

Jamie Sue Rankin

EDUCATION

- California Institute of Technology** 2019
Ph.D. Physics Pasadena, CA
Thesis: *Voyager 1 Observations of Galactic Cosmic Ray Anisotropies in the Interstellar Medium*
- M.S. Physics 2019
Pasadena, CA
- University of Utah** 2011
B.S. Physics (*Honors*) Salt Lake City, UT
Thesis: *Sonar Systems Analysis*
- B.A. Music Composition

RESEARCH EXPERIENCE

- 2018-Present **Princeton University**, *Postdoctoral Research Associate* Princeton, NJ
- Space Physics Laboratory of David J. McComas, Ph.D.
 - Pursued multi-spacecraft science investigations of the outer heliosphere and very local interstellar medium by integrating observations from *Voyager* and *IBEX* NASA missions.
 - Served as deputy instrument lead for IMAP's Solar Wind and Pickup-ion Instrument (SWAPI).
 - Designed and tested several types of aperture grids that will be critical for SWAPI's ability to simultaneously measure solar wind and pickup-ion plasma distributions at 1 AU.
 - Analyzed emerging energetic particle events from near the Sun measured by *Parker Solar Probe*'s Integrated Science Investigation of the Sun (ISOIS) instrument.
 - Contributed to architectural planning meetings and calibration system design for Princeton's new Space Physics Laboratory.
- 2012-2018 **California Institute of Technology**, *Ph.D. Candidate* Pasadena, CA
- Space Radiation Laboratory of Edward C. Stone, Ph.D.
 - Analyzed *Voyager 1* observational data to develop understanding and interpretation of humankind's first in-situ observations of galactic cosmic rays in interstellar space.
 - Tested and evaluated prototype and spaceflight detectors for the high-energy particle instrument (EPI-Hi) on NASA's *Parker Solar Probe* Mission.

- Monitored EPI-Hi space-flight qualification tests at accelerator and environmental facilities.

2011-2012 **University of Utah Telescope Array Project**, *Researcher* SLC, UT

- Laboratory of Gordon B. Thomson, Ph.D.
- Monitored and sustained instrument operations for international collaboration investigating ultra-high-energy cosmic rays.
- Generated Monte Carlo simulations to validate pioneering radar detection techniques.
- Assembled scintillator detectors in Japan to commence ground-based infill array for the Telescope Array Low Energy extension (TALE).

2009-2011 **Progeny Systems Corporation**, *Researcher* SLC, UT

- Assisted acoustic engineers in research on multi-sensor display development and actualized experiments in sonar simulation.
- Refined and manufactured active acoustic intercept and ranging systems.
- Streamlined and centralized database configuration for head engineers and their corresponding research subunits.

2006-2009 **University of Utah Department of Physics**, *ACCESS Scholar* SLC, UT

- Center for Acoustic Cooling Technology Laboratory of Orest G. Symko, Ph.D.
- Characterized material properties of piezoelectric transducers and assessed their suitability for sound-to-electricity conversion in thermoacoustic engines.
- Presented results to state legislators and at the National Conference for Undergraduate Research.

2006-2007 **University of Utah Department of Physics**, *ACCESS Scholar* SLC, UT

- Electroluminescent Conjugated Polymers Laboratory of Z. Valentine Vardeny, Ph.D.
- Developed and tested electrical, optical and magnetic properties of thin-film organic semiconductor polymers.
- Directed feasibility study of organic light emitting diodes for commercial lighting applications.
- Conducted cancer tomography experiments with Dr. Randy Polson at the Dixon Laser Institute.

NASA MISSION AND INSTRUMENT EXPERIENCE

2018-Present **IMAP**, *Solar Wind and Pickup-ion Instrument (SWAPI)*

2014-Present **Voyager**, *Cosmic-Ray Subsystem (CRS)*

2012-Present **Parker Solar Probe**, *Integrated Science Investigation of the Sun (ISOIS)*

MENTORING

- Summer 2019 **Undergraduate Summer Research Program, Mentor** Princeton, NJ
- Directly supervised Tyler Eddy on automated detection and characterization of solar energetic particle events.
 - Program hosted by Princeton University Department of Astrophysical Sciences.
- Fall 2019 **Undergraduate Junior Papers, Co-advisor** Princeton, NJ
- Directly supervised Tyler Eddy on independent research for his Junior Paper, titled: "Key metrics necessary for enhancing data analysis in Solar Energetic Particle events."
 - Directly supervised Alexandros Papamathaiou on independent research for his Junior Paper, titled: "Redesigning the Cassini Ion Mass Spectrometer."
 - Research projects satisfied academic requirements established by Princeton University and the Department of Astrophysical Sciences.

LEADERSHIP AND COMMUNITY SERVICE

- 2012-2016 **Caltech Graduate Student Council, Board Member** Pasadena, CA
- Proposed, assessed and debated policies, funding, and legislation.
 - Served on Budget, Academics and central Steering Committees.
 - Publications Chair (2013-2014).
 - Vice Chair (2014-2015).
- 2014-2015 **Caltech Keck Institute for Space Studies, Member** Pasadena, CA
- Served on "Science and Enabling Technologies to Explore the Interstellar Medium" think-tank.
 - Participated in multi-part integrative workshops focused on the challenge of sending durable robotic probes to the interstellar medium.
 - Articulated key scientific questions, identified near-term science goals and derived science measurement requirements in collaboration with multi-disciplinary team of scientists and engineers.
- 2013 **Caltech Space Challenge, Explorer Team** Pasadena, CA
- Designed viable mission architecture for sending astronauts to a Martian moon on multi-national team.
 - Gained exposure to systems engineering, project management, and recent advances in space studies through interactions with top scientists from multiple institutions.
 - Gave public presentation and produced final report of innovative solutions to be considered by NASA for design of future space flight missions.

- 2010-2011 **Committee for Technology Enhanced Curriculum, Member** SLC, UT
- Sole student representative on faculty advisory panel to the Technology Assisted Curriculum Center, Academic Senate, and the Information Technology Executive Committee (ITEC).
 - Counseled University of Utah faculty for technology-assisted education policies and procedures.
 - Directed funding for faculty-proposed development of technology-enhanced courses.

- 2010-2011 **Honors Think Tank, Re-Imagining the Campus, Member** SLC, UT
- Strategized how to transition the University of Utah's built and natural environment into a place that generates knowledge and energy.
 - Visualized planning and development solutions including transportation and mobility options, diverse housing, energy production, and the creation of vibrant social spaces and natural landscapes.
 - Presented solutions to community members, student associations, and administrative groups including the Board of Trustees.

PUBLICATIONS

Accepted

Rankin, J. S., McComas, D. J., Schwadron, N. A., "Galactic Cosmic-Ray Anisotropies: Electrons Observed by Voyager 1 in the Very Local Interstellar Medium", ApJ, Accepted, 2020

2020

Cohen, C. M. S., Christian, E. R., Cummings, A. C., Davis, A. J., Desai, M. I., Giacalone, J., Hill, M. E., Joyce, C.J., Labrador, A. W., Leske, R. A., Matthaeus, W. H., McComas, D. J., McNutt, R. L., Mewaldt, R. A., Mitchell, D. G., **Rankin, J. S.**, Roelof, E. C., Schwadron, N. A., Stone, E. C., Szalay, J. R., Wiedenbeck, M. E., Allen, R. C., Ho, G. C., Jian, L. K., Lario, D., Odstrcil, D., Bale, S .D., Badman, S. T., Pulupa, M., MacDowall, R.J., Kasper, J. C., Case, A. W., Korreck, K. E., Larson, D. E., Livi, R., Stevens, M. L., Whittlesey, P., "Energetic Particle Increases Associated with Stream Interaction Regions", ApJS 246, 20, 2020. <https://doi.org/10.3847/1538-4365/ab4c38>

Joyce, C. J., McComas, D. J., Christian, E. R., Schwadron, N. A., Wiedenbeck, M. E., McNutt, R. L., Cohen, C. M. S., Leske, R.A., Mewaldt, R. A., Stone, E. C., Labrador, A.W., Davis, A. J., Cummings, A. C., Mitchell, D. G., Hill, M.E., Roelof, E. C., Szalay, J. R., **Rankin, J. S.**, Desai, M. I., Giacalone, J., Matthaeus, W. H., "Energetic Particle Observations from the Parker Solar Probe Using Combined Energy Spectra from the ISOIS Instrument Suite", ApJS 246, 41, 2020. <https://doi.org/10.3847/1538-4365/ab5948>

Leske, R. A., Christian, E. R., Cohen, C. M. S., Cummings, A. C., Davis, A. J., Desai, M. I., Giacalone, J., Hill, M. E., Joyce, C. J., Krimigis, S. M., Labrador, A. W., Malandraki, O., Matthaeus, W. H., McComas, D. J., McNutt, R. L., Mewaldt, R. A., Mitchell, D. G., Posner, A., **Rankin, J. S.**, Roelof, E. C., Schwadron, N. A., Stone, E. C., Szalay, J. R., Wiedenbeck, M. E., Vourlidas, A., Bale, S. D., MacDowall, R. J., Pulupa, M., Kasper, J. C., Allen, R. C., Case, A. W., Korreck, K. E., Livi, R., Stevens, M. L., Whittlesey, P., Poduval, B., "Observations of the 2019 April 4 Solar Energetic Particle Event at the Parker Solar Probe", *ApJS* 246, 35, 2020. <https://doi.org/10.3847/1538-4365/ab5712>

Schwadron, N. A., Bale, S., Bonnell, J., Case, A., Christian, E. R., Cohen, C. M. S., Cummings, A. C., Davis, A. J., Dudok de Wit, T., Wet, W. de, Desai, M. I., Joyce, C. J., Goetz, K., Giacalone, J., Gorby, M., Harvey, P., Heber, B., Hill, M. E., Karavolos, M., Kasper, J. C., Korreck, K., Larson, D., Livi, R., Leske, R. A., Malandraki, O., MacDowall, R., Malaspina, D., Matthaeus, W. H., McComas, D. J., McNutt, R. L., Mewaldt, R. A., Mitchell, D. G., Mays, L., Niehof, J. T., Odstrcil, D., Pulupa, M., Poduval, B., **Rankin, J. S.**, Roelof, E. C., Stevens, M., Stone, E. C., Szalay, J. R., Wiedenbeck, M. E., Winslow, R., Whittlesey, P., "Seed Population Preconditioning and Acceleration Observed by the Parker Solar Probe", *ApJS* 246, 33, 2020. <https://doi.org/10.3847/1538-4365/ab5527>

Wiedenbeck, M. E., Bučík, R., Mason, G. M., Ho, G. C., Leske, R. A., Cohen, C. M. S., Christian, E. R., Cummings, A. C., Davis, A. J., Desai, M. I., Giacalone, J., Haggerty, D. K., Hill, M. E., Joyce, C. J., Labrador, A. W., Malandraki, O., Matthaeus, W. H., McComas, D. J., McNutt, R. L., Mewaldt, R. A., Mitchell, D. G., Posner, A., **Rankin, J. S.**, Roelof, E. C., Schwadron, N. A., Stone, E. C., Szalay, J. R., Bale, S. D., Case, A.W., Kasper, J. C., Korreck, K. E., Larson, D. E., MacDowall, R. J., Pulupa, M., Stevens, M. L., "He-rich Solar Energetic Particle Observations at the Parker Solar Probe and near Earth", *ApJS* 246, 42, 2020. <https://doi.org/10.3847/1538-4365/ab5963>

2019

McComas, D. J., **Rankin, J. S.**, Schwadron, N. A., Swaczyna, P., "Termination Shock Measured by Voyagers and IBEX", *ApJ*, 884, 145, 2019.

Rankin, J. S., McComas, D. J., Richardson, J. D., & Schwadron, N., "Heliosheath Properties Measured from a Voyager 2 to Voyager 1 Transient", *ApJ*, 883, 101, 2019b.

Rankin, J. S., Stone, E. C., Cummings, A. C., McComas, D. J., Lal, N. & Heikkila, B.C., "Galactic Cosmic-Ray Anisotropies: Voyager 1 in the Local Interstellar Medium", *ApJ*, 873, 46, 2019a.

Rankin, J. S., 2019, "Voyager 1 Observations of Galactic Cosmic Ray Anisotropies in the Local Interstellar Medium", Dissertation, Ph.D., California Institute of Technology, doi:10.7907/WX3S-1D86.

2017

Wiedenbeck, M. E., Angold, N. G., Birdwell, B., Burnham, J. A., Christian, E. R., Cohen, C. M. S., Cook, W. R., Cummings, A. C., Davis, A. D., Dirks, G., Do, D. H., Everett, D. T., Goodwin, P. A., Hanley, J. J., Hernandez, L., Kecman, B., Klemic, J., Labrador, A.W., Leske, R. A., Lopez, S., Link, J. T., McComas, D. J., Mewaldt, R. A., Miyasaka, H., Nahory, B. W., **Rankin, J. S.**, Riggans, G., Rodriguez, B., Rusert, M. D., Shuman, S. A., Simms, K. M., Stone, E. C., von Rosenvinge, T. T., Weidner, S. E., & White, M. L., 2017, "Capabilities and Performance of the High-Energy Energetic-Particles Instrument for the Parker Solar Probe Mission", in proceedings of "35th International Cosmic Ray Conference", [PoS\(ICRC2017\)016](#)

2016

McComas, D. J., Alexander, N., Angold, N., Bale, S., Beebe, C., Birdwell, B., Boyle, M., Burgum, J. M., Burnham, J. A., Christian, E. R., Cook, W. R., Cooper, S. A., Cummings, A. C., Davis, A. J., Desai, M. I., Dickinson, J., Dirks, G., Do, D. H., Fox, N., Giacalone, J., Gold, R. E., Gurnee, R. S., Hayes, J. R., Hill, M. E., Kasper, J. C., Kecman, B., Klemic, J., Krimigis, S. M., Labrador, A. W., Layman, R. S., Leske, R. A., Livi, S., Matthaeus, W. H., McNutt, R. L., Mewaldt, R. A., Mitchell, D. G., Nelson, K. S., Parker, C., **Rankin, J. S.**, Roelof, E. C., Schwadron, N. A., Seifert, H., Shuman, S., Stokes, M. R., Stone, E. C., Vegriff, J. D., Velli, M., von Rosenvinge, T. T., Weidner, S. E., Wiedenbeck, M. E., & Wilson, P. 2016, "Integrated Science Investigation of the Sun (ISIS): Design of the Energetic Particle Investigation," Space Sci Rev (2016) 204: 187. doi:10.1007/s11214-014-0059-1

2015

Alkalai L., Arora N., Arya M., Barnes N., Brashears T., Brown M., Cauley P. W., Cesarone R. J., Dyson F., Friedman L., Garber D., Goldsmith P., Jemison M., Johnson L., Liewer P., Lubin P., Maccone C., Males J., McDonough K., McNutt R. L. J., Mewaldt R., Michael A., Montgomery E., Opher M., Provornikova E., **Rankin J.**, Redfield S., Shao M., Shotwell R., Strange N., Stone E., Svitek T., Swain M., Turyshev S., Werner M., & Zank G. P. 2015, "Science and Enabling Technologies for the Exploration of the Interstellar Medium", Report, Keck Institute for Space Studies, 30 Sept. 2015. URL: <http://kiss.caltech.edu/programs.html#ism>

2014

Bosanac N., Diaz A., Dang V., Ebersohn F., Gonzalez, S., Qi, J., Sweet, N., Tie, N., Valentino, G., Fraeman, A., Gibbings, A., Maddox, T., Nie, C., **Rankin, J.**, Rebelo, T., & Taylor, G., "Manned Sample Return Mission to Phobos: A Technology Demonstration for Human Exploration of Mars", Aerospace Conference, 2014 IEEE, pp. 1-20, 1-8 March 2014. URL: <http://ieeexplore.ieee.org/document/6836251/>

2011

Rankin, J. S., “Sonar Systems Analysis”, Senior Thesis, Honors Bachelor of Science, University of Utah, Salt Lake City, 2011.

IN THE PRESS

- Princeton University, Jan. 29, 2020: “NASA’s Interstellar Mapping and Acceleration Probe Mission Enters Design Phase” (<https://spacephysics.princeton.edu/news/nasas-interstellar-mapping-and-acceleration-probe-mission-enters-design-phase>)
- Princeton University, Dec. 4, 2019: “Sun’s Close-Up Reveals Atmosphere Hopping with Highly Energetic Particles” (<https://www.princeton.edu/news/2019/12/04/suns-close-reveals-atmosphere-hopping-highly-energetic-particles>)
- National Geographic, Nov. 4, 2019: “Interstellar Space Even Weirder Than Expected, NASA Probe Reveals” (<https://www.nationalgeographic.com/science/2019/11/interstellar-space-weirder-than-expected-nasa-voyager-2-reveals/>)
- EOS Earth & Space Science News, Nov. 4, 2019: “Voyager 2’s Interstellar Crossing Was Kind of Familiar. That’s Surprising.” (<https://eos.org/articles/voyager-2s-interstellar-arrival-was-kind-of-familiar-thats-surprising>)
- EOS Earth & Space Science News, Oct. 17, 2019: “What Inflates the Solar Bubble? Voyagers Count What’s Missing” (<https://eos.org/articles/what-inflates-the-solar-bubble-voyagers-count-whats-missing>)
- Newsweek, Oct. 10, 2019: “Pressure at the Edge of the Solar System is Far Higher Than Expected, Scientists Discover” (<https://www.newsweek.com/pressure-edge-solar-system-scientists-1464328>)
- NASA Feature, Oct. 8, 2019: “Pressure Runs High at Edge of Solar System” (<https://www.nasa.gov/feature/goddard/2019/pressure-runs-high-at-edge-of-solar-system>)
- Caltech News, Aug. 7, 2018: “Spacecraft to Speed Through Sun’s Atmosphere and Snag Solar Wind” (<https://www.caltech.edu/about/news/spacecraft-speed-through-suns-atmosphere-and-snag-solar-wind-83057>)
- NASA Jet Propulsion Laboratory: “The Insider’s Guide to Voyager: Personal Stories from the Mission” (<https://voyager.jpl.nasa.gov/share/>)
- Strange New Worlds Podcast, Oct. 3, 2017: “The Real V’gers” (<https://soundcloud.com/strange-new-worlds/episode-16-the-real-vgers>)

SELECTED CONFERENCE PRESENTATIONS

Voyager 1 Observations of Galactic Cosmic Ray Anisotropies in the Local Interstellar Medium, **Rankin, J. S.** (International Space Science Institute Team Meeting, September 2018, Talk).

Recent Developments on the Galactic Cosmic-Ray Anisotropies Observed by Voyager 1 in the Local Interstellar Medium, **Rankin, J. S.**, Stone, E. C., Cummings, A. C., McComas, D. J., Lal, N. & Heikkila, B.C. (American Geophysical Union Fall Meeting, December 2018, Poster).

Galactic Cosmic-Ray Anisotropies: Voyager 1 in the Local Interstellar Medium, **Rankin, J. S.**, Stone, E. C., Cummings, A. C., McComas, D. J., Lal, N. & Heikkila, B.C. (18th Annual International Astrophysics Conference, February 2019, Talk).

Transient Events Near the Heliosphere-Interstellar Boundary: Science Using Voyager and IBEX, **Rankin, J. S.** (IBEX/IMAP Science Working Team Meeting, June 2019, Talk).

Exciting Science at the Edge of the Heliosphere from Voyager and IBEX, **Rankin, J. S.** (NASA Science Mission Directorate: Heliophysics Brown Bag Lunch, October 2019)

Voyager 1 Galactic Cosmic-Ray Anisotropies: Electron Observations in the Very Local Interstellar Medium, **Rankin, J. S.** Stone, E. C., Cummings, A. C., McComas, D. J., Lal, N. & Heikkila, B.C. (American Geophysical Union Fall Meeting, December 2019, Poster).

Electrons and the Galactic Cosmic Ray Anisotropies in the Very Local Interstellar Medium, **Rankin, J. S.** (19th Annual International Astrophysics Conference, February 2020, Talk).