Revised Bioastronomy 2002 Abstract:

Alien Oceans: The Future of Europa Exploration

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The Galileo and Voyager spacecraft have revealed a potential biologically interesting environment beneath the ice crust of Jupiter's moon Europa. Compelling evidence exists that Europa contains a water ocean twice as large as all the oceans on Earth overlain by a geologically youthful brittle ice crust. Furthermore, this ocean has probably been liquid for the life of Europa and could harbor a biosphere. The presence of an extensive liquid water layer is obviously a key to Europa's potential interest for pre-biologic chemistry or even current biological activity as well as strategies for future exploration.

Recent NASA plans included follow-up exploration of this world with an orbiting spacecraft, launching in 2008 and designed to determine the nature of the Europan ocean and to search for potential areas where the ocean may be accessible to future exploration. The specific science goals for the Europa Orbiter as determined by the Science Definition Team are:

- Determine the presence or absence of a subsurface ocean.
- Characterize the three dimensional distribution of any subsurface liquid water and its over-lying layers.
- Understand the formation of surface features including sites of recent or current activity, and identify candidate sites for future lander missions.

The process for selecting a payload for this mission would be through responses to an Announcement of Opportunity. However, for planning purposes, the Science Definition Team recommended a strawman payload included remote sensing maps of the surface, a laser altimeter combined with tracking data to make gravity and tidal measurements and an ice-penetrating radar.

Technology programs are currently developing the radiation hard avionics required to conduct the orbiter mission. These same electronics will allow the next generation of Europa missions. This future exploration will involve surface sampling landers and melting probes designed to enter the ocean with an instrumented submarine to search for life.