

Electric Propulsion's Present and Future Impact on Space Exploration



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Friday, November 16th
12:30 PM Bowen Hall Rm 222

Electric propulsion has been used on six deep-space science missions--Deep Space 1, SMART-1, Hayabusa 1, LISA Pathfinder, Hayabusa 2, and Dawn—and is being used on over a hundred commercial communication satellites. The next robotic science missions to use ion propulsion will be NASA's mission to the metal world (16) Psyche and ESA's BebiColombo mission to Mercury. All of this activity is driven by the inescapable reality quantified by the rocket equation, and yet electric propulsion has so far just scratched the surface of what it can do. This talk will discuss how we got to this point and how advanced electric propulsion technologies have the potential to impact an impressive range of humanity's future space activities including: robotic deep-space science missions; human missions beyond low-Earth orbit; planetary defense; asteroid mining; gravitational wave experiments; rapid transportation throughout the solar system; and even interstellar precursor missions.

John Brophy is a Fellow of the Jet Propulsion Laboratory (JPL), California Institute of Technology, and AIAA; and he is a specialist in electric propulsion technology for JPL, where he has worked since 1985. He received a B.S. in mechanical engineering from the Illinois Institute of Technology in 1978, and an M.S. and Ph.D. in mechanical engineering from Colorado State University in 1980 and 1984, respectively. He led the 1991 evaluation in Russia of the SPT-100 Hall thruster developed by the Soviet Union. Dr. Brophy helped initiate the NASA Solar Electric Propulsion Technology Application Readiness (NSTAR) project that successfully demonstrated the use of ion propulsion for planetary science missions on NASA's New Millennium Deep Space 1 flight test. He was responsible for the development and delivery of the ion propulsion system for NASA's Dawn mission. He co-led the Asteroid Retrieval Mission study at Caltech's Keck Institute for Space Studies that resulted in NASA's Asteroid Redirect Robotic Mission studies. In 2015 he was awarded the Ernst Stuhlinger Medal for Outstanding Achievement in Electric Propulsion and received the AIAA Wyld Propulsion award in 2017.

