

# Kenshiro Oguri (Ken)

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## EDUCATION

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### Ph.D. student (2017-2020 (expected))

Department of Aerospace Engineering Sciences, **University of Colorado Boulder**, CO, USA  
Advisor: Prof. Jay McMahon

### M.S. (2017) & B.S. (2015) in Aeronautics and Astronautics

Department of Aeronautics and Astronautics, **the University of Tokyo**, Japan  
Advisor: Prof. Shin-ichi Nakasuka and Prof. Ryu Funase  
Master thesis: "*Optimal Attitude and Trajectory Control for Spinning Solar Sails Steered by Reflectivity Control Devices Considering Arbitrary Membrane Deformation*"

## PROFESSIONAL EXPERIENCE

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**NASA JPL visiting student researcher (2019)**, outer planet mission analysis (mentor: Dr. Gregory Lantoine & Dr. Jon Sims)  
• “SRP-based Orbit Control for Solar Sailing missions”

**NASA JPL visiting student researcher (2018)**, outer planet mission analysis (mentor: Dr. Gregory Lantoine & Dr. Jon Sims)  
• “Investigating non-Keplerian dynamics around Psyche”: science orbit design for the Psyche mission

**CCAR graduate research assistant (2017-present)**, CCAR, University of Colorado Boulder  
• Risk-aware trajectory design around asteroids; SRP-based orbit control around asteroids; NIAC 2017 project

**JSPS DC1 research fellow (2017)**, Japan Society for the Promotion of Science (JSPS)  
• Attitude control & trajectory design of solar sailing spacecraft

**JAXA ISAS assistant researcher (2015-2017)**, Institute of Space and Astronautical Science, JAXA  
• Trajectory & system design for deep-space small-sat projects (PROCYON and EQUULEUS projects)

**UTokyo graduate teaching assistant (2016)**, Department of Aero&Astro, The University of Tokyo  
• “Exercise in Space Engineering” (junior-level class on space mission design)

## PROJECTS

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**Psyche mission (Summer 2018) [URL]**, PI: Dr. L. Elkins-Tanton (ASU)  
• NASA discovery mission program (*Psyche: Journey to a Metal World*)  
• role – *visiting student researcher*: science orbit design around a metal asteroid (16) Psyche

**NIAC 2017: Dismantling Rubble Pile Asteroids with AoES (2017-present) [URL]**, PI: Prof. J. McMahon (CU Boulder)  
• funded by NASA Innovative Advanced Concepts (NIAC) program (Phase I & II)  
• role – *graduate research assistant*: trajectory design & mission analysis around small asteroids

**EQUULEUS<sup>1</sup> (2016-present) [URL]**, PI: Prof. T. Hashimoto & Prof. R. Funase (JAXA/UTokyo)  
• JAXA’s CubeSat mission to explore cis-lunar space with low energy transfer, one of 13 CubeSat payloads on NASA’s SLS-EM1  
• role – *project engineer lead*: high-level mission & system design; *mission analysis engineer*: trajectory design & mission analysis; quasi-halo orbit design in ephemeris & stationkeeping control

**Guidance & Control of solar sailing spacecraft (2014-2017)**, PI: Prof. R. Funase (UTokyo)  
• collaboration with ISAS/JAXA solar sail working group  
• role – *JSPS researcher*: guidance & control algorithm for attitude-orbit coupled dynamics, interplanetary trajectory design

**PROCYON<sup>2</sup> (2014-2017) [URL]**, PI: Prof. R. Funase & Prof. Y. Kawakatsu (UTokyo/JAXA)  
• JAXA’s small-sat mission, the world-first 50kg-class deep-space explorer, successfully launched and operated  
• role – *attitude control system engineer*: flight data analysis & flight software development

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<sup>1</sup>EQUULEUS: Equilibrium Lunar-Earth point 6U Spacecraft

<sup>2</sup>PROCYON: Proximate Object Close Flyby with Optical Navigation

## AWARDS

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### Individual awards

**Bahls Endowed Funds – Travel Award (2019)** [URL], from Colorado Center for Astrodynamics Research. Paper title: *Science Orbit Design with Frozen Beta angle: Theory and Application to Psyche mission*

**John V. Breakwell student award (2018)** [URL], from American Astronautical Society. Paper title: “SRP-based Orbit Control with Application to Small Body Landing”

**Tuition fee half exemption for outstanding students (2017)**, from the University of Tokyo.

**Outstanding Student Presentation Award (2016)**, from Japan Society for Aeronautical and Space Sciences. Paper title: “Time-Optimal Attitude Control and its Application to Orbital Control of Spinning Solar Sail Driven by Reflectivity Control”

**Travel awards for international conference attendance (2016)**, from Tokyo electric power company holdings memorial foundation (~\$2,000); from Murata science foundation, Japan (~\$1,200); from Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan (~\$4,000)

**Young Researcher Award (2015)**, from Japan Society for Aeronautical and Space Sciences, as the third author. Paper title: “Preliminary Study of Angular Momentum Control by Solar Radiation Pressure for 50 kg-class Spacecraft PROCYON”

### Group awards

**Japanese government MEXT<sup>3</sup> Commendation for Science and Technology (2017)**, for PROCYON project.

**The University of Tokyo President Award (2015)**, for PROCYON project.

### Fellowships

**Study abroad fellowship (2017-2019)**, from Nakajima science foundation, Japan [URL; Japanese]. Cover tuition and monthly stipend for two years; selection ratio ~14%

**Masason foundation fellowship (2017-2021)**, from Masason foundation, Japan [URL]. Cover tuition and monthly stipend and provide research grant as needed for five years; selection ratio ~8.7%.

**Departmental fellowship (2017)**, from Department of Aerospace Engineering Sciences, University of Colorado Boulder. \$5,000.

**JSPS DC1 research fellowship for young scientist (2017)**, from Japan Society for the Promotion of Science [URL]. *The most prestigious fellowship for Ph.D. students in Japan.* Cover monthly stipend and provide research grant for three years (declined when leaving UTokyo to start study abroad); selection ratio ~20%

**Japanese Government MEXT fellowship (2015-2017)**, from Ministry of Education, Culture, Sports, Science and Technology, Japan [URL]. Provide monthly stipend for two years.

### Research grants

**Research grant for foundation members (FY2017, 2018)**, from Masason foundation, Japan. FY2017 ~\$3,000; FY2018 ~\$5,000 (up to ~\$50,000/year)

**Grants-in-Aid for Scientific Research <KAKENHI> (FY2017)**, from Japan Society for the Promotion of Science. Total budget up to ~\$30,000/3year (declined when leaving UTokyo to start study abroad)

## PEER-REVIEWED JOURNAL PUBLICATIONS

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1. K. Oguri and J. W. McMahon. Solar Radiation Pressure based Orbit Control with Application to Small Body Landing. *Journal of Guidance, Control, and Dynamics*, submitted; reviews received with minor revision.
2. K. Oguri, K. Oshima, S. Campagnola, K. Kakihara, N. Ozaki, N. Baresi, Y. Kawakatsu, R. Funase, EQUULEUS Trajectory Design, *The Journal of the Astronautical Sciences*, accepted with minor corrections; revision submitted.
3. 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(10):38–44, 2019
4. S. Ikari, T. Inamori, T. Ito, K. Ariu, K. Oguri, et.al, Attitude Determination and Control System for the Micro Spacecraft PROCYON, *Transactions of the Japan Society for Aeronautical and Space Sciences*.

<sup>3</sup>MEXT: Ministry of Education, Culture, Sports, Science and Technology

## CONFERENCE PROCEEDINGS

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### First author (selected)

1. K. Oguri, M. Ono, and J. W. McMahon. Convex Optimization over Sequential Linear Feedback Policies with Continuous-time Chance Constraints. In *2019 IEEE Conference on Decision and Control, accepted.*, Nice, France, 2019
2. 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
3. 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
4. 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
5. 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**
6. K. Oguri and J. W. McMahon. SRP-based Orbit Control with Application to Orbit Stationkeeping at Small Bodies. In *AAS/AIAA Space Flight Mechanics Meeting*, Ka'anapali, HI, 2019,
7. 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**
8. 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 *26th International Symposium on Space Flight Dynamics*, Ehime, Japan, 2017
9. 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
10. K. Oguri, T. Kudo, and R. Funase. Design Criteria of Reflectivity Control System Under Uncertainty in Sail Property for Maneuverability Requirement of Spinning Solar Sail. In *AIAA/AAS Astrodynamics Specialist Conference, AIAA2016-5674*, Long beach, CA, 2016
11. 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 (also paper of 26th AAS/AIAA Space Flight Mechanics Meetings, AAS 16-329)*, 158:933–951, 2016
12. 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**
13. K. Oguri, T. Furumoto, and R. Funase. Optimal Attitude Control of Spinning Solar Sail with Reflectivity Control. In *30th International Symposium on Space Technology and Science, 2015-d-26*, Kobe, Japan, 2015

### Co-author (selected)

1. J. W. McMahon, C. Keplinger, K. Oguri, S. K. Mitchell, D. Kuettel, N. Kellaris, and B. Bercovici. Area-of-Effect Softbots (AoES) for Asteroid Proximity Operations. In *2019 IEEE Aerospace Conference*, Big Sky, Montana, 2019. IEEE
2. 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
3. S. Campagnola, N. Ozaki, J. Hernando-ayuso, K. Oshima, T. Yamaguchi, K. Oguri, Y. Ozawa, T. Ikenaga, K. Kakihara, S. Takahashi, R. Funase, Y. Kawakatsu, and T. Hashimoto. Mission Analysis for EQUULEUS and OMOTENASHI. In *31st International Symposium on Space Technology and Science*, 2017
4. R. Funase, N. Ozaki, S. Nakajima, K. Oguri, K. Miyoshi, S. Campagnola, H. Koizumi, Y. Kobayashi, T. Ito, T. Kudo, Y. Koshiro, and S. Nomura. Mission to Earth to Moon Lagrange Point by a 6U CubeSat : EQUULEUS. In *31st International Symposium on Space Technology and Science*, 2017
5. 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
6. K. Oshima, S. Campagnola, C. H. Yam, Y. Kayama, Y. Kawakatsu, N. Ozaki, Q. Verspieren, K. Kakihara, K. Oguri, and R. Funase. EQUULEUS Mission Analysis: Design of the Transfer Phase. In *26th International Symposium on Space Flight Dynamics*, Ehime, Japan, 2017
7. S. Nomura, R. Takahashi, M. Ikura, K. Oguri, T. Obata, S. Ikari, and R. Funase. Initial Design of EQUULEUS Attitude Determination and Control System : How to Design an ADCS with High Reliability for a Deep Space CubeSat. In *31st International Symposium on Space Technology and Science*, pages 1–6, 2017
8. S. Campagnola, N. Ozaki, K. Oguri, Q. Verspieren, K. Kakihara, K. Yanagida, R. Funase, H. C. Yam, L. Ferella, T. Yamaguchi, Y. Kawakatsu, and G. D. Yarnoz. Mission Analysis for EQUULEUS, JAXA's Earth-Moon Libration Orbit Cubesat. In *67th International Astronautical Congress*, Guadalajara, 2016

9. 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**
10. T. Ito, S. Ikari, T. Nakatani, M. Fujimoto, K. Ariu, K. Oguri, T. Inamori, S. Sakai, Y. Kawakatsu, and R. Funase. Reliable and Robust Implementation of Attitude Determination and Control Subsystem and Initial Flight Operation Results. In *25th International Symposium on Space Flight Dynamics ISSFD*, number 1, pages 1–12, Munich, Germany, 2015

## PRESENTATIONS

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### Oral

1. “Risk-aware Trajectory Design with Continuous Thrust: Primer Vector Theory Approach,” at *AAS/AIAA Astrodynamics Specialist Conference, AAS 19-912*, Portland, ME, 2019.
2. “Risk-aware Trajectory Design with Impulsive Maneuvers: Convex Optimization Approach,” at *AAS/AIAA Astrodynamics Specialist Conference, AAS 19-893*, Portland, ME, 2019.
3. “SRP-based Orbit Control for Asteroid Exploration”, at *32nd International Symposium on Space Technology and Science, ISTS 2019-d-021*, Fukui, Japan, 2019.
4. “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.
5. “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.
6. “SRP-based Orbit Control with Application to Small body Landing”, at *2018 AAS/AIAA Astrodynamics Specialist Conference, AAS 18-375*, Snowbird, UT, 2018.
7. “EQUULEUS Mission Analysis: Design of the Science Orbit Phase”, at *26th International Symposium on Space Flight Dynamics, ISSFD-2017-072*, Ehime, Japan, 2017.
8. “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.
9. “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.
10. “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.
11. “On-Orbit Estimation of ADCS Parameters for micro-astronomy satellite “Nano-JASMINE”” at *59th Space Sciences and Technology Conference, 2015-3J13*, Kagoshima, Japan, 2015.
12. “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.
13. “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.

### Poster

1. “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.
2. “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

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**Languages:** Japanese (native), English (fluent)

**Academic society:** AAS, AIAA, IEEE, SIAM, Japan Society for Aeronautical and Space Sciences (JSASS)

**Programming:** Matlab (proficient), Python (proficient), C (intermediate), C++ (intermediate)

**Software, tools:** CVX<sup>4</sup>, SPICE, GMAT, jTOP<sup>5</sup>, SBDT<sup>6</sup>, Microsoft Visual Studio, CAD software (SolidWorks, Autodesk inventor, PTC Creo), Subversion, GitHub

<sup>4</sup>software dedicated for solving convex optimization [URL]

<sup>5</sup>spacecraft trajectory optimization software developed by Dr. Stefano Campagnola

<sup>6</sup>small body dynamics simulation software developed by Dr. Stephen Broschart

Last updated: August 27, 2019