

CALLISTO IS NOT BORING! Paul M. Schenk and William B. McKinnon, Department of Earth and Planetary Sciences and McDonnell Center for the Space Sciences, Washington University, Saint Louis, MO 63130.

The surface of Callisto, upon close inspection, is rather enigmatic. Secrets not easily wrested have a direct bearing on its and Ganymede's structure and evolution.

Palimpsest Stratigraphy. What is the stratigraphy of the bright central palimpsest of Valhalla, and also that of the palimpsests of Ganymede? Are the palimpsests shallow surface deposits of ejecta or extruded water ice, or are they windows into cleaner icy mantles, brought upward during post-excavation rebound? The Valhalla palimpsest (Fig. 1) is the largest on Callisto or Ganymede, and consists of a relatively smooth circular bright patch. The margin of the palimpsest is somewhat irregular and portions appear to have been replaced or removed. Several irregular patches and crater floors within the Valhalla palimpsest have normal reflectances almost as low as cratered terrain beyond Valhalla, suggesting that at least the outer portion of the palimpsest is a bright superficial deposit, and the dark patches are "outcrops" or fensters of dark, cratered terrain due to relief or crater excavation. Similar features are seen in Memphis Facula, on Ganymede (Fig. 2). Irregular dark patches are found to within ~ 150 km of the center of the Valhalla palimpsest. If the dark patches are exposures of original crust through an ejecta-like deposit, then the diameter of any "exposed" mantle is constrained to be less than ~ 300 km in diameter. Remnants of concentric ridges are visible in the interiors of the palimpsests of both Valhalla and Memphis Facula to a comparable radial distance.

Albedo Patterns and Composition of the Crust. The cratered terrain itself is not uniform in albedo. Numerous small (10 's of km) anomalously dark spots can be seen and on a regional scale (100 's of km) the terrain can be divided into polygonal areas of generally lighter and darker material. This may be due to non-random distribution of craters of different ages or may reflect areal variations in the distribution of ice- and silicate-enriched surfaces, possibly related to water ice mobility (1). The darkening of the surface of Callisto relative to Ganymede may be due to contamination by infalling silicate or carbonaceous debris. Are there any dark ray craters, as identified on Ganymede? Could they be detectable on Callisto's dark surface? The identification of such craters would strengthen arguments linking these craters and surface darkening to projectile contamination (2,3). The brightness of the Valhalla palimpsest relative to bright and dark material on Ganymede may indicate the degree to which Callisto's surface is silicate-enriched relative to Ganymede.

Ring System Geometry. The degree of non-circularity of the Valhalla system (4) affects the interpretation of the rimmed furrows in Galileo Regio and other units of cratered terrain on Ganymede (5,6). Regional variations in thermal structure or asymmetric asthenosphere flow are possibilities. Small scale deviations from circularity along strike may reflect the influence of preexisting impact structures, faults, or fault systems (7).

REFERENCES: (1) Spencer J. R. and Maloney P. R. (1984) *Geophys. Res. Lett.* **11**, p. 1223-1226; (2) Conca J. (1981) *Proc. Lunar Planet. Sci.* **12B**, p. 1599-1606; (3) Schenk P. M. and McKinnon W. B. (1984) *Bull. Am. Astron. Soc.* **16**, p. 683; (4) Hale W. S. (1981) *EOS*, **62**, p. 318; (5) Casacchia R. and Strom R. G. (1984) *Proc. Lunar Planet. Sci. Conf. 14th*, in *J. Geophys. Res.* **89**, p. B419-B428; (6) Parmentier E. M. and Zuber M. T. (1984) *Icarus* **60**, p. 200-210; (7) Thomas P. and Masson Ph. (1984) *Abs. NATO Workshop Ices in the Solar System*, p. 86.

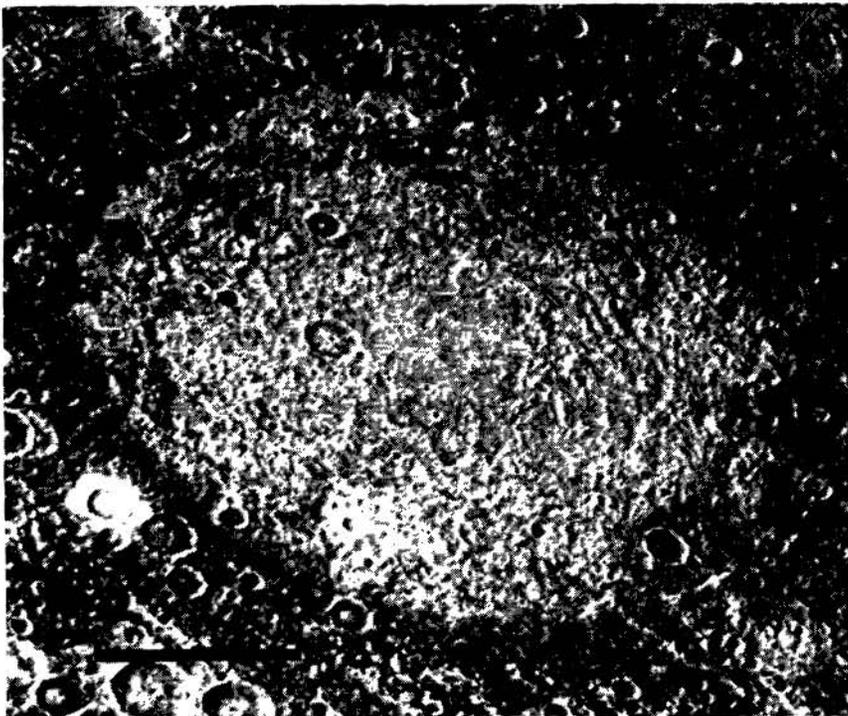
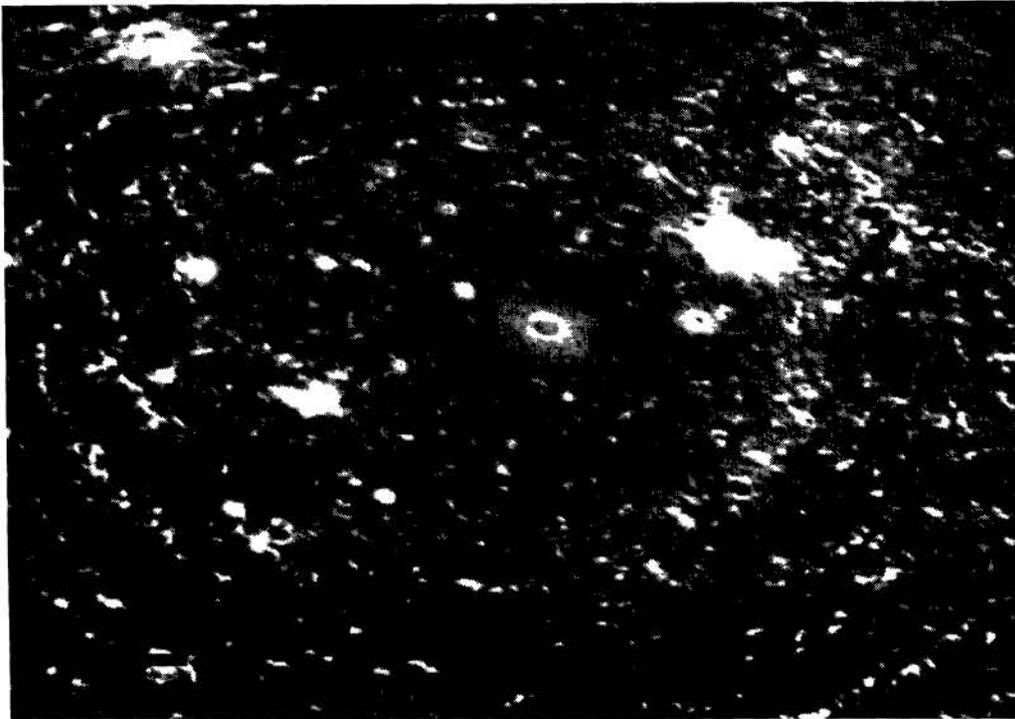


Fig. 1 (top) Central palimpsest of the Valhalla multi-ringed structure, Callisto.
Fig. 2 (bottom) Memphis Facula, Galileo Regio, Ganymede. Scale bars = 100 km.