LUNAR, TERRESTRIAL AND METEORITIC IMPACT BRECCIAS:

K. Fredriksson, J. Nelen and A. Noonan, Smithsonian Inst., Washington, D. C., 20560.

Textural similarities and differences between "simple", single impact rocks from recent, small, to ancient, larger, terrestrial structures and the more complicated multiple impact products from the Moon and meteorites are described, Figs. 1-8. Meteorites, especially chondrites, are 4½ b.y. and apparently exclusively impact products. Similarily, most Moon rocks over 3.9 b.y. are impact generated. It may be concluded that the older the rock, the more likely it is to be an impact product and probably any rock from anywhere in the solar system older than 4 b.y. is an impact product. This is consistent with the hypothesis that some of the oldest terrestrial rocks are impact generated and with the absence on the Earth of rocks older than ~ 3½ b.y.

FIGURE CAPTIONS

Fig. 1. Rounded recrystallized breccia fragment in Apollo sample 60052,1-A. The fragment, ~ 0.2 mm in diameter, is included in highly vesicular glass and fine-grained breccia matrix.

Fig. 2. Abraded "anorthositic" inclusion, 0.8 mm long, in a fine-grained glass-coated breccia (Apollo 16).

Fig. 3. A typical multiple impact breccia (Apollo 16, 68822, 1-D). It contains glass beads, (white, upper left) chondrules, (dark sphere just below glass) and rounded rock fragments, both recrystallized older breccias (center right) and basalts (lower left) together with shocked as well as undamaged plagioclase fragments in fine-grained matrix. Width of field is 0.7 mm. Compare Fig. 4.

Fig. 4. (A) Rounded basaltic fragment in the BUNUNU meteorite, ~ 1 mm long. (B) Detail of lower right part of A (~ 0.3 mm) shows the primary igneous texture of the fragment and the sharp boundary to the host breccia. The fragment consists mainly of augite and plagioclase (An88). The breccia contains among other rock fragments also glass spheres (see Fig. 6) and shocked as well as undamaged mineral fragments much like the Moon breccia shown in Fig. 3.

Fig. 5. (A) Abraded breccia fragment, 1 mm in diameter, of crushed and welded olivine in the KOHAR chondrite. The olivine composition in the fragment is constant,

LUNAR, METEOR & TERREST IMPACT BRECCIAS

Fredriksson, K. et al.

~ Fa 24, and similar to that of L-group chondrites although KOHAR is "unequilibrated" and its olivines commonly vary between ~ Fa5 and ~ Fa20. KOHAR is apparently also a multiple impact breccia. (B,C) Detail of A shows the fractured and recrystallized texture of the olivine. In C some major displacement lines are indicated.

Fig. 6. Glass spherule, 0.3 mm, in the BUNUNU meteorite impact breccia. Compare Fig. 4.

Fig. 7. Microbreccia from the recent (< 50000 yrs) LONAR crater (diameter ~ 2 km) in the Deccan basalt, India. The sample is from a drill core inside the crater and ~ 275 m below the rim. Note the rounded basaltic fragment, 1 mm, in a matrix of crushed bedrock displaying "flow" texture. These breccias are analogous to many lunar and meteoritic impact breccias.

Fig.8. Impact breccia from the Rochechouart, central France, impact structure, approx. 18×10^7 yrs old, and probably > 15 km in diameter. Rounded gneiss fragment, (upper right corner), aplite and granite fragments (white) and glass with shocked mineral fragments (lower left corner) are imbedded in a fine-grained matrix representing a variety of rock types in the area. Width of section is 0.3 mm.

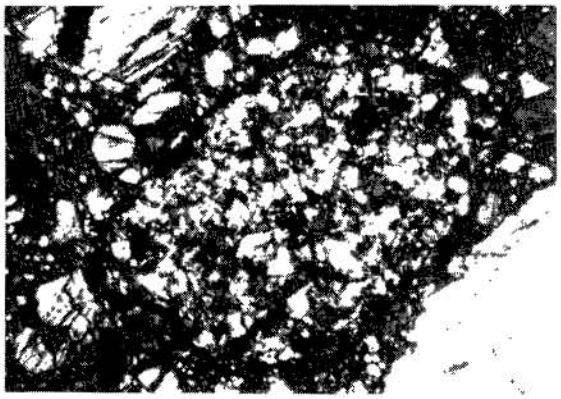
Fig. 1

Fig. 2

Fig. 3

LUNAR, METEOR & TERREST IMPACT BRECCIAS

Fredriksson, K. et al.



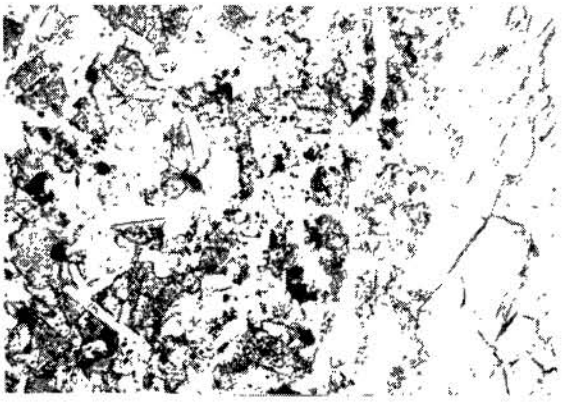
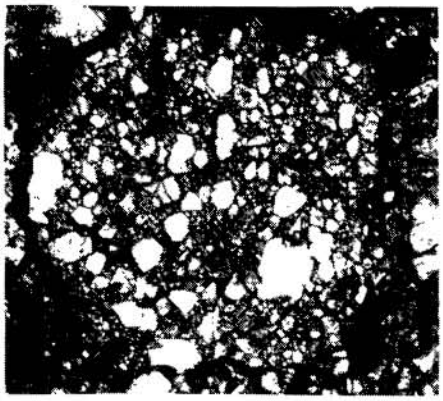


Fig. 4. A B



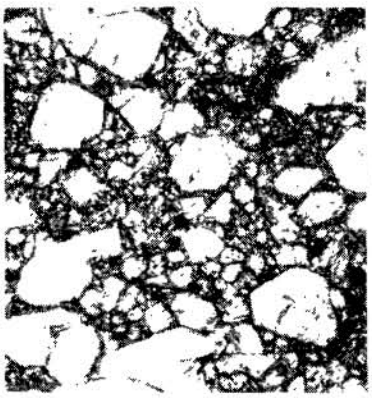


Fig. 5. A B C

Fig. 6.

Fig. 7.

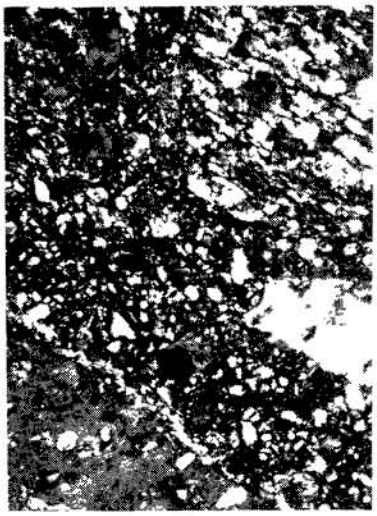


Fig. 8.