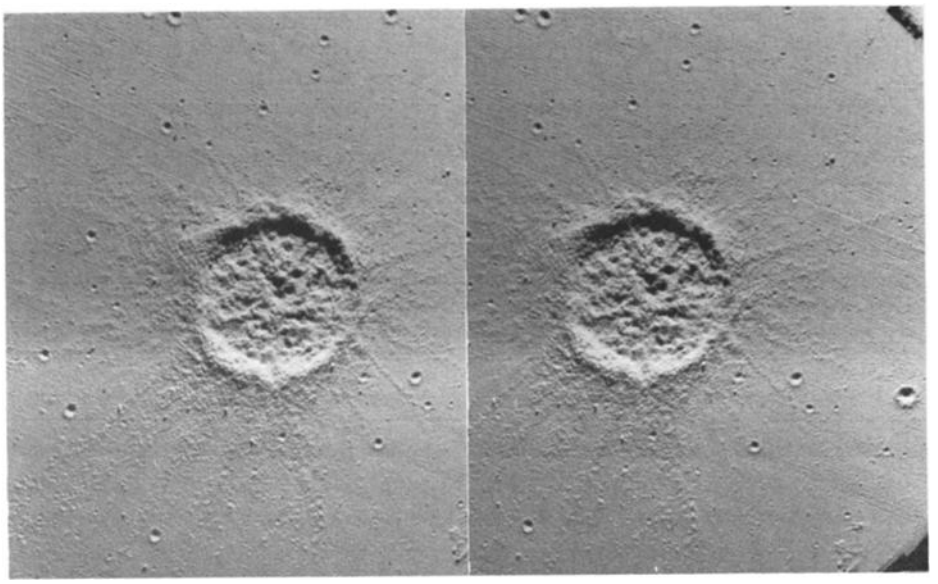

Fig. 7*a*

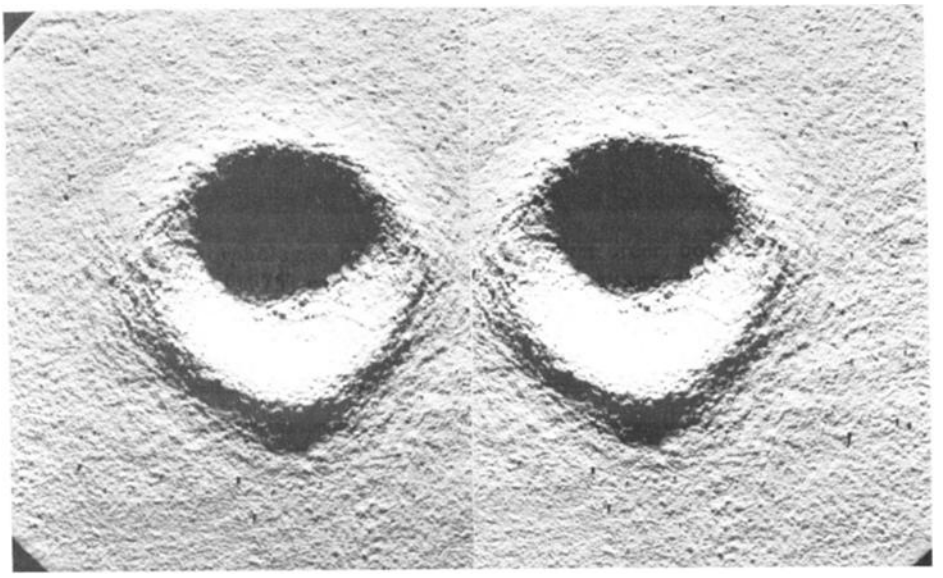

Fig. 7*b*

Fig. 7. Stereo views of clustered (Figure 7*a*) and single-body (Figure 7*b*) impacts into compacted pumice. The clustered impact (830526) in Figure 7*a* was produced by a 0.635-cm pyrex sphere ruptured by passage through thin (1.0 mil) aluminum foil. Impact velocity was 1.77 km/s with a lateral dispersion of 7.0 cm at impact. The crater has a shallow, flat floor with a narrow raised rim (rim-rim diameter of 13.5 cm). Beyond the rim, ejecta are concentrated in radial and subradial spikes. The small isolated craters were produced by unburned powder grains and did not interfere with the formation of the principal impact. Figure 7*b* shows a crater (820503) produced by 2.01 km/s pyrex sphere 0.635 cm in diameter. The rim-rim crater diameter is 20 cm. The single-body impact produced a deep crater with a broad rim and uniformly distributed ejecta.

produce a similar sequence, although tightly clustered impacts into sand produce craters resembling loosely clustered impacts into pumice. Figure 10 illustrates this point for two clustered impacts with nearly identical dispersions in sand and in pumice. The crater in pumice has a shallow floor encircled by a moat, whereas the crater in sand has a slightly mounded floor.

Fortson and Brown [1958] and *Piekutowski* [1975] have experimentally produced a similar variety of crater morphologies by half-buried explosions in layered sand, and *Quaide and Oberbeck* [1968] produced similar morphologies by impacts into similar targets. *Piekutowski's* [1975] experiments, however, produced a central mound even in unlayered sand, a feature not observed by *Quaide and Oberbeck* [1968]. If a tightly clustered impact expends most of its energy and momentum near the surface, then a gross analogy can be made between the static half-buried explosive cratering experiments and the results presented here.

4.2. *Aspect Ratios*

To first order, both the shallowness of the crater and the morphology appear to depend on the dispersion of the clustered impactors. Cluster dispersion is related to the effective density