Daniel J. Scheeres, PhD.

A. Richard Seebass Endowed Chair Professor
The University of Colorado at Boulder
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Degrees

Ph.D. Aerospace Engineering The University of Michigan, 1992
On symmetric central configurations with application to satellite motion about rings
Prof. N.X. Vinh, Chairman.

M.S.E. Aerospace Engineering The University of Michigan, 1988

B.S.E. Aerospace Engineering (*summa cum laude*) The University of Michigan, 1987

B.S. Letters and Engineering Calvin College, 1985

Professional Positions

The University of Colorado at Boulder
Department of Aerospace Engineering Sciences
Colorado Center for Astrodynamics Research

A. Richard Seebass Endowed Chair Professor	2/08 – present
Visiting Professor	8/07 – 2/08

The University of Michigan
Department of Aerospace Engineering

Adjunct Professor	2/08 – 9/10
Graduate Chair, Department of Aerospace Engineering	10/06 – 12/07
Associate Professor	9/02 – 1/08
Assistant Professor	9/99 – 8/02

Institute of Space and Astronautical Science, Japan

Visiting Professor, JSPS Fellow	8/05 – 12/05
Japan Society for the Promotion of Science Fellow	5/99 – 8/99

Iowa State University
Department of Aerospace Engineering and Engineering Mechanics

Assistant Professor	8/97 – 8/99

Jet Propulsion Laboratory, California Institute of Technology

Senior Member of Engineering Staff	3/97 – 7/97
Member of the Technical Staff	9/92 – 3/97
Summer Intern/On-call employee	5/89 – 9/92

Honors and awards

- Best Paper of Conference Award, 19th AAS/AIAA Space Flight Mechanics Meeting, Savannah, Georgia, February 2009 (Awarded February 2011).
- Awarded a University of Colorado, College of Engineering Faculty Fellowship, Fall 2009.
- Elected to the Celestial Mechanics Institute, 2008.
- Fellow of the American Astronautical Society, 2008.
- NASA Tech Brief Award for NTR no 43641: "Solar Sail Spaceflight Simulation Software Version 2.0 (S5 v2.0)", 2006.
- Japan Society for the Promotion of Science Fellowship at the Institute of Space and Astronautical Science, Japan, August 15 – December 29, 2005.
- Associate Fellow of the American Institute of Aeronautics and Astronautics, 2003.
- Member of the International Astronomical Union, Commission on Celestial Mechanics and Dynamical Astronomy, 2003.
- NASA Group Achievement Award, NEAR-Shoemaker Mission Team. *For outstanding achievement in conducting the most comprehensive scientific study of Asteroid 433 Eros, including the first rendezvous, orbit, and landing on an asteroid.* Awarded July 9, 2002.
- Best Paper of Conference Award (with F.-Y. Hsiao), 12th AAS/AIAA Space Flight Mechanics Meeting, San Antonio, Texas, January 2002.
- Letters of commendation for exceptional reviewing, AIAA Journal of Guidance, Control, and Dynamics, 2000, 2001, 2004, 2008.
- Japan Society for the Promotion of Science Fellowship at the Institute of Space and Astronautical Science, Japan, May 23 – August 15, 1999.
- Asteroid (8887) 1994LK1 renamed (8887) Scheeres. *Scheeres has pioneered the investigation of the dynamics of orbits close to small, irregularly shaped minor planets. His research has included studies of the short-term evolution and the long-term stability of orbits around radar-derived models of (4179) Toutatis and (4769) Castalia. His work has far-reaching implications for the operation of spacecraft orbiting minor planets, for the cosmogony of satellites of minor planets and for understanding the distribution of non-escaping impact ejecta on small bodies.* Dictionary of Minor Planet Names, 4th Ed., L.D. Schmadel, Springer, 1999, pg. 1069.
- NASA Group Achievement Award, NEAR Project Team. *For development of the NEAR mission and the return of the first Discovery program science data from the successful Mathilde asteroid flyby.* Awarded June 4, 1998.

- The Johns Hopkins University Applied Physics Laboratory Award for an outstanding publication in the category of Special Publications, for contributions to the special issue of *The Journal of Astronautical Sciences*, Vol 43, 1995, devoted to the Near Earth Asteroid Rendezvous Mission.
- Recipient of a Rockwell International Fellowship at The University of Michigan, 1989-1992.
- Graduated *summa cum laude* from The University of Michigan, 1987.

Graduate Students

Ph.D. committees chaired

Weiduo Hu Defended April 2002
"Orbital Motion in Uniformly Rotating Second Degree and Order Gravity Fields"
Committee Chair
Associate Professor, Dept. of Aerospace Engineering, BeiHang University, Beijing, China

Esther Morrow Defended August 2002, University of California - San Diego
"Solar Sail Orbit Operations"
Committee Co-Chair

Benjamin Villac Defended July 2003, Rackham Pre-Doctoral Scholar
"Dynamics in the Hill Problem with Applications to Spacecraft Maneuvers"
Committee Chair
Assistant Professor, Department of Mechanical and Aerospace Engineering, University of California – Irvine

Fu-Yuen Hsiao Defended April 2004
"Stabilizing and Specifying Motion Relative to Unstable Trajectories: Applications to Spacecraft Formation Flight"
Committee Chair
Assistant Professor, Department of Aerospace Engineering, Tamkang Univ., Taiwan

Vincent Guibout Defended September 2004
"The Hamilton-Jacobi theory for solving two-point boundary value problems: Theory and numerics with application to spacecraft formation flight, optimal control and the study of phase space structure"
Committee Co-Chair
Chief System Engineer, MBDA, Paris, France

Islam Hussein Defended February 2005
"Motion Planning for Multi-Spacecraft Interferometric Imaging Systems"
Committee Co-Chair
Assistant Professor, Department of Mechanical Engineering, Worcester Polytechnic Institute

Chandeok Park Defended February 2006
"The Hamilton-Jacobi Theory for Solving Optimal Feedback Control Problems With General Boundary Conditions"
Committee Chair
National Research Council Post-Doctoral Fellow, Naval Post-Graduate School
Assistant Professor, Yonsei University, Korea.

Leonel Rios-Reyes Defended September 2006
"Solar Sails: Modeling, Estimation, and Trajectory Control"
Committee Chair
Aerospace Corporation, El Segundo, CA

Stephen Broschart Defended September 2006, NASA GSRP Fellow
"Close Proximity Spacecraft Maneuvers Near Irregularly Shaped Small-bodies: Hovering, Translation, and Descent"
Committee Chair
Jet Propulsion Laboratory, California Institute of Technology

Marci Paskowitz Defended October 2006, François-Xavier Bagnoud Fellow
"Orbit Design and Control of Planetary Satellite Orbiters in the Hill 3-Body Problem"
Committee Chair
GMV Space Systems, Rockville, MD

Ryan Park Defended November 2006
"Nonlinear Trajectory Navigation"
Committee Chair
Jet Propulsion Laboratory, California Institute of Technology

Jared M. Maruskin Defended January 2008
"On the Dynamical Propagation of Subvolumes and on the Geometry and Variational Principles of Nonholonomic Systems"
Committee Co-Chair
Assistant Professor, Department of Mathematics, San Jose State University

Julie Bellerose Defended April 2008, Canadian NSERC Fellow
"The Restricted Full Three Body Problem: Applications to Binary Asteroid Exploration"
Committee Chair
Post-Doctoral Researcher, Japanese Aerospace Exploration Agency

Prashant Patel Defended June 2008, NASA GSRP Fellow
"Automating the Generation of Feasible Trajectories for Trade Studies"
Committee Co-Chair
Institute for Defense Analysis, Alexandria, VA

Sharyl Byram Defended November 2008
"The Effects of Outgassing Jets on the Rotation of a Comet Nucleus and on the Trajectory of an Orbiting Spacecraft"
Committee Chair
GMV Space Systems, Rockville, MD

Eugene Fahnestock Defended December 2008, NDSEG and NSF Fellow
"The Full Two Body Problem: Simulation, Analysis, and Application to the Dynamics, Characteristics, and Evolution of Binary Asteroid Systems" Committee Chair
Solar Systems Dynamics Group, Jet Propulsion Laboratory, Pasadena, CA

Eric Gustafson Defended May 2010
"Stochastic Optimal Control of Spacecraft"
Committee Chair, University of Michigan
Inner Planets Navigation Group, Jet Propulsion Laboratory/California Institute of Technology

Ryan Woolley Defended June 2010
"Endgame Strategies for Planetary Moon Orbiters,"
Committee Chair, University of Colorado
Mission Design Section, Jet Propulsion Laboratory/California Institute of Technology

Jennifer Hudson Defended September 2010, NSF Fellow
"Reduction of Low-Thrust Continuous Controls for Trajectory Dynamics and Orbital Targeting,"
Committee Co-Chair, University of Michigan
Post-doc, Department of Aerospace Engineering, The University of Michigan

Oier Penagaricano Defended September 2010, Gobierno Vasco Predoctoral Fellow
"A Perturbation Theory for Hamiltons Principal Function: Applications to Boundary Value Problems,"
Committee Chair, University of Michigan

Ph.D. Candidates

Marcus Holzinger Department of Aerospace Engineering Sciences, University of Colorado

Jay McMahon Department of Aerospace Engineering Sciences, University of Colorado

Seth Jacobson Department of Astrophysics and Planetary Science, University of Colorado

Christine Hartzell Department of Aerospace Engineering Sciences, University of Colorado

Pre-Candidates

Yu Takahashi Department of Aerospace Engineering Sciences, University of Colorado

Kohei Fujimoto Department of Aerospace Engineering Sciences, University of Colorado

Dylan Boone Department of Aerospace Engineering Sciences, University of Colorado

M.S. committees chaired

David J.-P. Dechambre Defended Fall 2000, The University of Michigan
"Computation of Ellipsoidal Gravity Field Harmonics for Small Solar System Bodies"
Committee Chair

Nathan C. Shupe Defended Fall 2010, The University of Colorado
"Orbit Options for an Orion-Class Spacecraft Mission to a Near-Earth Object,"
Committee Chair

Research Interests

Astrodynamics

Investigation of orbital dynamics of highly perturbed systems using analytical, semi-analytical, and numerical methods. Specific problems of current interest include:

- Orbit mechanics about planetary satellites with applications to Lunar and Europa Orbiter missions
- Orbital motion about asteroids and comets with applications to NASA and international space science missions
- Spacecraft formation flight dynamics
- Spacecraft dynamics in unstable orbital environments with applications to missions to Earth-Sun and Earth-Moon libration points
- Trajectory and propulsion system optimization

Navigation, Orbit Determination and Control

Investigation of spacecraft navigation and non-linear optimal control of spacecraft and mechanical systems in challenging environments. Specific problems of interest include:

- Dynamical evolution of satellites subjected to solar radiation pressure using precision models
- Orbit determination and correlation of single-pass observations
- Metrics and constraints for maneuvering vehicles in Earth orbit
- Precision modeling of non-gravitational models for spacecraft and natural bodies
- Optimal non-linear feedback control exploiting Hamiltonian formalisms
- Navigation and control of spacecraft for sampling small body surfaces
- Navigation models of comet outgassing
- Navigation models of solar sail spacecraft
- Orbit determination and statistical control of spacecraft in unstable orbital environments

Space Science

- Co-Investigator on the Astrodynamics Science Team of the Japanese Hayabusa Mission to Asteroid Itokawa
- Participating Scientist on the Radiometric Science Team of NASA's Near Earth Asteroid Rendezvous Mission to Asteroid Eros
- Investigations into the mechanics and dynamics of the asteroid and comet environment
- Formation and evolution of small-body binary systems
- Co-I on several proposed NASA Discovery and New Frontiers missions.
- PI on a submitted Discovery Mission Proposal: Binary Asteroid in-situ Explorer (BASiX) Mission.

Publications

Journal Articles

1. R.P. Perrine, D.C. Richardson, and **D.J. Scheeres**. "A Numerical Model of Cohesion in Planetary Rings," *Icarus* in press.

2. J.M. Hudson and **D.J. Scheeres**. "Orbital Targeting using the Reduced Eccentric Anomaly Low-Thrust Coefficients," *Journal of Guidance, Control and Dynamics* in press.

3. R.C. Woolley and **D.J. Scheeres**. "Application of V-infinity leveraging maneuvers to endgame strategies for planetary moon orbiters," *Journal of Guidance, Control and Dynamics* in press.

4. **D.J. Scheeres**. "Orbit mechanics about asteroids and comets," *Journal of Guidance, Control and Dynamics* in press.

5. M.J. Holzinger and **D.J. Scheeres**. "Analytical Reachability Solutions for a Class of Nonlinear Systems with Ellipsoidal Initial Sets," *IEEE Transactions on Aerospace and Electronic Systems* in press.

6. B.F. Villac and **D.J. Scheeres**. "Third-Body Driven vs. One-Impulse Plane Changes," *Journal of the Astronautical Sciences*, in press.

7. M.W. Busch, S.J. Ostro, L.A.M. Benner, M. Brozovic, J.D. Giorgini, J.S. Jao, D.J. Scheeres, C. Magri, M.C. Nolan, E.S. Howell, P.A. Taylor, J.-L. Margot and W. Brisken. "Radar Observations and the Shape of Near-Earth Asteroid 2008 EV5," *Icarus* in press.

8. P. Sánchez and **D.J. Scheeres**. 2011. "Simulating Asteroid Rubble-Piles with a Self-Gravitating Soft-Sphere DEM Model," *Astrophysical Journal*, 727: 120.

9. M. Brozovic, L.A.M. Benner, C. Magri, S.J. Ostro, **D.J. Scheeres**, J.D. Giorgini, M.C. Nolan, J.-L. Margot, R.F. Jurgens and R. Rose. 2010. "Radar observations and a physical model of contact binary Asteroid 4486 Mithra," *Icarus* 208(1): 207-220.

10. J. McMahon and **D.J. Scheeres**. 2010. "New Radiation Pressure Force Model for Navigation," *Journal of Guidance, Control and Dynamics* 33(5): 1418-1428.

11. **D.J. Scheeres**, C.M. Hartzell, P. Sànchez, M. Swift. 2010. "Scaling forces to asteroid surfaces: The role of cohesion," *Icarus* 210: 968-984.

12. J. McMahon and **D.J. Scheeres**. 2010. "Detailed Prediction for the BYORP Effect on Binary Near-Earth Asteroid (66391) 1999 KW4 and Implications for the Binary Population," *Icarus* 209: 494-509.

13. P. Pravec, D. Vokrouhlicky, D. Polishook, **D.J. Scheeres**, A. W. Harris, A. Galad, O. Vaduvescu, F. Pozo, A. Barr, P. Longa, F. Vachier, F. Colas, D. P. Pray, J. Pollock, D. Reichart, K. Ivarsen, J. Haislip, A. LaCluyze, P. Kusnirak, T. Henych, F. Marchis, B. Macomber, S. A. Jacobson, Y. N. Krugly, A. Sergeev, and A. Leroy. 2010. "Formation of asteroid pairs by rotational fission," *Nature* 466: 1085-1088.

14. K.E. Davis, R.L. Anderson, **D.J. Scheeres**, and G.H. Born. 2010. "The Use of Invariant Manifolds for Transfers between Unstable Periodic Orbits with Different Energies," *Celestial Mechanics and Dynamical Astronomy* 107(4): 471-485.

15. *M. Nakamiya*, H. Yamakawa, **D.J. Scheeres**, and M. Yoshikawa. 2010. "Interplanetary Transfers Between Halo Orbits: Connectivity Between Escape and Capture Trajectories," *Journal of Guidance, Control and Dynamics*, 33(3): 803-813.

16. J. McMahon and **D.J. Scheeres**. 2010. "Secular Orbit Variation due to Solar Radiation Effects: A Detailed Model for BYORP," *Celestial Mechanics and Dynamical Astronomy* 106: 261-300.

17. S. Cicalò and **D.J. Scheeres**. 2010. "Averaged rotational dynamics of an asteroid in tumbling rotation under the YORP torque," *Celestial Mechanics and Dynamical Astronomy* 106: 301-337.

18. K. Fujimoto and **D.J. Scheeres**. 2010. "Circular and Zero-inclination Solutions for Optical Observations of Earth-orbiting Objects," *Celestial Mechanics and Dynamical Astronomy*, 106(2): 157-182.

19. D. Currel, E.C. Lorenzini, C. Bombardelli, M. Sanjurjo-Rivo, J. Pelaez, **D. Scheeres**, and M. Lara. 2010. "Three-Body Dynamics and Self-Powering of an Electrodynamic Tether in a Plasmasphere," *Journal of Propulsion and Power* 26(3): 385-395.

20. O. Peñagaricano Muñoa and **D.J. Scheeres**. 2010. "A perturbation theory," *Acta Astronautica* 67(1-2): 27-37.

21. J. Masiero, C. Hartzell, and **D.J. Scheeres**. 2009. "The effect of the dust size distribution on asteroid polarization," *The Astronomical Journal* 138: 1557-1562.

22. E.G. Fahnestock and **D.J. Scheeres**. 2009. "Binary asteroid orbit expansion due to continued YORP spin-up of the primary and primary surface particle motion," *Icarus* 201(1): 135-152.

23. P. Patel and **D.J. Scheeres**. 2009. "A Second Order Optimization Algorithm Using Quadric Control Updates for Multistage Optimal Control Problems," *Optimal Control Applications and Methods* 30: 525-536.

24. Y. Tsuda and **D.J. Scheeres**. 2009. "State Transition Matrix Approximation Using a Generalized Averaging Method," *Journal of Guidance, Control and Dynamics* 32(6): 1781-1794.

25. S.M. Byram and **D.J. Scheeres**. 2009. "Stability of Sun-Synchronous Orbits in the Vicinity of a Comet," *Journal of Guidance, Control and Dynamics* 32(5): 1550-1559.

26. Y. Tsuda and **D.J. Scheeres**. 2009. "Computation and Applications of an Orbital Dynamics Symplectic State Transition Matrix," *Journal of Guidance, Control and Dynamics* 32(4): 1111-1123.

27. A. Rossi, F. Marzari and **D.J. Scheeres**. 2009. "Computing the effects of YORP on the spin rate distribution of the NEO population," *Icarus* 202: 95-103.

28. M. Brozovic, S.J. Ostro, L.A.M. Benner, J.D. Giorgini, R.F. Jurgens, R. Rose, M.C. Nolan, A.A. Hine, C. Magri, **D.J. Scheeres**, and J.-L. Margot. 2009. "Radar observations and a physical model of Asteroid 4660 Nereus, a prime space mission target," *Icarus* 201: 153-166.

29. E.D. Gustafson and **D.J. Scheeres**. 2009. "Optimal Timing of Control Law Updates for Unstable Systems with Continuous Control," *Journal of Guidance, Control and Dynamics* 32(3): 878-887.

30. J.S. Hudson and **D.J. Scheeres**. 2009. "Reduction of Low Thrust Continuous Controls for Trajectory Dynamics," *Journal of Guidance, Control and Dynamics* 32(3): 780-787.

31. **D.J. Scheeres**. 2009. "Stability of the Planar Full 2-Body Problem," *Celestial Mechanics and Dynamical Astronomy* 104: 103-128.

32. **D.J. Scheeres**. 2009. "Minimum energy asteroid recongurations and catastrophic disruptions," *Planetary and Space Science* 57: 154-164.

33. J.M. Maruskin, **D.J. Scheeres** and A.M. Bloch. 2009. "Dynamics of Symplectic Subvolumes," *SIAM Journal of Applied Dynamical Systems* 8(1): 180-201.

34. M. Paskowitz Possner and **D.J. Scheeres**. 2009. "Control of Science Orbits About Planetary Satellites," *Journal of Guidance, Control and Dynamics*, 32(1): 223-231.

35. J.M. Maruskin, **D.J. Scheeres** and K.T. Alfriend. 2009. "Correlation of optical observations of objects in Earth orbit," *Journal of Guidance, Control and Dynamics*, 32(1): 194-209.

36. R.W. Gaskell, O.S. Barnouin-Jha, D.J. Scheeres, A.S. Konopliv, T. Mukai, S. Abe, J. Saito, M. Ishiguro, T. Kubota, T. Hashimoto, J. Kawaguchi, M. Yoshikawa, K. Shirakawa, T. Kominato, N. Hirata, H. Demura. 2008. "Characterizing and navigating small bodies with imaging data," *Meteoritics & Planetary Science* 43(6): 1049-1061.

37. C. Park, **D.J. Scheeres**, V. Guibout, and A. Bloch. 2008. "Global Solution for the Optimal Feedback Control of the Underactuated Heisenberg System," *IEEE Transactions on Automatic Control*, 53(11): 2638-2642.

38. V.V. Sidorenko, **D.J. Scheeres** and S.M. Byram. 2008. "On the rotation of comet Borrelly's nucleus," *Celestial Mechanics and Dynamical Astronomy*, 102: 133-147.

39. *M. Nakamiya*, **D.J. Scheeres**, H. Yamakawa, and M. Yoshikawa. 2008. "Analysis of Capture Trajectories into Periodic Orbits about Libration Points," *Journal of Guidance, Control and Dynamics*, 31(5): 1344-1351.

40. W.-D. Hu and **D.J. Scheeres**. 2008. "Periodic Orbits in Rotating Second Degree and Order Gravity Fields," *Chinese Journal of Astronomy & Astrophysics* 8(1): 108-118.

41. **D.J. Scheeres** and R.W. Gaskell. 2008. "Effect of density inhomogeneity on YORP: The case of Itokawa," *Icarus* 198: 125-129.

42. M.W. Busch, L.A.M. Benner, S.J. Ostro, J.D. Giorgini, R.F. Jurgens, R. Rose, **D.J. Scheeres**, C. Magri, J.-L. Margot, M.C. Nolan, and A.A. Hine. 2008. "Physical Properties of Near-Earth Asteroid (33342) 1998 WT24," *Icarus* 195(2): 614-621.

43. E.G. Fahnestock and **D.J. Scheeres**. 2008. "Simulation and Analysis of the Dynamics of Binary Near-Earth Asteroid (66391) 1999 KW4," *Icarus* 194: 410-435.

44. E.G. Fahnestock and **D.J. Scheeres**. 2008. "Dynamical Characterization and Stabilization of Large Gravity Tractor Designs," *Journal of Guidance, Control and Dynamics* 31(3): 501-521.

45. J.E. Bellerose and **D.J. Scheeres**. 2008. "General Dynamics in the Restricted Full Three-Body Problem," *Acta Astronautica* 62(10-11): 563-576.

46. **D.J. Scheeres** and S. Mirrahimi. 2008. "Rotational Dynamics of a Solar System Body Under Solar Radiation Torques," *Celestial Mechanics and Dynamical Astronomy* 101(1-2): 69-103.

47. M.K. Shepard, B.E. Clark, M.C. Nolan, L.A.M. Benner, S.J. Ostro, J.D. Giorgini, F. Vilas, K. Jarvis, S. Lederer, L.F. Lim, T. McConnochie, J. Bell, J.-L. Margot, A. Rivkin, C. Magri, **D.J. Scheeres**, and P. Pravec. 2008. "Multi-wavelength observations of Asteroid 2100 Ra-Shalom," *Icarus* 193: 20-38.

48. J.E. Bellerose and **D.J. Scheeres**. 2008. "Restricted Full Three-Body Problem: Application to Binary System 1999 KW4," *Journal of Guidance, Control and Dynamics* 31(1): 162-171.

49. J.E. Bellerose and **D.J. Scheeres**. 2008. "Energy and stability in the Full Two Body Problem," *Celestial Mechanics and Dynamical Astronomy* 100(1): 63-91.

50. *J.M. Maruskin*, **D.J. Scheeres**, F.C. Adams and A.M. Bloch. 2008 "The eccentric frame decomposition of central force fields," *Celestial Mechanics and Dynamical Astronomy* 100(1): 43-62.

51. J. Kadish, J.R. Barber, P.D. Washabaugh and **D.J. Scheeres**. 2008. "Stresses in accreted planetary bodies," *International Journal of Solids and Structures* 45: 540-550.

52. R.S. Park and **D.J. Scheeres**. 2007. "Nonlinear Semi-Analytic Methods for Trajectory Estimation," *Journal of Guidance, Control and Dynamics* 30(6): 1668-1676.

53. S.M. Byram, **D.J. Scheeres** and M.R. Combi. 2007. "Models for the Comet Dynamical Environment," *Journal of Guidance, Control and Dynamics* 30(5): 1445 – 1454.

54. M.W. Busch, J.D. Giorgini, S.J. Ostro, L.A.M. Benner, R.F. Jurgens, R. Rose, M.D. Hicks, P. Pravec, P. Kusnirak, M.J. Ireland, **D.J. Scheeres**, S.B. Broschart, C. Magri, M.C. Nolan, A.A. Hine, J.-L. Margot. 2007. "Physical Modeling of Near-Earth Asteroid (29075) 1950 DA," *Icarus* 190(2): 608-621.

55. I.I. Hussein, **D.J. Scheeres**, A.M. Bloch, D.C. Hyland, and N.H. McClamroch. 2007. "Optimal Motion Planning for Dual-Spacecraft Interferometry," *IEEE Transactions on Aerospace and Electronic Systems* 43(2): 723 – 737.

56. L. Rios-Reyes and **D.J. Scheeres**. 2007. "Solar Sail Navigation: Estimation of Force, Moments, and Optical Parameters," *Journal of Guidance, Control and Dynamics* 30(3): 660-668.

57. S.D. Ross, and **D.J. Scheeres**. 2007. "Multiple Gravity Assists, Capture, and Escape in the Restricted Three-Body Problem," *SIAM Journal on Applied Dynamical Systems* 6(3): 576-596. DOI: 10.1137/060663374

58. H. Miyamoto, H. Yano, **D.J. Scheeres**, S. Abe, O. Barnouin-Jha, A.F. Cheng, H. Demura, R.W. Gaskell, N. Hirata, M. Ishiguro, T. Michikami, A.M. Nakamura, R. Nakamura, J. Saito, and S. Sasaki. 2007. "Regolith migration and sorting on asteroid Itokawa," *Science* 316: 1011-1014.

59. **D.J. Scheeres**. 2007. "Rotational fission of contact binary asteroids," *Icarus* 189: 370-385.

60. **D.J. Scheeres**. 2007. "The dynamical evolution of uniformly rotating asteroids subject to YORP," *Icarus* 188: 430-450.

61. **D.J. Scheeres**, M. Abe, M. Yoshikawa, R. Nakamura, R.W. Gaskell, P.A. Abell. 2007. "The effect of YORP on Itokawa," *Icarus* 188: 425-429.

62. F.Y. Hsiao and **D.J. Scheeres**. 2007. "Fundamental Constraints on Uncertainty Evolution in Hamiltonian Systems," *IEEE Transactions on Automatic Control* 52(4): 686-691.

63. P.A. Taylor, J.-L. Margot, D. Vokrouhlický, **D.J. Scheeres**, P. Pravec, S.C. Lowry, A. Fitzsimmons, M.C. Nolan, S.J. Ostro, L.A.M. Benner, J.D. Giorgini, C. Magri. 2007. "Spin Rate of Asteroid (54509) 2000 PH5 Increasing due to the YORP Effect," *Science* 316: 274-277.

64. S.B. Broschart and **D.J. Scheeres**. 2007. "Boundedness of Spacecraft Hovering Under Dead-Band Control in Time-Invariant Systems," *Journal of Guidance, Control and Dynamics* 30(2): 601-610.

65. C. Magri, S.J. Ostro, **D.J. Scheeres**, M.C.Nolan, J.D. Giorgini, L.A.M.Benner and J-L. Margot. 2007. "Radar observations and a physical model of Asteroid 1580 Betulia," *Icarus* 186: 152-177.

66. J. Bellerose and **D.J. Scheeres**. 2007. "Stability of Equilibrium Points in the Restricted Full Three Body Problem," *Acta Astronautica* 60: 141-152.

67. **D.J. Scheeres**, F.-Y. Hsiao, R.S. Park, B.F. Villac, and J.M. Maruskin. 2006. "Fundamental Limits on Spacecraft Orbit Uncertainty and Distribution Propagation," *Journal of the Astronautical Sciences* 54: 505-523.

68. E.G. Fahnestock and **D.J. Scheeres**. 2006. "Simulation of the Full Two Rigid Body Problem Using Polyhedral Mutual Potential and Potential Derivatives Approach," *Celestial Mechanics and Dynamical Astronomy* 96: 317-339.

69. **D. J. Scheeres**, E. G. Fahnestock, S. J. Ostro, J.-L. Margot, L. A. M. Benner, S. B. Broschart, J. Bellerose, J. D. Giorgini, M. C. Nolan, C. Magri, P. Pravec, P. Scheirich, R. Rose, R. F. Jurgens, S. Suzuki, E. M. DeJong. 2006. "Dynamical Configuration of Binary Near-Earth Asteroid (66391) 1999 KW4," *Science* 314: 1280-1283.
Featured on the cover of Science.

70. S. J. Ostro, J.-L. Margot, L. A. M. Benner, J. D. Giorgini, **D. J. Scheeres**, E. G. Fahnestock, S. B. Broschart, J. Bellerose, M. C. Nolan, C. Magri, P. Pravec, P. Scheirich, R. Rose, R. F. Jurgens, S. Suzuki, E. M. DeJong. 2006. "Radar Imaging of Binary Near-Earth Asteroid (66391) 1999 KW4," *Science* 314: 1276-1280.
Featured on the cover of Science.

71. R.S. Park and **D.J. Scheeres**. 2006. "Nonlinear Mapping Of Gaussian State Uncertainties: Theory And Applications To Spacecraft Control And Navigation," 2006. *Journal of Guidance, Control and Dynamics* 29(6): 1367-1375.

72. M.E. Paskowitz and **D.J. Scheeres**. 2006. "Design of Science Orbits About Planetary Satellites: Application to Europa," *Journal of Guidance, Control and Dynamics* 29(5): 1147-1158.

73. *P. Patel*, **D.J. Scheeres**, and A. Gallimore. 2006. "Maximizing Payload Mass Fractions of Spacecraft for Interplanetary Electric Propulsion Missions," *Journal of Spacecraft and Rockets* 43(4): 822-827.

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Conference Papers

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2. M. Lara, J. Peláez, C. Bombardelli, F.R. Lucas, M. Sanjurjo-Rivo, D. Curreli, E.C. Lorenzini, **D.J. Scheeres**. "Dynamic Stabilization of L_2 Periodic Orbits Using Attitude-Orbit Coupling Effects," paper presented at the 22nd International Symposium on Space Flight Dynamics, San José dos Campos, Brazil, February 28-March 4, 2011.

3. M.J. Holzinger and **D.J. Scheeres**. "Object Correlation and Maneuver Detection Using Optimal Control Performance Metrics," paper presented at the 2010 AMOS Meeting, Maui, September 2010.

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5. D. Boone and **D.J. Scheeres**. "Analysis and Implementation of Geodesy Science for the Jupiter Europa Orbiter Mission," paper presented at the 2010 AIAA/AAS Astrodynamics Specialist Conference, Toronto, August 2010. Paper AIAA-2010-8255.

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33. K. Davis, R.L. Anderson, G.H. Born and **D.J. Scheeres**. "Connecting Libration Point Orbits of Different Energies Using Invariant Manifolds," paper presented at the 2009 AAS/AIAA Space Flight Mechanics Meeting, Savannah, Georgia, February 9-12, 2009. Paper AAS 09-256.

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35. D. Curreli, E.C. Lorenzini, C. Bombardelli, M. Sanjurjo-Rivo, F.R. Lucas, J. Pelaez, **D.J. Scheeres** and M. Lara. "Exploration of the Jupiter Plasma Torus With a Self-Powered Electrodynamic Tether," paper presented at the 2009 AAS/AIAA Space Flight Mechanics Meeting, Savannah, Georgia, February 9-12, 2009. Paper AAS 09-240.

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42. E.G. Fahnestock and **D.J. Scheeres**. "Characterization of Spacecraft and Debris Trajectory Stability within Binary Asteroid Systems," paper presented at the 2008 AIAA/AAS Astrodynamics Specialist Meeting, Honolulu, Hawaii, August 18-21, 2008. AIAA-2008-7203

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50. E. Gustafson and **D.J. Scheeres**. "Optimal Timing of Control Law Updates for Unstable Systems with Continuous Control," paper presented at the 2008 American Control Conference, Seattle, Washington, June 13, 2008. FrC15.4.

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53. P. Patel and **D.J. Scheeres**. "A Non-Linear Optimization Algorithm," paper presented at the 2008 AAS/AIAA Spaceflight Mechanics Meeting, Galveston, Texas, January 27-31, 2008. AAS 08-116.

54. J.M. Maruskin, **D.J. Scheeres**, and A.M. Bloch. "Dynamics of Symplectic SubVolumes," paper presented at the 46th IEEE Conference on Decision and Control, New Orleans, Louisiana, December 2007.

55. **D.J. Scheeres**, J.M. Maruskin, and K.T. Alfriend. "Correlation of optical observations of objects in Earth orbit," invited paper S3.2 presented at the Seventh US/Russian Space Surveillance Workshop, Naval Postgraduate School, Monterey, California, October 29-November 1, 2007.

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64. S. Ross and **D.J. Scheeres**. "Multiple Gravity Assists in the Restricted Three-Body Problem," paper presented at the 17th AAS/AIAA Space Flight Mechanics Meeting, Sedona, Arizona, January 2007. AAS 07 - 227

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66. O. Peñagaricano Muñoa and **D.J. Scheeres**. "A Perturbation Theory for Hamilton's Principal Function: Applications to the Two-Point Boundary Value Problem," paper presented at the 17th AAS/AIAA Space Flight Mechanics Meeting, Sedona, Arizona, January 2007. AAS 07 - 220

67. J. Pelaez and **D. J. Scheeres**. "A Permanent Tethered Observatory at Jupiter: Dynamical Analysis," paper presented at the 17th AAS/AIAA Space Flight Mechanics Meeting, Sedona, Arizona, January 2007. AAS 07 - 190

68. P. Patel, **D.J. Scheeres**, A. Gallimore, and T. Zurbuchen. "A Path Based Approach to Finding Optimal Interplanetary Trajectories," paper presented at the 17th AAS/AIAA Space Flight Mechanics Meeting, Sedona, Arizona, January 2007. AAS 07 - 156

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70. M. Paskowitz Possner and **D.J. Scheeres**. "Control of Science Orbits About Planetary Satellites," paper presented at the 17th AAS/AIAA Space Flight Mechanics Meeting, Sedona, Arizona, January 2007. AAS 07 - 132

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81. L. Rios-Reyes and **D.J. Scheeres**. "Solar Sail Navigation: Estimation of Force, Moment, and Optical Parameters," paper presented at the 2006 AAS/AIAA Space Flight Mechanics Meeting, Tampa, Florida, January 2006. AAS 06-225.

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86. F.Y. Hsiao and **D.J. Scheeres**. "Uncertainty Control Utilizing Natural Dynamics in Hamiltonian Systems," paper presented at the 2006 AAS/AIAA Space Flight Mechanics Meeting, Tampa, Florida, January 2006. AAS 06-136

87. C. Park and **D.J. Scheeres**. "Formulation of a Hamiltonian Cauchy Problem for Solving Optimal Feedback Control Problems," paper presented at the 2005 CDC-ECC conference.

88. *I. Hussein*, **D.J. Scheeres**, D.C. Hyland. "Optimal Formation Control for Imaging and Fuel Usage with Terminal Imaging Constraints," paper presented at the 2005 IEEE Conference on Control Applications.

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Conference Abstracts and Posters

1. **D.J. Scheeres** and P. Sánchez. "Evolution of Small, Rapidly Rotating Asteroids," abstract presented at the 42nd Lunar and Planetary Science Conference, Houston, Texas, March 2011. Abstract 2307.

2. S.A. Jacobson and **D.J. Scheeres**. "Long-term Stable Equilibria for Synchronous Binary Asteroids," abstract presented at the 42nd Lunar and Planetary Science Conference, Houston, Texas, March 2011. Abstract 2239.

3. P. Sánchez and **D.J. Scheeres**. "Rotational Reshaping and Yield Stress of Rubble-Pile Asteroids," abstract presented at the 42nd Lunar and Planetary Science Conference, Houston, Texas, March 2011. Abstract 2120.

4. O. Robert, P. Lognonne, **D.J. Scheeres**, N. Goujon, M. Le Feuvre, A. Izzet, C. Blitz, and L. Bowman. " Seismology on a small body: expected results for the BASiX Discovery Mission proposal," poster presented at the 2010 American Geophysical Union Fall Meeting, San Francisco, December 2010.

5. **D. J. Scheeres**, C.M. Hartzell, Paul Sanchez and M. Swift. "Scaling Forces to the Asteroid Surface: The Role of Cohesion," abstract presented at the 2010 American Astronomical Society Division for Planetary Sciences Meeting, Pasadena, California, October 2010. Abstract 63.08.

6. S.A. Jacobson and **D. J. Scheeres**. "Dynamics of Rotationally Fissioned Asteroids," abstract presented at the 2010 American Astronomical Society Division for Planetary Sciences Meeting, Pasadena, California, October 2010. Abstract 63.07.

7. J. McMahon and **D. J. Scheeres**. "Measuring the Binary YORP Effect and the Influence of Librations on Binary Asteroid Evolution," abstract presented at the 2010 American Astronomical Society Division for Planetary Sciences Meeting, Pasadena, California, October 2010. Abstract 63.06.

8. Paul Sanchez and **D. J. Scheeres**. "DEM Simulation of Rotational Disruption of Rubble-Pile Asteroids," abstract presented at the 2010 American Astronomical Society Division for Planetary Sciences Meeting, Pasadena, California, October 2010. Abstract 63.05.

9. Alessandro Rossi, F. Marzari and **D. J. Scheeres**. "Unveiling The Excess Of Slow Rotators In The Small Main Belt Asteroids," abstract presented at the 2010 American Astronomical Society Division for Planetary Sciences Meeting, Pasadena, California, October 2010. Abstract 63.02.

10. M.W. Busch, et al., **D. J. Scheeres**, et al.. "Radar Observations and the Shape of 2008 EV5: Ridges and Craters on Near-Earth Asteroids," abstract presented at the 2010 American Astronomical Society Division for Planetary Sciences Meeting, Pasadena, California, October 2010. Abstract 57.05.

11. E.S. Howell, et al., **D. J. Scheeres**, et al.. "Radar Shape Modeling Of (8567) 1996 HW1 Combined With Thermal Observations," abstract presented at the 2010 American Astronomical Society Division for Planetary Sciences Meeting, Pasadena, California, October 2010. Abstract 57.03.

12. M. Brozovic, et al., **D. J. Scheeres**, et al.. "Radar Images And Shape Model Of A Triple Asteroid (136617) 1994CC," abstract presented at the 2010 American Astronomical Society Division for Planetary Sciences Meeting, Pasadena, California, October 2010. Abstract 57.02.

13. Richard Dissly, **D.J. Scheeres**, E. Nilsen, S. Roark, W. Frazier, T. Bank, D. Rosing, E. Jordan, The BASiX Science Team. "The Binary Asteroid in-situ Explorer (BASiX) Mission," poster presented at the 2010 American Astronomical Society Division for Planetary Sciences Meeting, Pasadena, California, October 2010. Abstract 49.28L.

14. C.M. Hartzell and **D. J. Scheeres**. "Electrostatic Dust Launching Methods," abstract presented at the 2010 American Astronomical Society Division for Planetary Sciences Meeting, Pasadena, California, October 2010. Abstract 17.01.

15. L.A.M. Benner, J. Margot, M.C. Nolan, J.D. Giorgini, M. Brozovic, **D.J. Scheeres**, C. Magri, S.J. Ostro. "Radar Imaging and a Physical Model of Binary Asteroid 65803 Didymos," poster presented at the 2010 American Astronomical Society Division for Planetary Sciences Meeting, Pasadena, California, October 2010. Abstract 13.17.

16. J. McMahon and **D.J. Scheeres**. "A detailed model of BYORP," abstract presented at the Second Workshop on Binaries in the Solar System Wasowo/Poznan, Poland. July 12-15, 2010.

17. S.A. Jacobson and **D.J. Scheeres**. "Dynamical evolution of binary asteroid systems," abstract presented at the Second Workshop on Binaries in the Solar System Wasowo/Poznan, Poland. July 12-15, 2010.

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19. **D.J. Scheeres** and O. Peñagaricano-Muñoa. "The Computation and Application of Hamiltons Principal Function in Astrodynamics," abstract presented at the DSPDES 2010 SIAM Conference, Barcelona, Spain, June 2010.

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24. **D.J. Scheeres**, C.M. Hartzell, P. Sánchez and M. Swift. "The Relevance and Role of Cohesive Forces for Small Asteroids," talk presented at the 41st Lunar and Planetary Science Conference, March 2010. Abstract 1839.

25. R.W. Gaskell, O.S. Barnouin and **D.J. Scheeres**. "The NEAR Shoemaker Landing on Eros," talk presented at the 41st Lunar and Planetary Science Conference, March 2010. Abstract 2093.

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27. S. Roark, C. Cottingham, R. Dissly, **D. Scheeres**, V. Petr, and K. Housen. "Explosive Surface Pods for Cratering Experiments on Small Bodies," poster presented at the 41st Lunar and Planetary Science Conference, March 2010. Abstract 2100.

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29. P. Sánchez, **D.J. Scheeres** and M. Swift. "Impact Driven Size Sorting in Self-Gravitating Granular Aggregates," talk presented at the 41st Lunar and Planetary Science Conference, March 2010. Abstract 2634.

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31. **D.J. Scheeres**. "Studying the Fundamental Physical Characteristics of Asteroid Surfaces at Binary Asteroids," invited talk given at the International Workshop on Small Body Exploration by Physical Interactions, October 19-20, 2009. Hotel Villa Fontaine, Tokyo, Japan.

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33. J. McMahon and **D.J. Scheeres**. "Predictions For The Effects Of BYORP On 1999 KW4," talk presented at the 41st Annual American Astronomical Society - Division of Planetary Sciences Meeting, Puerto Rico. Abstract #56.09.

34. S.A. Jacobson and **D.J. Scheeres**. "A Rapid Phase of Tidal Dissipation for Post-Fission Binary Asteroids," talk presented at the 41st Annual American Astronomical Society - Division of Planetary Sciences Meeting, Puerto Rico. Abstract #56.08.

35. **D.J. Scheeres**. "The Orbital Stability of Fissioned Contact Binary Asteroids," talk presented at the 41st Annual American Astronomical Society - Division of Planetary Sciences Meeting, Puerto Rico. Abstract #56.07.

36. A. Rossi, F. Marzari and **D.J. Scheeres**. "Spin Evolution of Small Main Belt Asteroids," talk presented at the 41st Annual American Astronomical Society - Division of Planetary Sciences Meeting, Puerto Rico. Abstract #56.01.

37. C. Hartzell and **D.J. Scheeres**. "The Dynamics of Dust Levitated from Asteroids," poster presented at the 41st Annual American Astronomical Society - Division of Planetary Sciences Meeting, Puerto Rico. Abstract #50.07.

38. M. Brozovic, L.A.M. Benner, C. Magri, S.J. Ostro, **D.J. Scheeres**, J.D. Giorgini, M.C. Nolan, J.-L. Margot, R.F. Jurgens, R. Rose. "Radar observations and a physical model of contact binary asteroid 4486 Mithra," talk presented at the 41st Annual American Astronomical Society - Division of Planetary Sciences Meeting, Puerto Rico. Abstract #43.11.

39. **D.J. Scheeres**. "The Meaning of an Asteroid's Shape," invited talk presented at the 41st Annual American Astronomical Society - Division of Planetary Sciences Meeting, Puerto Rico. Abstract #29.04.

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41. **D.J. Scheeres**. "Stability of the Full 2-Body Problem: Applications to Binary Asteroids," invited talk given at CELMEC V, the Fifth International Meeting on Celestial Mechanics, Balletti Park Hotel, San Martino al Cimino, Viterbo (Italy). September 2009.

42. **D.J. Scheeres**. "The mechanics of motion on and about asteroids," talk presented at the Steve Ostro Memorial Symposium, Jet Propulsion Laboratory, June 3, 2009.

43. **D.J. Scheeres**. "Stability of Relative Equilibria for Coupled Rotational and Translational Motion," talk presented at the 2009 American Astronomical Society – Division on Dynamical Astronomy Meeting, Virginia Beach, Virginia, May 2009. Abstract #10.01.

44. S.A. Jacobson and **D.J. Scheeres**. "Tidal and Dynamical Evolution of Binary Asteroids," talk presented at the 2009 American Astronomical Society – Division on Dynamical Astronomy Meeting, Virginia Beach, Virginia, May 2009. Abstract #10.02.

45. J.W. McMahon and **D.J. Scheeres**. "Secular Orbit Variation due to Solar Radiation Effects: A Detailed Model for BYORP," talk presented at the 2009 American Astronomical Society – Division on Dynamical Astronomy Meeting, Virginia Beach, Virginia, May 2009. Abstract #10.03.

46. **D.J. Scheeres**. "Fundamental Limits on Uncertainty Propagation in Astrodynamical Systems," talk presented in MS107: Applications of Phase Space Analysis to Astrodynamics, 2009 SIAM Conference on Dynamical Systems, Snowbird, Utah. May 2009.

47. **D. J. Scheeres**, P. Sánchez, R. W. Dissly, E.I. Asphaug, K.R. Housen, M.R. Swift, H. Yano, S.E. Roark, and J.C. Soto. "Extra Low-Gear: A Micro-gravity laboratory to simulate asteroid surfaces," poster presented at the 40th Lunar and Planetary Science Conference, March 2009. Abstract 2447.

48. **D.J. Scheeres** and S.A. Jacobson. "Fission and stability of ellipsoidal contact binary asteroids," talk presented at the 40th Lunar and Planetary Science Conference, March 2009. Abstract 2040.

49. E. Asphaug, A. Safaeinili, M.J.S. Belton, **D.J. Scheeres**, S. Chesley, W. Kofman, and D. Yeomans. "Deep Interior: High-resolution volumetric radar imaging of a comet nucleus," poster presented at the 40th Lunar and Planetary Science Conference, March 2009. Abstract 2109.

50. P. Sánchez and **D.J. Scheeres**. "Granular mechanics in asteroid regolith: Simulating and scaling the brazil nut effect," talk presented at the 40th Lunar and Planetary Science Conference, March 2009. Abstract 2228.

51. C. M. Cottingham, S. E. Roark, W. D. Deininger, R. W. Dissly, K. W. Epstein, D. M. Waller, and **D. J. Scheeres**. "Small surface probes for enchanced asteroid and

comet rendezvous missions," poster presented at the 40th Lunar and Planetary Science Conference, March 2009. Abstract 2310.

52. **D.J. Scheeres**, R.W. Gaskell and P. Sánchez. "YORP and Density Inhomogeneity within Itokawa ," talk presented at the 2008 American Geophysical Union, San Francisco, December 2008.

53. **D.J. Scheeres**, C. Park, V. Guibout, A.M. Bloch. "Optimal Control and Hamiltonian Dynamics," talk presented at the American Mathematical Society, Meeting 1044, Huntsville, AL, Special Session on Geometric Mechanics, Control and Integrability.

54. E.G. Fahnestock and **D.J. Scheeres**. "Primary Surface Particle Motion as a Mechanism for YORP-driven Binary Asteroid Evolution," talk presented at the 40th Annual American Astronomical Society - Division of Planetary Sciences Meeting, Ithaca.

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4. **D.J. Scheeres**, D. Han, and Y. Hou. 2001. "Orbit Determination Uncertainty Distributions and Mappings in an Unstable Halo Orbit," *InterPlanetary Network Progress Report* 42-146.

5. **D.J. Scheeres**. 2001. "Design and Analysis of Landing and Low-Altitude Asteroid Flyovers," *InterPlanetary Network Progress Report* 42-146.

6. **D.J. Scheeres**, S. Bhargava, and A. Enzian. 2000. "A Navigation Model of the Continuous Outgassing Field Around a Comet," *Telecommunications and Data Acquisition Progress Report* 42-142.

7. **D.J. Scheeres**. 2000. "A Comparison of Close-Proximity Operations at Comets and Asteroids," *Telecommunications and Data Acquisition Progress Report* 42-141.

8. **D.J. Scheeres** and F. Marzari. 1999. "Dynamics of dust ejected from comet Tempel 1 due to the Deep Impact cratering event," report written for the Deep Impact Discovery Mission PI, M. A'Hearn.

9. N. Samarasinha, H. Boehnhardt, L. Jorda, F. Marzari, B. Mueller, and **D.J. Scheeres**. 1998. "Rotation Models of Comet 46P/Wirtanen," report written for the Rosetta Science Working Group on Comet 46P/Wirtanen.

10. **D.J. Scheeres**. 1998. "Interactions Between Ground-Based and Autonomous Navigation for Precision Landing at Small Solar-System Bodies," *Telecommunications and Data Acquisition Progress Report* 42-132.

11. E. DeJong, S. Suzuki, **D.J. Scheeres**, S.J. Ostro, and R.S. Hudson, "Orbits About Asteroid 4179 Toutatis," JPL Video Release, AVC-96-096. Distributed to a wide international and national science and educational audience.

12. E. DeJong, S. Suzuki, **D.J. Scheeres**, S.J. Ostro, and R.S. Hudson, "Visualization of Earth Approaching Asteroids - 1. Orbits About Asteroid 4769 Castalia (1989 PB)," JPL Video Release, AVC-95-147. Distributed to a wide international and national science and educational audience.

13. W.C. Masters, **D.J. Scheeres**, and S.W. Thurman. 1993. "Enhanced Orbit Determination Filter: Inclusion of Ground System Errors as Filter Parameters," *Telecommunications and Data Acquisition Progress Report* 42-116: 37–41.

14. **D.J. Scheeres**. 1993. "Failure Modes of Reduced-Order Orbit Determination Filters and Their Remedies," *Telecommunications and Data Acquisition Progress Report* 42-114: 34–42.

Invited Seminars and Talks

1. "Optimal Control and Space Situational Awareness," Department of Aerospace Engineering Seminar, The University of Illinois, Champaign-Urbana, November 8, 2010.

2. "The Life-cycles of Small Asteroids," SÉMINAIRES "Temps & Espace", IMCCE/Observatoire of Paris, January 11, 2010.

3. "Celestial Mechanics and the lifestyles of small asteroids," Department of Applied Mathematics Colloquium, University of Colorado, May 1, 2009.

4. "The Life-cycles of Small Asteroids," Department of Astronomy Seminar, University of Maryland at College Park, April 1, 2009.

5. "A Proposed Characterization Mission to a Binary Asteroid," National Research Council Panel on Asteroid Mitigation, Washington DC, March 31, 2009.

6. "The Life-cycles of Small Asteroids," LASP Seminar series, University of Colorado at Boulder, March 19, 2009.

7. "Asteroid Exploration: On Earth and in Space," Department of Mechanical and Aerospace Engineering Seminar, University of Missouri – Columbia, March 5, 2009.

8. "The Life-cycles of Small Asteroids," Astrophysics Seminar, Ohio University, February 25, 2009.

9. "The Life-cycles of Small Asteroids," Institute for Space and Astronautical Science, Japanese Exploration Agency, Japan, January 26, 2009.

10. "Orbital Mechanics about and on Comet 67P/C-G," Workshop on trajectories about small bodies, CNRS, Toulouse, France, December 11, 2008.

11. "Orbit Mechanics of and About Asteroids," 5 seminars at the XIII Ciclo de Cursos Especiais, Observatório Nacional, Rio de Janeiro, Brazil, October 27-31, 2008.

12. "Characterization and Correlation of One-Pass Optical Observations," Space Situational Awareness Workshop, Maui, HI, September 22, 2008.

13. "Characterization and Correlation of One-Pass Optical Observations," Kirtland Air Force Research Lab, August 5, 2008.

14. "Asteroid Exploration: On Earth and in Space," University of Texas at Austin, Center for Space Research, July 28, 2008.

15. "The Life-cycles of Small Asteroids," Institute for Astronomy Colloquium, University of Hawaii at Manoa, April 23, 2008.

16. "Celestial Mechanics of the Full Two-Body Problem: Applications to Binary Asteroids," Applied Mathematics Dynamics Seminar, University of Colorado, February 14, 2008.

17. "Asteroid Exploration: On Earth and In Space," ISTI-CNR, Pisa, Italy, June 21, 2007.

18. "Asteroid Exploration: On Earth and In Space," University of Zaragoza, Zaragoza, Spain, June 18, 2007.

19. "Asteroid Exploration: On Earth and In Space," Massachusetts Institute of Technology, Earth and Planetary Science Seminar, April 25, 2007.

20. "Asteroid Exploration: On Earth and In Space," California Institute of Technology, Planetary Science Seminar, February 27, 2007.

21. "Asteroid Exploration: On Earth and In Space," University of Michigan, Department of Aerospace Engineering Seminar, January 18, 2007.

22. "The Full Two Body Problem," Texas A&M University, Department of Aerospace Engineering Seminar, November 16, 2006.

23. "The Full Two Body Problem," University of Illinois, Champaign-Urbana, Department of Aerospace Engineering Seminar, November 6, 2006.

24. "Asteroids Up Close and Personal," Calvin College, Grand Rapids, Physics/Astronomy Seminar, October 17, 2006.

25. " Space Missions to Asteroids: NEAR and Hayabusa," Harbin Institute of Technology, Harbin, China, July 20, 2006.

26. "The Full Two-Body Problem: Celestial Mechanics and Binary Asteroids," Harbin Institute of Technology, Harbin, China, July 20, 2006.

27. "Asteroid Mission Design and Navigation," Harbin Institute of Technology, Harbin, China, July 21, 2006.

28. "Space Missions to Asteroids," Beihang University, Beijing, China, July 18, 2006.

29. "The Full Two-Body Problem," ETSI Aeronauticos, Technical University of Madrid, May 30, 2006.

30. "Solving Two Point Boundary Value Problems with Generating Functions," Department of Applied Mathematics, University of Murcia, Spain, May 2006.

31. "The Full Two-Body Problem: Celestial Mechanics and Binary Asteroids," Department of Applied Mathematics, University of Murcia, Spain, May 2006.

32. "Space Missions to Asteroids," University of Alicante, Spain, May 2006.

33. "Stability of Binary Asteroids Formed Through Fission," Southwest Research Institute – Boulder, February 20, 2006.

34. "The Full Two Body Problem," UCLA Department of Mechanical and Aerospace Engineering, February 16, 2006.

35. "Optimal Feedback Control and Hamiltonian Dynamics," Tokyo Metropolitan University, December 9, 2005.

36. "Space Exploration Missions to Asteroids," Tokyo Metropolitan University, December 9, 2005.

37. "Fundamental Limits on Spacecraft Orbit Uncertainty and Distribution Propagation," Guidance, Navigation and Control Section, Jet Propulsion Laboratory, July 29, 2005.

38. "The Full Two Body Problem: Celestial Mechanics and Binary Asteroids," Applied and Interdisciplinary Mathematics Seminar, Department of Mathematics, University of Michigan, April 8, 2005.

39. "Space Exploration and Astrodynamics," Shipman Society Seminar, University of Michigan, October 27, 2004.

40. "Exploration and Astrodynamics," Undergraduate Student Seminar, Department of Aerospace Engineering, University of Michigan, September 17, 2004.

41. "The High Impact of Low Thrust Propulsion," FEGI Student Seminar, University of Michigan, August 6, 2004.

42. "Dynamics of Planetary Satellite Orbiters: Applications to JIMO at Europa," Navigation Systems Section, Jet Propulsion Laboratory, August 2, 2004.

43. "The Dynamical Environment about Asteroid 25143 Itokawa: Scientific Implications," Institute of Space and Astronautical Science, Japan, June 8, 2004.

44. "The Dynamical Environment about Asteroid 25143 Itokawa: Navigation Implications," Institute of Space and Astronautical Science, Japan, June 7, 2004.

45. "Asteroid Fission and Final Rotation Rates," Spaceflight Dynamics Section, ISTI-CNR, Pisa, Italy, April 2004.

46. "Full Body Problems: Where to next?," Full Body Problem Workshop, California Institute of Technology, November 14, 2003.

47. "The Full 2-Body Problem," Michigan Aerospace Seminar, Department of Aerospace Engineering, University of Michigan, October 9, 2003.

48. "Past, Present and Pending Space Missions to Asteroids and Comets," Space Science Seminar Series, Atmospheric and Oceanic Space Science Department, University of Michigan, September 26, 2003.

49. "Close Proximity Spacecraft Operations About Asteroids and Comets," University of Michigan ΣΓΤ chapter, September 25, 2003.

50. "The Dynamical Environment of Binary Asteroids," Non-linear Astrodynamics Group, California Institute of Technology, July 2003.

51. "The Dynamical Environment of Binary Asteroids," Navigation Systems Section, Jet Propulsion Laboratory, July 2003.

52. "The Full Two-Body Problem and the Dynamics of Binary Asteroids," University of Padova, Italy, June 2003.

53. "The Orbital Dynamics Environment of 433 Eros," Spaceflight Dynamics Section, ISTI-CNR, Pisa, Italy, June 2003.

54. "The Full Two-Body Problem and the Dynamics of Binary Asteroids," Cornell University, Theoretical and Applied Mechanics Seminar, May 2003.

55. "Mission Phases for Close Proximity Operations at Small Bodies and Other Issues," invited seminar at the B612 Foundation Founder's Meeting, March 14, 2003.

56. "Dynamics of Mutual Attraction: Gravitational Coupling of Rotation and Translation," California Institute of Technology, CDS Seminar, November 2002.

57. "Close Proximity Operations at Small Bodies: Orbiting, Hovering, and Hopping," Workshop on Scientific Requirements for Mitigation of Hazardous Comets and Asteroids, Arlington, Virginia, September 3-6, 2002.

58. "Engineering Constraints of Sample Collection," Workshop on Scientific Criteria for the Samples for the Hera Mission, workshop held at the Meteoritical Society Meeting, UCLA, July 21, 2002.

59. "Orbit Determination and Control of a Spacecraft in a Libration Point Orbit," Jet Propulsion Laboratory/California Institute of Technology, Pasadena, July 19, 2002.

60. On-air live interview concerning asteroid impact and hazard mitigation, P.W. Smith Show, WJR 760 AM, July 7, 2002.

61. "Orbit Determination and Control of a Spacecraft in a Libration Point Orbit," CNUCE, Pisa, Italy, June 2002.

62. "Orbit Determination and Control of a Spacecraft in a Libration Point Orbit," University of Barcelona, Barcelona, Spain, June 2002.

63. "The Orbital Dynamics Environment of 433 Eros," Faculty of Mathematics, University of Barcelona, Barcelona, Spain, June 2002.

64. "Dynamics of Binary Asteroids," UM Astronomy Colloquium, March 2002.

65. "Landing on an Asteroid: NASA's NEAR Mission," The University of Michigan, Department of Aerospace Engineering Undergraduate Seminar, Ann Arbor, September 2001.

66. "Spacecraft Formation Flight in Unstable Orbital Environments," UM Control Seminar Series, April 2001.

67. "Orbit Determination in Unstable Orbits," Jet Propulsion Laboratory/California Institute of Technology, Pasadena, August 2, 2000.

68. "Stability of Asteroid Binary Systems," CNUCE, Pisa, Italy, July 2000.

69. "Hovering and Orbit Dynamics of the Muses-C S/C at Asteroid 1989 ML," Institute of Space and Astronautical Science, Japan, May 24, 2000.

70. "NEAR at Eros: A science report on the mission to date," Institute of Space and Astronautical Science, Japan, May 22, 2000.

71. "NEAR at Eros: An Overview of the Mission to Date," Institute of Space and Astronautical Science, Japan, May 15, 2000.

72. "Ejecta Dynamics at Comet Tempel 1," Deep Impact Cratering Workshop, Ball Aerospace, February 2, 2000.

73. "NASA's Near Earth Asteroid Rendezvous (NEAR) Mission to Asteroid Eros," The University of Michigan, Department of Aerospace Engineering Undergraduate Seminar, Ann Arbor, October 1999.

74. "Measuring the Attraction of Eros," Dept. of Aeronautics and Astronautics, Purdue University, October 5, 1999.

75. "Design and Objectives of the NEAR Orbital Mission about 433 Eros," Institute of Space and Astronautical Science, Japan, July 23, 1999.

76. "Orbital Dynamics of the NEAR Spacecraft About Asteroid 433 Eros," Tsukuba Space Center (NASDA), Japan, June 24, 1999.

77. "Measuring the Mathilde and Eros Gravity Fields for the NEAR Mission," Institute of Space and Astronautical Science, Japan, June 3, 1999.

78. "Stability and Control of Hovering Orbits about Small Bodies," Jet Propulsion Laboratory/California Institute of Technology, March 16, 1999.

79. "Stability analysis of a Europa Orbiter," Jet Propulsion Laboratory/California Institute of Technology, Pasadena, March 15, 1999.

80. "Making Mathilde (and Toutatis) Tumble," University of California – Santa Cruz, February 1999.

81. "Spacecraft dynamics in the comet environment," University of Padova, Italy, July 13, 1998.

82. "Spacecraft dynamics in the comet environment," Jet Propulsion Laboratory/California Institute of Technology, Pasadena, June 4, 1998.

83. "Navigation in Unstable Orbits," Libration Point Mission Workshop, California Institute of Technology, February 6, 1998.

84. "Navigating Asteroid Flybys," Iowa State University AIAA chapter, November 1997.

85. "Landing Softly on a Comet," Iowa State University, Dept. of Aerospace Engineering and Engineering Mechanics, Ames, March 1997.

86. "Rosetta spacecraft dynamics at the comet Wirtanen," European Space Operations Center, Darmstadt, Germany, November 1996.

87. "Navigating to Near-Earth Asteroids," The University of Michigan, Department of Aerospace Engineering, Ann Arbor, November 1996.

88. "Spacecraft Dynamics about Asteroids," The University of Minnesota, Department of Aerospace Engineering and Mechanics, Minneapolis, March 1996.

Service to Professional Societies

Memberships

Celestial Mechanics Institute Board Member since 2008, Elected Vice-President (2010)

American Astronautical Society Fellow, 2008

American Institute of Aeronautics and Astronautics Associate Fellow

American Astronomical Society
Member of the Division for Planetary Sciences
Member of the Division on Dynamical Astronomy: Elected Vice-Chair for 2010/2011, Chair for 2011/2012.

International Astronomical Union Commission 07, Celestial Mechanics and Dynamical Astronomy

Review Activities

Associate Editor SIAM Journal on Applied Dynamical Systems (2010-2012)

Contributing Scientific Editor The Astronomical Journal, published by the Institute of Physics (2009-2011).

Associate Editor Celestial Mechanics & Dynamical Astronomy: An International Journal of Space Dynamics, published by Springer (2003-).

Associate Editor Journal of the Astronautical Sciences, published by the American Astronautical Society (2003-).

Associate Editor Journal of Guidance, Control, and Dynamics, published by the American Institute of Aeronautics and Astronautics (2005-).

Editorial Board Journal of Nonlinear Science, published by Springer (2008-).

NRC Panel Member Mitigation of hazardous asteroids panel, 2009-2010.

NASA James Web Space Telescope Orbit Determination Review 2006, 2010.

NASA Discovery Data Analysis Program Proposal Review Board 2004.

NASA Planetary Astronomy Proposal Review Board 2003.

NASA Planetary Data Systems Review Board Planetary Data Systems Small Bodies Node: Comet review (April 2006), Lead reviewer for radio science data sets for the Stardust mission (August 2003), Near Earth Asteroid Rendezvous mission (August 2001).

NASA Red Team Review Board Member of the Genesis Mission Red Team Review Board, held at Lockheed-Martin, Denver, 2000.

JPL Peer Review Board Member of the Genesis Mission Peer Review Board, held at the California Institute of Technology, 1998.

Paper Reviews for the Journals *Science*; *Nature*; *Geophysical Review Letters*; *Icarus*; *Astronomical Journal*; *Astronomy and Astrophysics*; *Planetary and Space Science*; *Journal of Guidance, Control and Dynamics*; *Celestial Mechanics and Dynamical Astronomy*; *Journal of Spacecraft and Rockets*; *IEEE Transactions on Control Systems Technology*; *Physica D*; *Chaos*; *Nonlinearity*; *Journal of the Astronautical Sciences*; *Journal of Geophysical Research – Planets*; *Astrophysics and Space Science*; *Acta Astronautica*; *Journal of Power and Propulsion*; *Reviews of Geophysics*, *International Journal of Control*, *SIAM Journal on Applied Dynamical Systems*, *Astronomical Journal*, *Astrophysical Journal*, *Conference on Decision and Control*.

Proposal Reviews JPL New Millennium Program proposals, NASA Office of Space Science Proposals for the Planetary Geology and Geophysics Progam and the Planetary Atmospheres and Theoretical Modeling Program, U.S. Civilian Research and Development Foundation, JPL Telecommunications and Mission Operations Technology Program proposals, German-Israel Foundation for Scientific Research and Development, Israel Science Foundation.

Committee Activities

Vice-Chair American Astronomical Society's Division on Dynamical Astronomy, term starts July 2010. Culminates in position as Chair of AAS-DDA for one year, starting July 2011.

Member American Institute of Aeronautics and Astronautics Astrodynamics Technical Committee.

Member American Astronomical Society Division of Dynamical Astronomy Committee (2001-2004).

Member American Astronautical Society Technical Committee on Space Flight Mechanics (1998-2003, 2005 -).

Chair American Astronautical Society's Dirk Brouwer Award Committee (2007-present).

Chair American Astronomical Society Division on Dynamical Astronomy Student Travel Stipend Committee (2004-2005).

Chair American Astronautical Society's Breakwell Student Travel Award Committee (2001-2004).

Conference Activities

Member Scientific organizing committee for the 2nd Workshop on Binary Asteroids, Poznan, Poland, July 2010.

Session Chair 2010 AAS-DPS meeting, Pasadena, California. Co-chaired a contributed session.

Session Chair 2010 LPSC meeting, Houston, Texas. Co-chaired a contributed session.

Session Chair 2009 AAS-DPS meeting, San Juan, Puerto Rico. Co-chaired a contributed session.

Micro-Symposium Organizer Applications of Phase Space Analysis to Astrodynamics, 2009 SIAM Conference on Dynamical Systems, Snowbird, Utah. May 2009.

Member Scientific organizing committee for the 7th Alexander von Humboldt Colloquium for Celestial Mechanics, Bad Hofgastein, Austria, March 30 - April 5, 2008.

Invited Session Chair 2007 AAS-DPS meeting, Orlando, Florida. Co-chaired an invited session: *YORP Observed!*

General Chair 2007 AAS/AIAA Astrodynamics Specialist Conference, Mackinac Island, Michigan.

Co-Chair 2007 AAS-DDA Annual Meeting, Ann Arbor, Michigan.

Member Scientific organizing committee for the Workshop on Spacecraft Reconnaissance of Asteroid and Comet Interiors, Santa Cruz, California, October 5-6, 2006.

Member Scientific organizing committee for the Hayabusa Symposium 2006.

General Chair 2006 AIAA/AAS Astrodynamics Specialist Conference, Keystone, Colorado.

Technical Chair Winter 2003 AAS/AIAA Space Flight Mechanics Conference, Ponce, Puerto Rico.

Member Scientific organizing committee for the International Workshop on the Scientific Requirements for Mitigation of Hazardous Comets and Asteroids, Washington D.C., September 2002.

General Chair Winter 2001 AAS/AIAA Space Flight Mechanics Conference, Santa Barbara, California.

Session Chair Several AAS/AIAA Space Flight Mechanics and Astrodynamic Specialists Meeting sessions.

Session Chair Several AAS-DDA Meeting sessions.

Session Chair 2004 American Control Confernence, Boston, June 2004, Optimal Control session.

Session Co-Chair 24th International Symposium on Space Technology and Science, Miyazaki, Japan, June 2004, Student session, Guidance and Navigation session, Planetary Science session.

Session Co-Chair 23rd International Symposium on Space Technology and Science, Matsue, Japan, May 2002, Country-wide Education and Outreach Activity session.

Session Co-Chair AAS-DPS 2001 Meeting, Cometary Nuclei and Dynamics session.

Session Chair SPACE 98 conference, Albuquerque, New Mexico, April 1998.