

# Onboard Planning for Future Science Missions

Steve Chien  
Jet Propulsion Laboratory  
California Institute of Technology

Automated mission planning capabilities have already contributed to a wide range of space exploration missions (HST, MAMM, MER, EO-1, MEX, OE). However future missions will stretch the bounds of automated planning applications. In this talk I describe how three new mission concepts stretch the bounds of deployed space mission planning systems. First, future sensorwebs for Earth and will need to coordinate hundreds of assets without centralized control. Such missions will require mission planners to discover capabilities of other agents, negotiate with other agents, replanning as required. Second, missions to comets will maneuver to explore, sample, and image in a very dynamic and potentially poorly characterized environment. This will require that mission planners respond rapidly with tight integration with guidance, navigation, and control. Third, missions to heavy atmospheric bodies (such as Titan) will explore environments with wide and varied transient science phenomena (such as methane thunderstorms as cryovolcanos). Such systems will need rigorous methods (e.g. decision theoretic) to balance risks, science objectives, data volume and vehicle constraints.

## **Biography:**

Dr. Steve Chien is a Principal Scientist at the Jet Propulsion Laboratory, California Institute of Technology where he leads efforts in autonomous space systems ([ai.jpl.nasa.gov](http://ai.jpl.nasa.gov)). He holds a B.S. with Highest Honors in Computer Science, with minors in Mathematics and Economics, M.S., and Ph.D. degrees in Computer Science, all from the University of Illinois. Dr. Chien has received over 80 awards from NASA and JPL, including NASA Medals in 1997, 2000, and 2006. He is a three time honoree in the NASA Software of the Year Competition, most recently he was the team lead for the Autonomous Sciencecraft, co-winner in 2005. Dr. Chien has authored numerous publications in the areas of Artificial Intelligence, Autonomous Systems, and Operations Research.