



BUENAVENTURA AEROSPACE SOCIETY CHAPTER

To Boldly Go... Well, You Know: NASA's Dawn Mission to the Asteroid Belt

Marc D. Rayman, Ph.D. NASA JPL

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California Lutheran University, Lundring Events Center

130 Overton Court

Thousand Oaks, CA 91360

Meetings are free and open to the public



The ambitious Dawn mission, launched in September 2007, is one of NASA's most remarkable ventures into the solar system. The spacecraft has recently completed a spectacular exploration of Vesta and is now traveling to Ceres; these were among the last uncharted worlds in the inner solar system prior to Dawn. They are the two most massive residents of the main asteroid belt. Ceres is so large that it is included in the category of dwarf planets, along with Pluto. Remnants from the time that planets were formed, Ceres and Vesta hold clues that will help scientists understand the dawn of the solar system. Dawn orbited Vesta from July 2011 to September 2012 and returned astonishing views of this fascinating world. It is the only spacecraft ever to orbit an object in the asteroid belt. Such a mission would be impossible without the use of ion propulsion, a technology that has mostly been in the domain of science fiction, but which was tested extensively on the Deep Space 1 mission,

paving the way for Dawn. Dr. Marc Rayman, Dawn's Chief Engineer and Mission Director at JPL, will describe the Dawn mission and its use of ion propulsion as well as its two exotic destinations. He will also share the excitement and profundity of controlling a spacecraft in deep space.

Dr. Marc D. Rayman Bio: Marc Rayman is not only a top rocket scientist at NASA's Jet Propulsion Laboratory but also a magnificent communicator. He grew up in Toledo, Ohio earned an A.B. in physics from Princeton University. His undergraduate work focused on astrophysics and cosmology. He received an M.S. in physics from the University of Colorado at Boulder, where he conducted investigations in nuclear physics. He then performed research at the Joint Institute for Laboratory Astrophysics (JILA) on experimental tests of special relativity and atomic and laser physics, and received his Ph.D. there. He continued at JILA as a postdoctoral

researcher. Throughout his time at JILA, he worked with Dr. John Hall, who subsequently won a Nobel Prize in Physics.

Dr. Rayman combined his scientific training with his lifelong study and passion for the exploration of space by joining JPL in 1986. His work there has spanned a broad range, including optical interferometry missions to detect planets around other stars, design of a mission to return samples from Mars, a laser altimeter for Mars, an infrared space telescope, the development of systems to use lasers instead of radios to communicate with interplanetary spacecraft, and more.

In 1994, he helped initiate a new NASA program to characterize highly sophisticated and risky technologies for future space science missions by flying them on dedicated test flights. The first mission of this New Millennium program, Deep Space 1 (<http://nmp.jpl.nasa.gov/ds1>), was launched in October 1998, and he worked on it from its inception in 1995 to its conclusion in 2001. During the course of the project, Dr. Rayman served as chief mission engineer, mission director, and project manager. The new technologies that were tested on DS1 (including such exotic systems as ion propulsion and artificial intelligence) were designed to reduce the cost and risk and to improve the performance of subsequent interplanetary missions. The primary mission was extremely successful and led to a very productive and exciting extension, culminating in a spectacular encounter with Comet Borrelly that yielded NASA's first close-up images of the nucleus of a comet. The spacecraft remains in orbit around the Sun.

Now he is chief engineer and mission director on a mission that builds on DS1 to study the two largest unexplored worlds in the inner solar system. Launched in September 2007, Dawn (<http://dawn.jpl.nasa.gov>) is designed to explore two giants of the main asteroid belt, protoplanet Vesta and dwarf planet Ceres, in an ambitious mission that should reveal much about the dawn of the solar system. In July 2011, Dawn became the only spacecraft ever to orbit a resident of the asteroid belt. Following an outstandingly successful investigation of Vesta, it left in September 2012 for its 2015 appointment with mysterious Ceres.

Dr. Rayman is the recipient of numerous honors. His many accolades from NASA include an extraordinary three Exceptional Achievement Medals and two Outstanding Leadership Medals, which are among NASA's most selective awards. He was named a JPL Fellow, the highest technical position available, "for extraordinary technical contributions made over an extended period." He is the only person to have received both the Exceptional Technical Excellence Award and the Exceptional Leadership Award, two of JPL's most prestigious honors. Asteroid Rayman was named in recognition of his contributions to space exploration.

Marc is very active in education and public outreach. He is a highly regarded and popular speaker, relating the thrill of science and the excitement of discovery, and he has appeared frequently on television and been quoted often in other news media on subjects as wide-ranging as DS1 and Dawn, a fire onboard the Mir space station, the discovery of the top quark, and the profundity of humankind's exploration of the cosmos. His DS1 blog (at <http://nmp.jpl.nasa.gov/ds1/archives.html>) had an enormous following and gained critical acclaim as it provided an exceptionally entertaining and informative view into the flight of DS1, and his Dawn blog (at <http://dawn.jpl.nasa.gov/mission/journal.asp>) continues in the same delightful style. Marc is technical advisor and a popular writer for NASA's educational website the Space Place (at <http://spaceplace.nasa.gov>, where his digital alter ego Dr. Marc resides).

In addition to more than 50 technical publications in physics and engineering, he has published many articles on Apollo, Skylab, the space shuttle, piloted and robotic missions of the former USSR, interplanetary missions, and a variety of topics in astrophysics, cosmology, and space exploration for reference books, encyclopedias, magazines, and newspaper.

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