352, 2020, doi: 10.1016/j.icarus.2020.113946

(J10) **R. Nakano** and M. Hirabayashi, "Mass-shedding Activities of Asteroid (3200) Phaethon Enhanced by Its Rotation," The Astrophysical Journal Letters, 899(2), L22, 2020, doi: 10.3847/2041-8213/ab7d36

Selected Conference Proceedings

(C1) **R. Nakano** and 23 authors, "NASA's Double Asteroid Redirection Test (DART): Orbit perturbations due to Dimorphos's reshaping and mass loss after the DART impact," *IAA Planetary Defense Conference*, Vienna, Austria, 2023

(C2) **R. Nakano** and 24 authors, "NASA's DART Impact: Reshaping-induced Mutual Orbit Perturbation on (65803) Didymos," *American Geophysical Union Fall Meeting*, Chicago, IL, 2022

(C3) **R. Nakano**, M. Hirabayashi, and S.A. Jacobson, "Oscillatory variation in Binary-YORP revealed by a FEM-based BYORP model," *Division for Planetary Sciences Meeting*, London, Canada, 2022

(C4) **R. Nakano**, Ehsan Taheri, and M. Hirabayashi, "Time-Optimal and Fuel-Optimal Trajectories for Asteroid Landing via Indirect Optimization," *AIAA SciTech Forum and Exposition*, San Diego, CA, 2022, AIAA 2022-1128, doi: 10.2514/6.2022-1128

(C5) **R. Nakano** and M. Hirabayashi, "NASA/Double Asteroid Redirection Test: Orbital perturbation by the ejecta-collision driven reshaping of Didymos after the impact event," *7th IAA Planetary Defense Conference*, virtual meeting, 2021

(C6) M. Hirabayashi, **R. Nakano**, and 15 authors, "Spin-driven evolution of asteroids' top-shapes at fast and slow spins as seen from (101955) Bennu and (162173) Ryugu,' *AAS Division for Planetary Science Meeting*, virtual meeting, 2020

(C7) **R. Nakano** and M. Hirabayashi, "Mass-shedding Activities of Asteroid (3200) Phaethon Enhanced by Its Rotation," *NASA Exploration Science Forum*, virtual meeting, 2020

(C8) **R. Nakano** and K.G. Xu, "Development of a Metronome Thrust Stand for Miniature Electric Propulsion," *AIAA Propulsion and Energy Forum*, Cincinnati, OH, 2018, doi: 10.2514/6.2018-4517

Selected Leadership, Service, Outreach, Teaching

Referee for PSJ, A&A	Feb. 2022 - Present
College of Engineering E-day	Feb. 2022
Aerospace Engineering Department Open House	Sep. 2019 and Sep. 2021
Teaching Assistant: AERO 3220 – Aerospace Systems	Spring 2021
Teaching Assistant: ENGR 2350 – Dynamics	Fall 2019
GRAND Engineering Research Showcase	Sep. 2019