

Keith A. Holsapple
Professor of Aeronautics and Astronautics
University of Washington, Seattle, WA

Education

Ph.D. in A.A., (Engineering Mechanics)
University of Washington, 1966
M.S. in Engineering, University of Washington, 1964
B.S. in A.E., University of Washington, 1960

Positions Held

Professor: 1982-Present
Associate Dean, College of Engineering: 1988-1997
Associate Professor: 1973-1982
Assistant Professor: 1966-1972
Predoctoral Lecturer: 1965-1966

Research Interests:

Impact Processes
Planetary Sciences
Numerical Methods
Finite Element Methods
Structures

Publications of Last 10 years:

(Many of these are available at http://adsabs.harvard.edu/physics_service.html)

Holsapple, K. A., "On YORP-Induced Deformations of Asteroids", To Appear in *Icarus*, July, 2009.

Ormö, J., Lepinette, A., Sturkell, E., Lindström, M., Housen, K., **Holsapple**, K., "Dynamics of the water resurge at marine-target impact craters analyzed with a combination of low-velocity impact experiments and numerical simulation". Accepted to appear in the Geological Society of America Special Publication "Large Meteorite Impacts IV, Feb. 2009.

Holsapple, K. A., "On the Strength of small bodies of the Solar System", *Planetary and Space Science*, 2009.

Holsapple, K. A., "The deformation of asteroids by YORP spin-up", *Lunar and Planetary Science XXXL*, March 2009.

Ormö, J., Lepinette, A., Sturkell, E., Lindström, M., Housen, K. **Holsapple**, K. "Dynamics of the water resurge at Marine-target impact craters", *Lunar and Planetary Science XXXL*, March 2009.

- Holsapple, K.A.** and Patrick Michel, “Tidal disruptions II: A continuum theory for solid bodies with strength, with applications to the satellites of the Solar System”, *Icarus*, Volume 193, Issue 1, p. 283-30, 2008.
- Holsapple, K. A.**, " Spinning rods, elliptical disks and solid ellipsoidal bodies: Elastic and plastic stresses and limit spins", *International Journal of Non-Linear Mechanics* 43, 8, 2008.
- E. Pierazzo, N. Artemieva, E. Asphaug, E.C. Baldwin, J. Cazamias, R. Coker, G.S. Collins, D.A. Crawford, T. Davison, D. Elbeshausen, K.A. **Holsapple**, K.R. Housen, D.G. Korycansky, K. Wünnemann. “Validation of numerical codes for impact and explosion cratering”. *Meteoritics and Planetary Science* 43, 12, 2008.
- Holsapple, K. A.**, "Spin limits and spin fission of 100 km asteroids", (Abstract) *Asteroids, Comets and Meteorites, 2008*, Baltimore, July 2008.
- Holsapple, K. A.**, "Do 100 km asteroids spin-fission into binaries?", (Abstract) *Workshop on Binary Asteroids*, Meudon, France May, 2008.
- Holsapple, K. A.**, "Porous material models for impact studies", *Lunar and Planetary Science XXXIX paper 1391*, March 2008.
- Pierazzo, E.; Artemieva, N. A.; Baldwin, E. C.; Cazamias, J.; Coker, R. F.; Collins, G. S.; Crawford, D. A.; Davison, T.; **Holsapple, K. A.**; Housen, K. R.; Korycansky, D. G.; Wünnemann, K., "The Impact Hydrocode Benchmark and Validation Project: Results of Validation Tests", (2 page paper) *Lunar and Planetary Science XXXIX paper 1391*, p 1177, March 2008.
- Holsapple, K. A.** and Kevin R. Housen, "A Crater and Its Ejecta: An Interpretation of Deep Impact", in *Deep Impact at Comet Tempel 1*, Elsevier, p. 586-597. 2007.
- Holsapple, K.A.** and Patrick Michel, “Tidal disruptions II: A continuum theory for solid bodies with strength, with applications to the satellites of the Solar System”, *Icarus*, Volume 193, Issue 1, p. 283-30, 2007.
- Holsapple, K. A.**, " Spin limits of Solar System bodies: From the small fast-rotators to 2003 EL61", *Icarus*, Volume 187, Issue 2, p. 500-509. 2007.
- Holsapple, K. A.**, “On the Strength of small bodies of the Solar System”, VII Workshop on Catastrophic Disruption in the Solar System (CD07), Alicante, Spain, June, 2007.
- Holsapple, K. A.** and Kevin R. Housen, "A Crater and Its Ejecta: An Interpretation of Deep Impact", *Icarus*, Volume 187, Issue 1, p. 345-356. 2007.
- Pierazzo, E., N. Artemieva, E. Asphaug, J. Cazamias, R. Coker, G.S. Collins, G. Gisler, K.A. **Holsapple**, K.R. Housen, B. Ivanov, C. Johnson, D.G. Korycansky, H.J. Melosh, E.A. Taylor, E.P. Turtle, K. Wünnemann, “The Impact hydrocode Benchmark and Validation Project: Initial Results”. *Lunar and Planetary Science XXXVIII paper 2015*, March 2007.

Holsapple, K. A., “Response of NEO’s to Mitigation Techniques”, 2007 Planetary Defense Conference, George Washington University, March, 2007 (Abstract).

Holsapple, K. A. “Formation of Binaries by Spin Fission” *Lunar and Planetary Science XXXVIII*, Paper 2440, March 2007.

Holsapple, K. A., The spin fission of small asteroids into binaries. 2007 Binary Workshop, Steamboat Springs, Co. LPSC Paper 2440.

Holsapple, K. A. and P. Michel, “Tidal Disruptions II: Solid Bodies with all Kinds of Strength” *Lunar and Planetary Science XXXVIII paper 2127*, March 2007

Michel, P. and **Holsapple, K.A.**, "Collisional and tidal disruptions of small solid bodies: Influence of the internal structure and implications", Abstract, Division of Planetary Science Meeting, Pasadena, CA., Oct. 2006.

Michel, Patrick and K. A. **Holsapple**, "Tidal disturbances of small cohesionless bodies: limit planetary distances and applications" Proceedings IAU Symposium no. 236, August, 2006 Prague, Czech Republic, S236, #30.

Holsapple, K.A. and Patrick Michel, “Tidal disruptions: A continuum theory for solid bodies” *Icarus*, Volume 183, Issue 2, p. 331-348, 2006.

Holsapple, K. A., "Existing methods of asteroid deflections will work: Impacts and Nuclear Bombs" A White Paper prepared for: NASA NEO Detection, Characterization and Threat Mitigation Workshop, June, 2006

Holsapple, K.A. and Michel, P. "Collisional and tidal disruptions of small solid bodies: Influence of the internal structure and implications", American Astronomical Society, DPS meeting #38, #65.05. 2006.

Holsapple, K. A., "Are Impacts Into Small Bodies Strength Or Gravity Controlled? What Does Deep Impact Tell Us?" American Astronomical Society, DPS meeting #38, #65.04, 2006.

Holsapple, K. A., "What are the bulk properties of asteroids and comets?", Abstract, Workshop on Spacecraft Reconnaissance of Asteroid and Comet Interiors October 5-6, 2006, Santa Cruz, California. LPI Contribution No. 1325,.

Michel, P. and **Holsapple, K.A.**, "Collisional and tidal disruptions of small solid bodies: Influence of the internal structure and implications", Programme National de Planetologie, Nancy, France, Sept., 2006.

Holsapple, K.A. and Patrick Michel, “Tidal disruptions: Applications of an Analytical Theory for Solid Bodies”, *Lunar and Planetary Science XXXVII*, March 2006.

Holsapple, K. A. and Housen, K. R., Gravity or strength? An interpretation of the Deep Impact

experiment.", *Lunar and Planetary Science XXXVII*, March 2006.

Holsapple, K. A., Asteroid Spin Data: No Evidence of Rubble Pile Structures, *Lunar and Planetary Science XXXVI*, March 2005.

Holsapple, K.A., "Equilibrium figures of spinning bodies with self-gravity", *Icarus*, 172/1, 2004.

Holsapple, K. A. "About Deflecting Asteroids and Comets", A chapter in *Mitigation of Hazardous Comets and Asteroids*", Cambridge University Press, AZ. 2004.

Holsapple, K.A., "Equilibrium figures of spinning bodies with self-gravity", *Icarus*, **172/1** November, 2004.

Holsapple, K. A., "From Simple to Complex Craters: The Mechanics of Late-time Crater Adjustments" *35th Lunar and Planetary Science Conference*, March 15-19, 2004, League City, Texas, abstract no.1937.

Holsapple, K. A. "An assessment of our present ability to deflect asteroids and comets". Proceedings, 2004 Planetary Defense Conference. February 2004. AIAA Paper 2004-1413.

Holsapple, K. A.; Housen, K. R., " The Cratering Database: Making Code Jockeys Honest" 35th Lunar and Planetary Science Conference, March 15-19, 2004, League City, Texas, abstract no.1779.

Housen, K.R., and K.A. **Holsapple**, "Impact Cratering on Porous Asteroids", *Icarus*, Volume 163, Issue 1, p. 102-119. 2003.

Holsapple. K. A., " On Nuking Menacing Asteroids" *34th Annual Lunar and Planetary Science Conference*, March 17-21, 2003, League City, Texas, abstract no.1799.

Holsapple, K. A., "Does melt volume give the signature of the impactor?" *Proceedings, Workshop on Bridging the Gap between Modeling and Observations*. Houston TX, February, 2003.

Holsapple. K. A. " "Could Fast Rotator Asteroids be Rubble Piles?" *34th Annual Lunar and Planetary Science Conference*, March 17-21, 2003, League City, Texas, abstract no.1792

Holsapple. K. A. "What do we need to know to model Impact processes?", Proceedings, *Impact cratering: Bridging the gap between modeling and observation, Houston Tx, 2003*.

Holsapple, K. A. "Does melt volume give the signature of the impactor?" *Impact cratering: Bridging the gap between modeling and observation, Houston Tx, 2003*. (Abstract)

Holsapple K., Gibling I., Housen K., Nakamura A. and Ryan E. (2002). Asteroid impacts: Laboratory experiments and scaling laws. A chapter in ASTEROIDS III, University of Arizona Press, 2002.

Holsapple. K. A., "The deflection of menacing asteroids by nuclear weapons", *Proceedings, NASA Workshop on Scientific Requirements for Mitigation of Hazardous Comets and Asteroids*, Arlington VA, Sept. 2002.

Holsapple. K. A., "Speed limits of rubble pile asteroids: Even fast rotators can be rubble piles", *Proceedings, NASA Workshop on Scientific Requirements for Mitigation of Hazardous Comets and Asteroids*, Arlington VA, Sept. 2002.

Holsapple, K. A. "Geology of asteroids: Implication of spin states regarding internal structure and some implications of that structure on mitigation methods". (Abstract) *NASA Workshop on the Mitigation of Hazards due to Asteroids and Comets*, Arlington, VA, Sept, 2002.

Holsapple K. A. and Housen K. R. Code Wars: A comparison of codes and models for impact calculations. *Lunar and Planetary Science XXXIII. 2002.* (2-page paper)

Holsapple, K.A., "Equilibrium Configurations of Solid Ellipsoidal Cohesionless Bodies", *Icarus*, Volume 154, Issue 2, pp. 432-448 (2001).

Holsapple, K.A. "Equilibrium shapes of solid solar system bodies", *Proc. Lunar Planet. Sci. Conf. XXXII, 2001* (2-page paper)

Housen, K.R., and K.A. **Holsapple**, "Numerical Simulations of Impact Cratering in Porous Materials" *Lunar Planetary Science XXXI*, 1498 (2000)

Housen, K.R., K.A. **Holsapple** and M.E. Voss, "Compaction as the origin of the unusual craters on the asteroid Mathilde" *Nature* 402, 155 - 157 (1999)

Housen, K.R., and K.A. **Holsapple**, "Scale Effects in Strength-Dominated Collisions of Rocky Asteroids" *Icarus* 142: (1) 21-33 Nov. 1999

Housen, K.R. and K.A. **Holsapple**, "Impact Cratering on Porous Low-Density Bodies" *Proc. Lunar Planet. Sci. Conf. 30, 1999*

Housen, K.R. and K.A. **Holsapple**, "General Scaling Laws for Strength-Dominated Collisions of Rocky Asteroids". *Proc. Lunar Planet. Sci. Conf. 30, 1999.*

Selected Consulting:

Planetary Science Institute, Tucson, 2006-present
Boeing Phantom Works, 1998-present
Boeing Defense and Space Group, 1974-1997
Various Legal Consulting, 1975-present
Los Alamos National Laboratories, 1984-1986
Flow Industries, Inc. Kent, WA, 1985-1988
Quest Integrated, Inc, 1991-93
ECOCAD U.S.A. Inc., 1991-93

Professional Memberships: American Institute of Aeronautics and Astronautics
American Geophysical Union
American Society of Mechanical Engineers
Society of Automotive Engineers
Registered Mechanical Engineer, State of Washington
Phi Beta Kappa
Sigma Xi
Tau Beta Pi

**Professional Service,
National**

Member, National Academies /National research Council, Near Earth Object Mitigation Panel, 2009-Present
Numerous Conference Organizing or Program Committee, and Session Chairman
Technical Expert, 1995 DOD Military Critical Technologies List, 1995-96
NASA Planetary Physics and Geophysics Planning Group, 1989-1992
NASA Ames Vertical Gas Gun Review Committee Chairman, 1990-1991
Centrifuge Review Panel, Tyndall Airforce Base, 1985
National Science Foundation Centrifuge Review Board, 1984
Defense Nuclear Agency Ad-Hoc Committee on Cratering, Washington D.C., 1978-1987
Defense Nuclear Agency Ad-Hoc Committee on MX-CSB, 1982

International

US Science team, European Space Administration Marco Polo Mission, 2009-Present

Honors and Awards

Named Asteroid (20360) “**Holsapple**”