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Asteroid Retrieval and Mining using High Power Electric Propulsion

Recent media splashes media about asteroid mining by companies backed by celebrities is based on a real idea by John Brophy of JPL: retrieve an asteroid and bring it close enough to Earth to mine it using advanced, high power electric propulsion. A recent study at the Keck Institute at Caltech backed by further NASA work has investigated robotically capturing and returning an entire near-earth asteroid (NEA) to Earth and lunar orbits for study by astronauts and potentially even mining by commercial ventures. Moving an entire asteroid several meters in diameter weighing nearly 500,000 kg is a daunting task, but not impossible. Studies show that recent breakthroughs in high power electric thrusters at JPL and the possibility of large area, high voltage solar arrays directly driving these thrusters makes the concept of rearranging the solar system feasible. The ideas behind asteroid retrieval and mining, novel direct drive electric thrusters, and capturing and studying NEA by astronauts in the vicinity of the moon will be explored and described.

About the Speaker: Dan M. Goebel received the B.S. in physics, M.S. in electrical engineering, and Ph.D. in applied plasma physics from UCLA in 1977, 1978 and 1981. He is Senior Research Scientist at Jet Propulsion Laboratory, Adj. Prof. of Electrical Engineering at USC and Adj. Prof. of Aerospace Engineering at UCLA. At JPL he is responsible for the development of high efficiency ion and Hall thrusters and advanced components such as cathodes and grids. Previously he was a Research Scientist at HRL Laboratories and Principal Scientist at Hughes/Boeing EDD where he was the supervisor of the Advanced Technology Group for microwave tube development and the lead scientist of the XIPS ion thruster program for commercial satellite station keeping. Dr. Goebel is a Fellow of the AIAA, IEEE and American Physical Society. He is author of over 120 technical journal papers, 140 conference papers, one book entitled *Fundamentals of Electric Propulsion: Ion and Hall Thrusters* published in 2008, and holds 42 patents.