

## Kenshiro (Ken) Oguri

Colorado Center for Astrodynamics Research (CCAR)  
Department of Aerospace Engineering Sciences  
University of Colorado Boulder  
Boulder, CO 80303, USA

Citizenship: Japan  
Email: kenshiro.oguri {at} colorado.edu  
Website: <http://labusers.net/~kenoguri/>

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EDUCATION	<b>Ph.D. in Aerospace Engineering Sciences</b> <b>University of Colorado Boulder, USA</b> Advisor: Jay W. McMahon Thesis (draft): <i>Risk-aware Mission Design around Small Celestial Bodies</i>	Spring 2021 (expected)
	<b>M.S. &amp; B.S. in Aeronautics and Astronautics</b> <b>The University of Tokyo, Japan</b> Advisor: Shin-ichi Nakasuka and Ryu Funase	Mar 2017 & Mar 2015
PROFESSIONAL EXPERIENCE	<b>NASA JPL visiting student researcher</b> Outer planet mission analysis group, Mission design and navigation section Supervisors: Gregory Lantoine & Jon Sims	Sept – Nov 2019
	<b>NASA JPL visiting student researcher</b> Outer planet mission analysis group, Mission design and navigation section Supervisors: Gregory Lantoine & Jon Sims	June – Aug 2018
	<b>CCAR graduate research assistant</b> Colorado Center for Astrodynamics Research, University of Colorado Boulder	Aug 2017 – Present
	<b>JSPS DC1 research fellow</b> Japan Society for the Promotion of Science (JSPS)	Apr 2017 – Aug 2017
	<b>JAXA ISAS assistant researcher</b> Institute of Space and Astronautical Science, JAXA	Apr 2015 – Aug 2017
RESEARCH TOPICS	<b>Stochastic optimal control for robust mission design under uncertainty</b> – Combining astrodynamics + stochastic optimal control + optimization for mission design – Related publications: (J1), (J2), (C1), (C2), (C3), (C4), (C5)	Nov 2017 – Present
	<b>Non-Keplerian dynamics around small celestial bodies</b> – Analysis of complex dynamics around small bodies with application to science orbit design – Related publications: (J3), (C7)	Aug 2018 – Present
	<b>Solar Radiation Pressure–based orbit control</b> – Optimal orbit control law & trajectory optimization for solar sailing (interplanetary transfers & small-body proximity operations) – Related publications: (J4), (C6), (C8), (C9)	Aug 2017 – Present
	<b>Solar sail attitude-orbit coupled dynamics modeling &amp; control</b> – Precise modeling & optimal control of attitude-orbit coupled dynamics under sail deformation – Related publications: (C11), (C12), (C13), (C16)	Apr 2015 – Aug 2017
NASA PROJECTS	<b>NEA Scout mission</b> <a href="#">[URL]</a> – NASA CubeSat solar sailing mission to explore Near-Earth Asteroids (NEAs)	Sept – Nov 2019

- Role: Visiting student researcher, *SRP-based Orbit Control for Solar Sailing missions*
- Developed solar sailing trajectory indirect optimization techniques & missed-thrust analysis
- Related publications: to appear

**Psyche mission** [\[URL\]](#) June – Aug 2018

- NASA discovery mission program (*Psyche: Journey to a Metal World*)
- Role: Visiting student researcher, *Investigating non-Keplerian dynamics around Psyche*
- Analysis of the highly-perturbed dynamics & science orbit design around (16) Psyche
- Related publications: (J3), (C7)

**Dismantling rubble pile asteroids with AoES** [\[URL\]](#) Aug 2017 – Present

- NASA Innovative Advanced Concepts (NIAC) program (Phase I & II)
- Role: Graduate research assistant
- AoES mission design; guidance & control analysis for SRP-based landing on asteroids
- Related publications: (J4), (C9), (C14)

JAXA  
PROJECTS

**EQUULEUS: Equilibrium Lunar-Earth point 6U Spacecraft** [\[URL\]](#) Jan 2016 – Present

- JAXA CubeSat mission to explore cislunar space with low energy transfer
- Role: Project engineer lead & mission designer
- High-level design of mission concept & spacecraft system; design of transfer trajectories & science orbits; station-keeping analysis on EML2 NRHOs
- Related publications: (J5), (J7), (C10)

**PROCYON: Proximate Object Close Flyby with Optical Navigation** [\[URL\]](#) Apr 2014 – Aug 2017

- JAXA small-sat mission that successfully explored deep space for the first time as a small sat
- Role: Spacecraft Guidance, Navigation & Control (GNC) engineer
- GNC flight data analysis & GNC flight software development
- Related publications: (J6), (J8), (C17)

INDIVIDUAL  
AWARDS

**AAS GNC conference student paper competition 2nd place** [\[URL\]](#) Feb 2020  
Awarded for paper *Autonomous Guidance for Robust Achievement of Science Observations around Small Bodies*, from American Astronautical Society Rocky Mountain Section

**CCAR Bahls Endowed Funds – Travel Award** [\[URL\]](#) Jan 2019  
Awarded for paper *Science Orbit Design with Frozen Beta angle: Theory and Application to Psyche mission*, from Colorado Center for Astrodynamics Research

**AAS John V. Breakwell student award** [\[URL\]](#) Aug 2018  
Awarded for paper *SRP-based Orbit Control with Application to Small Body Landing*, from Space Flight Mechanics committee, American Astronautical Society

**UTokyo tuition fee half exemption for outstanding students** Apr 2017  
Awarded from the University of Tokyo.

**JSASS outstanding Student Presentation Award** Oct 2016  
Awarded for paper *Time-optimal Attitude Control with Application to Orbit Control of Spinning Solar Sail Driven by Reflectivity Control*, from Japan Society for Aeronautical and Space Sciences

**Travel awards for conference attendance abroad** Feb, June, July 2016  
Awarded from Ministry of Education, Culture, Sports, Science and Technology, Japan; Tokyo electric power company holdings memorial foundation, Japan; Murata science foundation, Japan

GROUP  
AWARDS

**Japanese Government MEXT Commendation for Science and Technology** Mar 2017

Awarded for PROCYON project team from Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan.

**UTokyo University President's Award** Mar 2015  
Awarded for PROCYON project team from the University of Tokyo.

FELLOWSHIPS **Masason foundation fellowship** FY2017 – FY2021  
Awarded from Masason foundation, Japan [\[URL\]](#).

**Study abroad fellowship** FY2017 – FY2018  
Awarded from Nakajima science foundation, Japan [\[URL\]](#).

**CU Boulder Aerospace Departmental fellowship** Aug 2017  
Awarded from University of Colorado Boulder.

**JSPS DC1 research fellowship for young scientist** Apr – Aug 2017  
One of the most prestigious fellowship awarded for Ph.D. students in Japan from Japan Society for the Promotion of Science (\*Terminated when leaving the position at UTokyo to start study abroad)

**Japanese Government MEXT fellowship** Apr 2015 – Mar 2017  
Awarded from Ministry of Education, Culture, Sports, Science and Technology, Japan

RESEARCH GRANTS **Research grant for Masason fellows** FY2017 – FY2020  
Awarded from Masason foundation, Japan

**JSPS Grants-in-Aid for Scientific Research <KAKENHI>** FY2017 – FY2019\*  
Awarded from Japan Society for the Promotion of Science (\*Terminated when leaving the position at UTokyo to start study abroad)

- JOURNAL PUBLICATIONS
- (J1) **K. Oguri** and J. W. McMahon. Stochastic Primer Vector for Robust Low-thrust Trajectory Design under Uncertainty. *Journal of Guidance, Control, and Dynamics*, in preparation
  - (J2) **K. Oguri** and J. W. McMahon. Robust Spacecraft Guidance around Small Bodies under Uncertainty: Stochastic Optimal Control Approach. *Journal of Guidance, Control, and Dynamics*, under review, 2020
  - (J3) **K. Oguri**, G. Lantoine, W. Hart, and J. McMahon. Science orbit design with a quasi-frozen beta angle: effects of body obliquity on J2-perturbed dynamics. *Celestial Mechanics and Dynamical Astronomy*, 132(10):48, Oct. 2020. doi: 10.1007/s10569-020-09987-z [\[URL\]](#)
  - (J4) **K. Oguri** and J. W. McMahon. Solar Radiation Pressure–Based Orbit Control with Application to Small-Body Landing. *Journal of Guidance, Control, and Dynamics*, 43(2):195–211, Feb. 2020. doi: 10.2514/1.G004489 [\[URL\]](#)
  - (J5) **K. Oguri**, K. Oshima, S. Campagnola, K. Kakihara, N. Ozaki, N. Baresi, Y. Kawakatsu, and R. Funase. EQUULEUS Trajectory Design. *The Journal of the Astronautical Sciences*, 67(3): 950–976, Sept. 2020. doi: 10.1007/s40295-019-00206-y [\[URL\]](#)
  - (J6) S. Ikari, T. Ito, **K. Oguri**, T. Inamori, S. Sakai, Y. Kawakatsu, A. Tomiki, and R. Funase. In Orbit Demonstration of a FDIR Algorithm for the Attitude Control System of Micro Interplanetary Spacecraft PROCYON. *Journal of the Japan Society for Aeronautical and Space Sciences*, 68 (2):89–95, 2020. doi: 10.2322/jjsass.68.89 (Japanese) [\[URL\]](#)
  - (J7) S. Campagnola, J. Hernando-ayuso, K. Kakihara, Y. Kawabata, T. Chikazawa, R. Funase, N. Ozaki, N. Baresi, T. Hashimoto, Y. Kawakatsu, T. Ikenaga, **K. Oguri**, and K. Oshima. Mission Analysis for the EM-1 CubeSats EQUULEUS and OMOTENASHI. *IEEE Aerospace and Electronic Systems Magazine*, 34(4):38–44, Apr. 2019. doi: 10.1109/MAES.2019.2916291 [\[URL\]](#)
  - (J8) S. Ikari, T. Inamori, T. Ito, K. Ariu, **K. Oguri**, M. Fujimoto, S. Sakai, Y. Kawakatsu, and

R. Funase. Attitude Determination and Control System for the PROCYON Micro-Spacecraft. *Transactions of the Japan Society for Aeronautical and Space Sciences*, 60(3):181–191, 2017. doi: 10.2322/tjsass.60.181 [\[URL\]](#)

CONFERENCE  
PROCEEDINGS  
(SELECTED)

- (C1) **K. Oguri** and J. W. McMahon. Stochastic Primer Vector for Robust Impulsive Trajectory Design Under Uncertainty. In *AAS/AIAA Astrodynamics Specialist Conference*, South Lake Tahoe, CA (Virtual), Aug. 2020
- (C2) **K. Oguri** and J. W. McMahon. Autonomous Guidance for Robust Achievement of Science Observations around Small Bodies. In *AAS Guidance, Navigation, and Control conference*, Breckenridge, Colorado, Feb. 2020, **2nd place in AAS GNC conference student paper competition**
- (C3) **K. Oguri**, M. Ono, and J. W. McMahon. Convex Optimization over Sequential Linear Feedback Policies with Continuous-time Chance Constraints. In *2019 IEEE 58th Conference on Decision and Control (CDC)*, pages 6325–6331, Nice, France, Dec. 2019. IEEE. doi: 10.1109/CDC40024.2019.9029604
- (C4) **K. Oguri** and J. W. McMahon. Risk-aware Trajectory Design with Impulsive Maneuvers: Convex Optimization Approach. In *AAS/AIAA Astrodynamics Specialist Conference*, Portland, ME, 2019
- (C5) **K. Oguri** and J. W. McMahon. Risk-aware Trajectory Design with Continuous Thrust: Primer Vector Theory Approach. In *AAS/AIAA Astrodynamics Specialist Conference*, Portland, ME, 2019
- (C6) **K. Oguri** and J. W. McMahon. SRP-based Orbit Control for Asteroid Exploration. In *32nd International Symposium on Space Technology and Science*, Fukui, Japan, 2019
- (C7) **K. Oguri**, G. Lantoine, B. Hart, and J. W. McMahon. Science Orbit Design with Frozen Beta angle: Theory and Application to Psyche mission. In *AAS/AIAA Space Flight Mechanics Meeting*, Ka’anapali, HI, 2019, **Bahls Endowed Funds Travel Award**
- (C8) **K. Oguri** and J. W. McMahon. SRP-based Orbit Control with Application to Orbit Stationkeeping at Small Bodies. In *AAS/AIAA Space Flight Mechanics Meetings Space Flight*, Ka’anapali, HI, 2019,
- (C9) **K. Oguri** and J. W. McMahon. SRP-based Orbit Control with Application to Small Body Landing. In *AAS/AIAA Astrodynamics Specialist Conference*, Snowbird, UT, 2018, **John V. Breakwell student award**
- (C10) **K. Oguri**, K. Kakihara, S. Campagnola, N. Ozaki, K. Oshima, T. Yamaguchi, and R. Funase. EQUULEUS Mission Analysis: Design of the Science Orbit Phase. In *International Symposium on Space Flight Dynamics*, Ehime, Japan, June 2017
- (C11) **K. Oguri**, A. Ishikawa, S. Ikari, T. Kudo, and R. Funase. Precision Evaluation of Reduced Dynamics Model for Non-uniform Spinning Solar Sail Driven by Reflectivity Control. In *4th International Symposium on Solar Sailing, 17045*, Kyoto, Japan, 2017
- (C12) **K. Oguri** and R. Funase. Time-optimal Attitude Control Law with a Strategy of Applying to Orbital Control for Spinning Solar Sail Driven by Reflectivity Control. *Advances in the Astronautical Sciences*, 158:933–951, 2016
- (C13) **K. Oguri**, T. Kudo, and R. Funase. Time-Optimal Attitude Control and its Application to Orbital Control of Spinning Solar Sail Driven by Reflectivity Control. In *60th Space Sciences and Technology Conference, 2016-P34*, Hokkaido, Japan, 2016, **Outstanding student presentation award**
- (C14) J. McMahon, S. K. Mitchell, **K. Oguri**, N. Kellaris, D. Kuettel, C. Keplinger, and B. Bercovici. Area-of-Effect Softbots (AoES) for Asteroid Proximity Operations. In *2019 IEEE Aerospace Conference*, pages 1–16, Big Sky, Montana, Mar. 2019. IEEE. doi: 10.1109/AERO.2019.8741680
- (C15) S. Campagnola, J. Hernando-ayuso, N. Ozaki, N. Baresi, T. Hashimoto, Y. Kawakatsu, K. Kakihara, Y. Kawabata, T. Chikazawa, R. Funase, T. Ikenaga, **K. Oguri**, and K. Oshima. Mission analysis for the EM-1 CubeSats EQUULEUS and OMOTENASHI. In *69th International Astronautical Congress*, 2018
- (C16) A. Ishikawa, **K. Oguri**, S. Ikari, R. Funase, and S. Nakasuka. Estimation of Shape and

- Optical Parameters of Spinning Solar Sail Equipped with Reflectivity Control Devices. In *26th International Symposium on Space Flight Dynamics*, pages 1–6, 2017
- (C17) T. Ito, S. Ikari, **K. Oguri**, M. Fujimoto, K. Ariu, Y. Kawabata, T. Inamori, S. Sakai, Y. Kawakatsu, and R. Funase. Preliminary Study of Angular Momentum Control by Solar Radiation Pressure for 50 kg-class Spacecraft PROCYON. In *59th Space Sciences and Technology Conference, 2015-3J08*, pages 1–6, Kagoshima, Japan, 2015, **Young researcher award**

INVITED TALKS “Robust in-situ Asteroid Exploration,” at *JAXA ISAS Planetary Exploration Workshop*, Sagamihara, Japan (Virtual), 2020.

- PRESENTATIONS (P1) “Autonomous Guidance for Robust Achievement of Science Observations around Small Bodies,” at *AAS Guidance, Navigation, and Control conference*, Breckenridge, Colorado, 2020.
- (P2) “Convex Optimization over Sequential Linear Feedback Policies with Continuous-time Chance Constraints,” at *2019 IEEE Conference on Decision and Control*, Nice, France, 2019.
- (P3) “Risk-aware Trajectory Design with Continuous Thrust: Primer Vector Theory Approach,” at *AAS/AIAA Astrodynamics Specialist Conference, AAS 19-912*, Portland, ME, 2019.
- (P4) “Risk-aware Trajectory Design with Impulsive Maneuvers: Convex Optimization Approach,” at *AAS/AIAA Astrodynamics Specialist Conference, AAS 19-893*, Portland, ME, 2019.
- (P5) “SRP-based Orbit Control for Asteroid Exploration”, at *32nd International Symposium on Space Technology and Science, ISTS 2019-d-021*, Fukui, Japan, 2019.
- (P6) “Science Orbit Design with Frozen Beta angle: Theory and Application to Psyche mission”, at *2019 AAS/AIAA Space Flight Mechanics Meeting, AAS 19-269*, Ka’anapali, HI, 2019.
- (P7) “SRP-based Orbit Control with Application to Orbit Stationkeeping at Small Bodies”, at *2019 AAS/AIAA Space Flight Mechanics Meeting, AAS 19-415*, Ka’anapali, HI, 2019.
- (P8) “SRP-based Orbit Control with Application to Small body Landing”, at *2018 AAS/AIAA Astrodynamics Specialist Conference, AAS 18-375*, Snowbird, UT, 2018.
- (P9) “EQUULEUS Mission Analysis: Design of the Science Orbit Phase”, at *26th International Symposium on Space Flight Dynamics, ISSFD-2017-072*, Ehime, Japan, 2017.
- (P10) “Precision Evaluation of Reduced Dynamics Model for Non-uniform Spinning Solar Sail Driven by Reflectivity Control”, at *4th International Symposium on Solar Sailing, ISSS-17045*, Kyoto, Japan, 2017.
- (P11) “Attitude Maneuverability Estimation for Preliminary Mission Design of Spinning Solar Sail Driven by Reflectivity Control” at *the AIAA/AAS Astrodynamics Specialist Conference, AIAA2016-5674*, Long Beach, California, 2016.
- (P12) “Optimal Attitude and Orbital Control Strategy of Spinning Solar Sail Spacecraft via Reflectivity Control” at *26th AAS/AIAA Space Flight Mechanics Meeting, AAS 16-329*, Napa, California, 2016.
- (P13) “On-Orbit Estimation of ADCS Parameters for micro-astrometry satellite ‘Nano-JASMINE’” at *59th Space Sciences and Technology Conference, 2015-3J13*, Kagoshima, Japan, 2015.
- (P14) “Time-Optimal Attitude Control of Spinning Solar Sail by Reflectivity Control” at *25th Workshop on JAXA Astrodynamics and Flight Mechanics, 2015-C-11*, Kanagawa, Japan, 2015.
- (P15) “Optimal Attitude Control of Spinning Solar Sail with Reflectivity Control” at *30th International Symposium on Space Technology and Science, 2015-d-26*, Kobe, Japan, 2015.
- (P16) “Mission Concept and System Design of World-First Cis-Lunar Space Exploration CubeSat EQUULEUS”, at *17th ISAS/JAXA Space Science Symposium, 2016-P-24*, Kanagawa, Japan, 2017.
- (P17) “Time-Optimal Attitude Control and its Application to Orbital Control of Spinning Solar Sail Driven by Reflectivity Control” at *60th Space Sciences and Technology Conference, 2016-P34*, Hokkaido, Japan, 2016. **Outstanding student presentation award**

MISCELLANEOUS **Membership:** AAS, AIAA, IEEE, SIAM, JSASS  
**Journal referee:** AIAA JGCD, ASR  
**Programming:** Python, Matlab, C, C++

**Software:** SNOPT [\[URL\]](#), CVX [\[URL\]](#), SPICE, Mathematica, GMAT

**Graduate course highlights:** Celestial Mechanics; Convex Optimization (applied math); Probabilistic Algorithms for Aerospace Autonomy; Statistical Orbit Determination; Space Vehicle Guidance and Control; Interplanetary Mission Design; Statistical Estimation for Dynamical Systems

Last updated: October 12, 2020