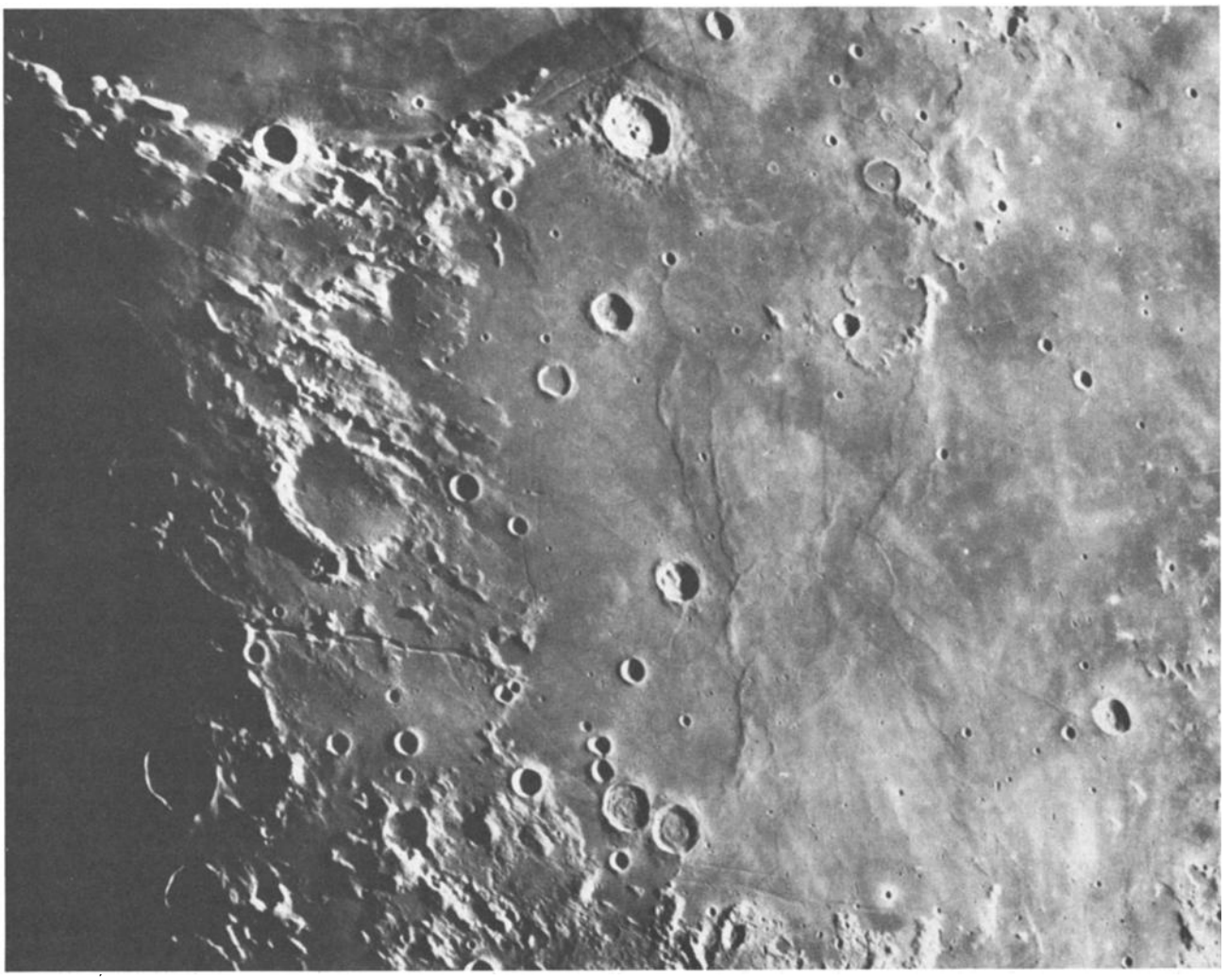

Fig. 10*a*. The lunar Tranquillitatis basin. Earth-based photograph; plate C2571D8 from *Kuiper et al.* [1967].

although two (Ritter and Sabine) are located at the edge of the Tranquillitatis mare deposits. It is also worth recalling that only the quotient t/η can be estimated for the viscous relaxation process; neither η nor the time interval t of important relaxation can be estimated separately. Probably the explanation for the apparently similar values of t/η for an ancient large basin and for younger, smaller craters lies in the observation [*Schultz*, 1976; *Hall et al.*, 1981] that the extent of modification of contemporaneous and neighboring craters on the moon can be quite variable. The high near-surface temperatures leading to topographic modification of many floor-fractured craters apparently were localized to regions and scales smaller than the dimensions of large impact basins. By this reasoning, the relaxation of a basin would be governed by a weighted average of the heterogeneous viscosity of the underlying crust, an average that may be considerably larger than the viscosity of local regions of higher than average temperature associated with volcanism, igneous intrusions, or impact heating. Note that the derived value of t/η for Tranquillitatis would not have been obtained had we applied a model for viscous relaxation of basin topography that neglected the effect of initial isostatic compensation; for such a model the best fitting value for t/η would have been smaller by 3 to 4 orders of magnitude.

The extent of modification of topographic relief in the Tranquillitatis basin appears to be representative of other pre-Nectarian basins on the lunar nearside. The Fecunditatis basin, for instance, of similar size, age, and state of preservation as Tranquillitatis [*Wilhelms*, 1981], has similar topographic relief both on the present surface and on the basin surface with mare basalt removed [*DeHon and Waskom*, 1976]. The largest and oldest proposed nearside basin of pre-Nectarian age is the 'Gargantuan' or Procellarum basin [*Cadogan*, 1974; *Whitaker*, 1981; *Wilhelms*, 1981], which has a postulated outer ring of diameter 3200 km [*Whitaker*, 1981]. Though the area encompassed by this ancient ring saw the subsequent formation of several major basins (Tranquillitatis, Serenitatis, Imbrium), the barely discernible present topography associated with the Procellarum basin and its ring structures is consistent with the large size and age of this basin and with a mean crustal viscosity similar to that in the Tranquillitatis region for the time period during which significant relaxation occurred.

South Pole–Aitken basin. On the southern farside of the moon is one of the largest identified lunar basins [*Howard et al.*, 1974], and one of the oldest [*Wilhelms*, 1981], named the South Pole–Aitken basin by *Stuart-Alexander* [1978]. The basin is outlined by isolated and subdued mountain remnants