

Stephen John Kortenkamp, Ph.D.

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Associate Professor of Practice
Department of Planetary Science
University of Arizona

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DEGREES

University of Florida, Astronomy, Ph.D. in 1996
University of Wisconsin at Eau Claire, Physics & Math, B.S. in 1990

PROFESSIONAL APPOINTMENTS

University of Arizona, Dept. of Planetary Science/Lunar and Planetary Lab
Associate Professor of Practice (2017-present)
Teaching Teams Instructional Specialist (2013-2017)
Adjunct Instructor (2007-2017)
Research Associate (2001-2003)

Planetary Science Institute
Senior Scientist (2007-2018)
Research Scientist (2001-2006)

University of Maryland, Department of Astronomy
Research Associate (2000-2001, 50%)

Carnegie Institution of Washington, Department of Terrestrial Magnetism
Research Associate (1997-2001, 50% after 2000)

TEACHING AND EDUCATIONAL ACTIVITIES AT UNIVERSITY OF ARIZONA

Undergraduate Instructor (2007-present)

Teaching planetary science courses for planetary/astronomy minors and non-science majors; using UA's Flandrau Planetarium as a classroom since 2012; courses taught include PTYS/ASTR 206: *Exploring Our Solar System*, PTYS/ASTR 170A1: *Alien Earths*, PTYS/ASTR 170S1: *Evolution of a Sustainable World* (experimental course developed and co-taught with SGDE faculty). Innovations in Teaching Award, UA College of Science, 2011.

Faculty Supervisor and Instructor in the Teaching Teams Program (2013-present)

Teaching Teams is the campus-wide undergraduate leadership and career development program that originated in the Department of Planetary Science in 1998. Courses include PTYS 297A, 397A, 393, 493

Service to UA Campus Teaching Community

College of Science rep on UWGEC (Univ-Wide Gen Ed Committee, 2019-present)
Working Group on Quality Teaching and Learning for Gen Ed Refresh (Spring 2020)
Member of Faculty Senate Ad Hoc Career Track Committee (Fall 2020-present)

Graduate Student & Postdoctoral Supervision

Current: Jinseok Park, Tasnim Alshuli;
Past: Knox Corbett, Laci Brock, Shireen Keyl (grad & postdoc), Molly Simon

Undergraduate Student Supervision

Current: Frank Acosta, Morgan Beckendorf, Victoria Breckenridge, Blythe Giddings, Kayli Glidic, Ashley Register, Desiree Romero;

Past: Mark Allen, Cecelia Byers, Natasha Burrell, Matiana Cascio, Caelan Caudel, Andrew Charles, Hunter Conley, Knox Corbett, Aivry Eastman, Hannah Edwards, Elizabeth Enright, Langzhao Feng, Julia Giallanza, Nadav Gerson, Rezwana Islam, Laura Kroll, Kelli Kostizak, August Kulas, Nicholas Lopez, Alicia Mason, Samantha Mayers, Jordan Randolph, Joaquin Rosales, Stefan Shoemaker, Ronica Sims, Benjamin Turensky, Anthony Jimenez Young, Nooreen Yusufoff, James Wymer

PROFESSIONAL EDUCATIONAL RESEARCH INTERESTS

Astronomy for the blind and visually impaired:

This NSF-funded research project seeks to develop and evaluate the effectiveness of 3D printed tactile models of planetary terrain, combined with professional mentoring and NGSS-aligned curriculum, to increase the representation within STEM majors of students who are blind or visually impaired. This project is approved for human subjects research by the University of Arizona (IRB #1702248263).

Effects of student choice in General Education STEM courses:

Students are allowed to individually customize the curriculum based on their own grading criteria. Their level of engagement and performance is then tracked over the course of each semester. The research involves evaluating the effects of their choices on their levels of interest, engagement, and performance. This project is approved for human subjects research by the University of Arizona (IRB #1608777887).

Innovative Computer Visualization Techniques in Earth and Space Science:

Developing ray-tracing computer code for production of high-resolution visualizations for research and education. To date over 100 unique animations have been produced to help demonstrate concepts such as planet formation, near-Earth asteroid orbital dynamics, planetary motion, seasons, phases, eclipses, and historical science discoveries.

PROFESSIONAL SCIENCE RESEARCH INTERESTS

Dynamical Evolution of Small Solar System Bodies:

Conducting N -body numerical simulations of orbital evolution, with particular emphasis on resonant interactions between planets and small bodies, such as with Trojan asteroids and quasi-satellites of the terrestrial and giant planets. Other types of modeling include the production and orbital evolution of asteroidal and cometary dust particles and the origins of dust particles collected from Earth's atmosphere.

Terrestrial Planet Formation and Dynamical Evolution:

Modeling the mid- and late-stages in the formation of Earth-like planets utilizing statistical and N -body numerical simulations. Recent focus is on dynamical consequences of Mars-mass companions in various co-orbital configurations with a proto-Earth, with the aim of constraining the origin of the moon-forming impactor.

GRANT AWARDS FOR RESEARCH AND EDUCATION (SINCE 2010)

NSF ITEST: Project POEM - Project-based learning opportunities and exploration of mentorship for students with visual impairments to STEM (ongoing grant, Co-PIs: Sunggye Hong and Kortenkamp)

NASA PG&G: Accretion of interplanetary dust through Earth's quasi-satellite resonance (PI: Kortenkamp)

UA 100% Engagement Grant: Creating and teaching an experiential STEM course using a multicultural approach for Latina/o students (PI: Shireen Keyl, Co-I: Kortenkamp)

NASA EPO Supplement: Out of this world - Bringing space rocks that hit Earth to children and families (PI: the late Betty Pierazzo, Co-I: Kortenkamp)

NASA PG&G: Investigation of a new resonant mechanism for accretion of interplanetary dust by Earth (PI: Kortenkamp)

NASA SMD EPOESS: Workshops in science education and resources (WISER) - Planetary perspectives (PI: David Crown, Co-I: Kortenkamp)

SERVICE TO PROFESSIONAL SCIENCE COMMUNITY

Past chair of dynamics review panel for NASA's PG&G program. Review panelist for NASA's Origins, PG&G, and OPR programs, external proposal reviewer for Exobiology, Origins, PMDAP, and PG&G.

Peer reviewer for *Ap.J.*, *Icarus*, Univ. Arizona Press, and Kluwer Academic Publishers.

Co-Discoverer of Near-Earth Asteroids (331999) 2005 HA8 and 2005 JS1.

Book reviewer for the journal *Meteoritics & Planetary Science*.

Scientific consultant and peer reviewer for Capstone Press for their children's books about Earth and space sciences.

EXTRACURRICULAR SCIENCE AND EDUCATIONAL OUTREACH ACTIVITIES

Children's Science Author:

Author of 24 peer-reviewed non-fiction children's science books addressing national and state education standards in Earth and space sciences. Numerous titles have been incorporated into the Accelerated Reader program used in elementary schools nation-wide. See below for partial listing and descriptions.

Science City at the Tucson Festival of Books:

Developed and participated in engaging hands-on activities for visitors to Science City during the annual Festival of Books (2014-present). Activities include comet building, asteroid/meteorite connections, scale model solar systems, 3D printing planetary terrain, and using spectroscopy to understand the nature of light.

Invited Public Speaker:

Numerous science and educational talks, including recently at UA's Flandrau Planetarium (several public evening presentations), La Palma Prison in Eloy, AZ (teaching inmates in the academic program), Kartchner Caverns State Park (public evening presentation), and many schools in Southern Arizona school districts.

SCIENCE AND EDUCATION RESEARCH PAPERS (SINCE 2010)

Kortenkamp S.J., Joseph E.C.S., Park J., Tupor I., and Hong S., Touching the Solar System: Development and mass production of 3D planetary terrain models for students with visually impairments. *Journal of Geoscience Education* (2022 - inpreparation, draft available upon request).

- Park J., Hong S., and Kortenkamp S.J. Use of 2D embossed tactile graphics in planetary science curriculum for students with visual impairments. *Journal of Visual Impairment & Blindness* (2021 - submitted, draft available upon request).
- Kortenkamp S.J., Park J., Alshuli T., Tsinajinie G., Buxner S., Tupor I., and Hong S. Touching the Solar System: A tactile Project-Based Learning astronomy program for students with visual impairments. *Connected Science Learning* (2022, in press).
- Kortenkamp S.J., and Hartmann W.K., Dynamical sequestration of the Moon-forming impactor in co-orbital resonance with Earth. *Icarus* **275**, 239–248 (2016).
- Kortenkamp S.J., Trapping and dynamical evolution of interplanetary dust particles in Earth’s quasi-satellite resonance. *Icarus* **226**, 1550–1558 (2013).
- Kortenkamp S.J. and Joseph E.C.S., Transformation of Trojans into quasi-satellites during planetary migration and their subsequent close-encounters with the host planet. *Icarus* **215**, 669–681 (2011).
- Marzari F., Thebault P., Kortenkamp S.J., Scholl H., Planetesimal dynamics and planet formation in and around binaries. In *Planets in Multiple-Star Systems*, p. 165 (Haghighipour N., Ed.), Springer/Verlag (2010).

FIRST-AUTHOR SCIENCE AND EDUCATION PRESENTATIONS (SINCE 2010)

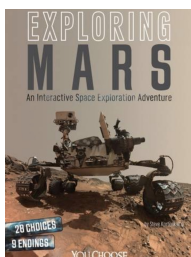
- Kortenkamp S.J. and Hempel, B.R., Clickers in the classroom - Dramatic results from an accidental experiment (poster), 234th Meeting of American Astronomical Society, abstract 3219911 (2019).
- Kortenkamp S.J., Tupor I., Tsinajinie G., Hong S., Touching our Solar System: Project-based learning experiences for students with visual impairments (talk), International Conference of Association for Education and Rehabilitation of the Blind and Visually Impaired, abstract pap212s1 (2018).
- Kortenkamp S.J., Dynamical evolution of interplanetary dust particles trapped in Earth’s horseshoe and quasi-satellite co-orbital resonance regions (talk), 48th DPS Meeting, abstract 521.02 (2016).
- Kortenkamp S.J. and Brock L., Utilizing a scale model solar system project to visualize important planetary science concepts and develop technology and spatial reasoning skills (poster), 48th DPS Meeting, abstract 419.06 (2016).
- Kortenkamp S.J., Blending Entertainment, Education, and Science in a Modern Digital Planetarium (talk), 47th DPS Meeting, abstract 202.04 (2015).
- Kortenkamp S.J., Dynamical Sequestration of the Moon-Forming Impactor in Co-Orbital Resonance with Earth (poster), 47th DPS Meeting, abstract 309.02 (2015).
- Kortenkamp S.J., The Nearest of the Near-Earth Asteroids (talk), 47th DPS Meeting, abstract 403.09 (2014).
- Kortenkamp S.J., Baldrige, Bleamaster, Buxner, Canizo, Crown, Joseph, Lebofsky, Computer Visualizations for K-8 Science Teachers in Professional Development Workshops at the Planetary Science Institute (poster), 44th LPSC, abstract 1719 (2013).
- Kortenkamp S.J., Trapping of Interplanetary Dust Particles in Earth’s Quasi-Satellite Resonance: Dependence on Particle Size (poster), 43rd LPSC, abstract 1659 (2012).

Kortenkamp S.J., Investigating the Role of Earth's Quasi-Satellite Resonance in the Accretion of Interplanetary Dust (poster), Fall AGU, abstract P11B-1823 (2012).

Kortenkamp S.J., Resonant Trapping and Subsequent Accretion of Interplanetary Dust Particles Through Earth's Quasi-Satellite Resonance (talk), 42nd DPS Meeting, abstract 17.02 (2010).

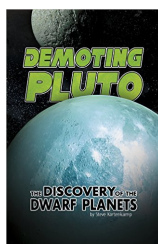
FIRST-AUTHOR PEER-REVIEWED CHILDREN'S SCIENCE BOOKS (SINCE 2010)

All published by Capstone Press, Mankato, MN



Kortenkamp S.J. (2017)
Exploring Mars: An Interactive Space Exploration Adventure

Children are guided through many different perspectives surrounding the ongoing efforts to explore Mars and the men and women working to better understand our solar system. Young readers are immersed in the action as their choices guide the narrative.



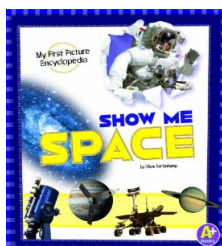
Kortenkamp S.J. (2016)
Demoting Pluto: Discovery of the Dwarf Planets

When is a planet not a planet? Dwarf planets orbit the sun, are solid bodies, and are not moons. But they are not considered regular planets. Learn more about these spherical oddities and why Pluto is still hotly debated today.



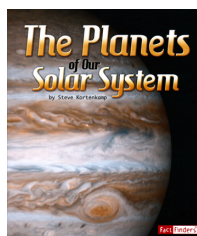
Kortenkamp S.J. (2016)
Future Explorers: Robots in Space

There's no air in space. But robots don't care! Learn more about how these mechanical robonauts can help us understand more about the solar system in which we live.



Kortenkamp S.J. (2014)
Show Me Space

From planets and comets to sunspots and spacewalks, there's so much to know about space! Show Me Space has more than 100 facts and definitions about our solar system and beyond.



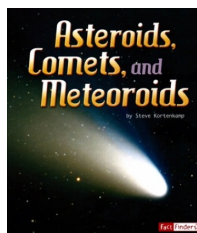
Kortenkamp S.J. (2011)
Planets of Our Solar System

Venus is a sweltering, spinning rock. Jupiter is a huge ball of gas. But they are both planets. Get up close to the eight planets that orbit around our sun.



Kortenkamp S.J. (2011)
Dwarf Planets

They're round and orbit around our sun. But they're not planets. What makes a dwarf planet different? Get up close to the five dwarf planets that call our solar system home.



Kortenkamp S.J. (2011)
Asteroids, Comets, Meteoroids

They're leftover rocks from when the planets formed. And they hold clues to how the solar system began. Get up close to asteroids, comets, and meteoroids that orbit in our solar system.