CALLISTO: A WORLD IN ITS OWN RIGHT. Jeffrey M. Moore[1], Paul M. Schenk[2], [1]Space Sciences Division, NASA Ames Research Center, MS 245-3, Moffett Field, CA 94035 (jeff.moore@nasa.gov), [2]Lunar and Planetary Institute, 3600 Bay Area Boulevard, Houston, Texas 77058.

Callisto, once unknown and then disregarded after *Voyager*, has emerged in the post-*Galileo* era worthy of the same intense scientific scrutiny that is lavished upon her sisters, playing an essential role in our understanding of the evolution of icy moons, and in a larger sense, the grand tapestry of solar system history. Along with the discovery of Callisto's conducting, probably fluid sub-surface layer, major *Galileo* discoveries about Callisto include the complete absence of cryo-volcanic resurfacing, the relatively undifferentiated interior, and the presence of massive landform erosion from sublimation processes. Callisto's landscape at decameter scales is unique among the Galilean satellites, and might be most akin to that of cometary nuclei. The process of sublimation degradation, previously underappreciated, is now recognized as a major surface modification process on Callisto. Its role in mass wasting and landslide initiation was elemental in creating the bizarre and astonishing scenery imaged by *Galileo*.

Outstanding questions remaining in Callisto studies must begin with what is the actual configuration of its interior? Is there a rock core? How is undifferentiated material distributed within Callisto's interior? What is the composition and thickness of the liquid layer? Does it indeed exist, and, if so, and how has it survived to the present? Moving toward the surface, what is the structure of the "crust?" Is the dark, non-icy material, so abundant on its surface, restricted to the upper several km? What is the composition of this non-icy material? Why is Callisto's "crust" apparently so volatile-rich compared to its siblings? Why are there 100 km-scale heterogeneities in composition and albedo of the surface? What is the nature and origin of the leading-trailing hemisphere dichotomy in photometric properties? Why is there a dearth of palimpsests relative to Ganymede? Do we really understand why knobs with bright summits dominate the surface at decameter scale? What is all of this telling us about galilean satellite formation and evolution? And the big question: are we certain that the reason Callisto and Ganymede had divergent histories is solely the consequence of the role of tidal torque heating?

Future exploration of Callisto will probably piggy back on missions to and through the Jovian system. The currently planned *New Horizons* mission to Pluto/Charon and the Kuiper belt may fly close enough in 2007 to obtain disk-resolved spectra of Callisto. Indeed, depending on the encounter geometry, Callisto may be studied at moderately high spatial resolutions by all remote-sensing instruments aboard that spacecraft.

The proposed Jupiter Icy Moons Orbiter (JIMO) is currently planned to first orbit Callisto then its two icy sisters Ganymede and Europa. During the Callisto phase of the JIMO mission, three globally complete mapping sets, one at nadir viewing low-sun for geomorphology, a second same-low-sun but at 30 off-nadir for topographic mapping derived from stereogrammetry, and a third at low solar phase for compositional mapping, should be obtained, all at a nominal resolution of at least 100 m/pixel. It would be desirable to map selected areas of high science interest at resolutions greater than 10 m/pixel. Spectroscopic studies should, in addition to good (~100 m/pixel) spatial resolution have sufficient spectral resolution (say ~5 nm bandwidths) and a spectral range of 0.8 - 4.5 μm and at high (>100) signal-to-noise at all wavelengths. A mid-IR imaging radiometer, similar to THEMIS on *Mars Odyssey*, could map the thermal-physical properties of surface materials, such as their thermal inertia from which particle size could be derived. Careful measure of the orbit will permit the detection of any anisostacy within its interior, which would go far to resolving its degree of differentiation. Ground penetrating radar, if available, would permit a measure of the segregation ice from non-ice and map the thickness of the refractory lag. Also, radar might reveal buried but surviving roots of ancient endogenic activity. Active incandescing of surface materials would greatly complement orbital compositional investigations. These are but a few examples of the ability of a comprehensive orbital study afforded by JIMO toward answering many of the outstanding questions remaining in Callisto studies.