Terrace Width Variations in Complex Mercurian Craters, and the Transient Strength of Cratered Mercurian and Lunar Crust


Widths of slump terraces of complex craters can be used to determine the effective cohesion of the cratered region during crater collapse. We have measured terrace widths for complex craters on Mercury: these generally increase outward towards the rim for a given crater, and the width of the outermost major terrace is generally an increasing function of crater diameter. Similar observations apply to lunar complex craters, but the widths of the outermost slump terraces of mercurian complex craters are less than those of similarly sized lunar complex craters. Using the terrace widths on Mercury and a gravity-driven slump model, we estimate the strength of the cratered region immediately after impact (specifically, during the modification stage of crater formation) to be ~1–2 MPa. Comparison with the previous study of lunar complex craters by Pearce and Melosh indicates that the transient strength of cratered mercurian crust is no greater than that of the Moon. The strength estimates only vary slightly with the geometric model used to restore the outermost major terrace to its precollapse configuration, and are consistent with independent strength estimates from the simple-to-complex crater depth/diameter transition, in particular the most recent depth/diameter study of mercurian craters by Pike. Thus, contrary to previous work, the difference in "target properties" between Mercury and the Moon may be small, and systematic morphological differences between craters on the two worlds may be largely caused by the factor of two difference in surface gravity (Leith and McKinnon, JGR-Planets, in press).

WEDNESDAY EVENING

Poster Session II
5:00–6:00
Posters from Sessions 13–16, 20, 21
Business Meeting
9:00–10:00, Large Conference Room

History of Planetary Science
(D. Cruikshank, Moderator)
8:00–9:00, Large Conference Room

H.01

Ground-Based Planetary Science at Lick Observatory 1888–1938

D. E. Osterbrock (UCO/Lick Observatory, UCSC)

When Lick Observatory went into operation on Mount Hamilton in 1888, astronomers were far less specialized than they are today. Many of its early staff members considered themselves (and were) competent to do observational research on planets, stars or nebulae, as the opportunity arose. James E. Keeler, the first Lick Observatory staff member, discovered a narrow, very dark division in the outer part of Saturn's A ring with the new 36-inch refractor, then the largest effective telescope in the world, on the very first night it was used, January 7, 1888. Keeler was an excellent visual observer and artist, and in his first three years at Lick produced spectacular, scientifically accurate drawings of Saturn, Jupiter and Mars. He never saw any canals on the latter. Keeler also studied (visually) the spectra of the outer planets, and after he left Lick for Allegheny Observatory, spectroscopically confirmed that the rings of Saturn follow Keplerian, not rigid-body rotation. Edward S. Holden, the first director, inaugurated a program of lunar photography which was unsuccessful in his hands, but later yielded excellent results, obtained by Fred Chappell in the 1930s. W. W. Campbell, who began as Keeler's assistant and ended as the long-term third director of Lick, was especially interested in spectroscopy of Mars, to find or set an upper limit to the H₂O in its atmosphere. As part of this program he led an expedition to the summit of Mount Whitney to obtain spectra of the red planet at an unusually close opposition, and also obtained high-dispersion grating spectograms of it with the 36-inch on Mount Hamilton.

Other observational planetary and cometary research by these men and by Lick astronomers E. E. Barnard, John M. Schaeberle, Donald H. Menzel, J.H. Moore, Robert J. Trumpler, William H. Wright, N. T. Bobrovnikoff, Heber D. Curtis and John C. Duncan during its first half century will be briefly described. That they did not do more planetary research can probably be ascribed to the very slow pace of new instrument and detector development, rather than to any lack of interest in solar system objects. Once a new spectrograph or photographic emulsion had been used on the few bright planets, little more could be done short of an expedition to a high mountain, the closest approach to a space observatory available at the time.