**DYNAMIC CRYSTALLIZATION EXPERIMENTS ON PYROXENE-RICH CHONDRULE MELTS: COMPARISON OF EXPERIMENTALLY PRODUCED AND NATURAL TEXTURES AND MINERAL COMPOSITIONS.** Gary Lofgren, SN-2 NASA Johnson Space Center, Houston, TX 77058.

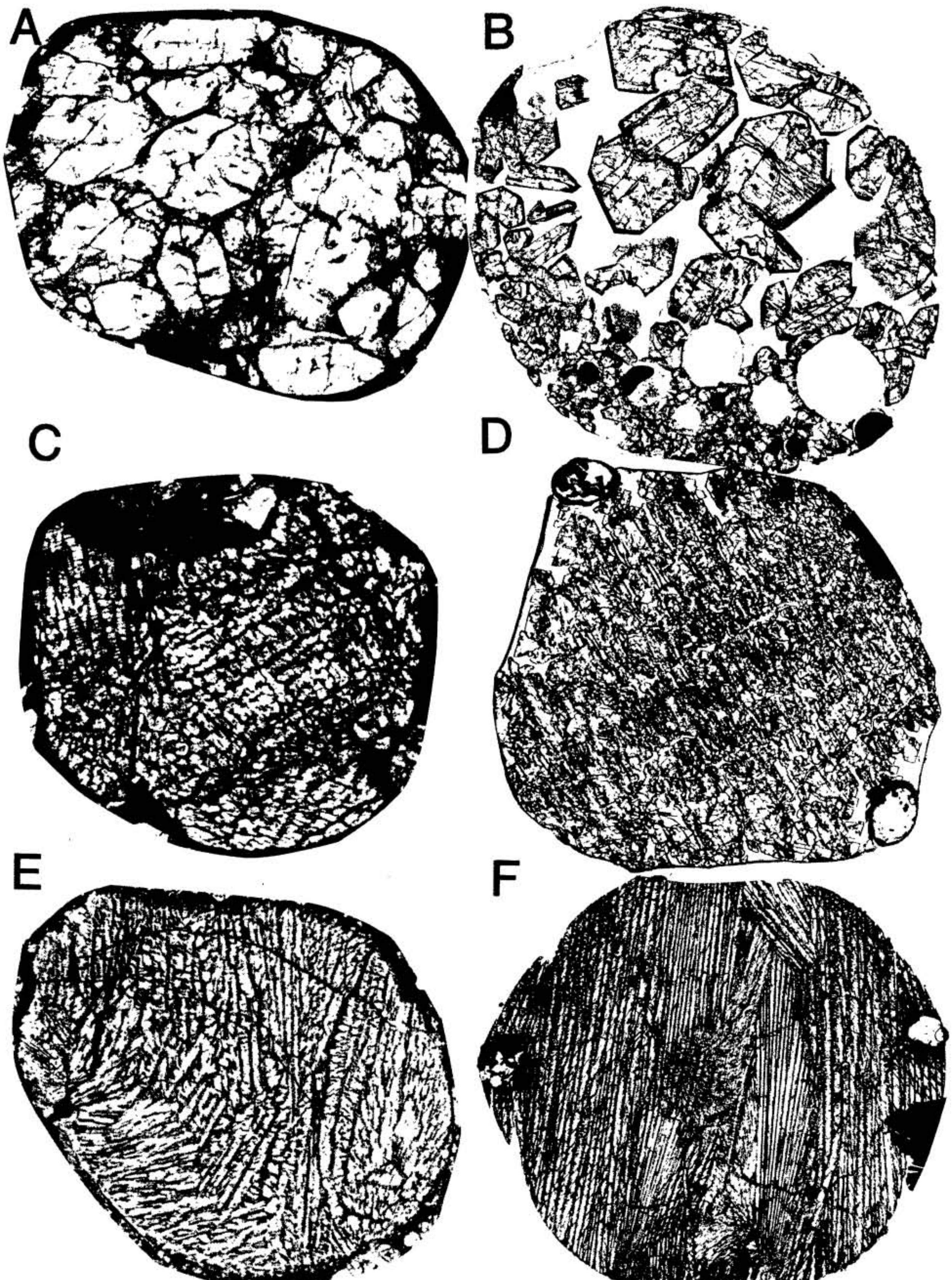
In an earlier study, Lofgren and Russell [1] demonstrated that a wide variety of textures were produced in experiments on pyroxene-rich melts which are generally similar to those observed in natural chondrules. In this study direct comparisons confirm that the experimental studies quite accurately reproduced the range of pyroxene rich chondrule textures and mineral chemistries. In the process, a class of textures not widely recognized has been found to be more common than preiously thought, that of the barred pyroxene chondrule; a direct parallel to the barred olivine chondrule.

Lofgren & Russell (1) produced chondrules textures ranging from porphyritic with a wide variety of phenocryst shapes, to dendritic or barred, to radial, with some excentroradial. Even the granular textures were observed. In Fig. 1 several of these textures are compared. Figures. 1a&b show typical porphyritic textures with eudral, equant phenocryts. The matrix in the natural chondrule is very fine spherulites while the experimentally produced matrix is still glassy. Porphyritic chondrules with quite different phenocrysts are shown in Figs. 1c&d; the chondrules each contain a single, large dendrite. Barred pyroxene chondrules are shown in Figs. e&f. These textures were commonly found in the experiments and more commonly in meteorites that one would presume based on the absence of discussions of them in the literature. Hewins et al (2) clearly produced similar barred pryoxenes in their experiments, but did not make comparisons with their natural equilvalents. Radial and especially excentroradial chondrule textures were also produced, but photomicrographs are not very informative and not shown here. Also not pictured are the numerous variations in pyroxene phenocryst shape which ranges from the equant, euhedral shape shown in Fig. 1 to hopper or skeletal to very coarsely barred; all with natural equivalents.

In general the mineral compositions of the experimentally produced and natural chondrule pyroxenes are similar. The experiments clearly come from a more restricted range of original compositions and are not as completely crystallized as their natural counterparts. The cores are En 90 to 97 and zone out to 50; in some cases the rims are subcalcic augite to augite. The rims contain increased levels of Al, Cr, and Mn in response to the change of composition of the pyroxene. There is also an increase in these minor elements with increased growth rate of the crystals. Crystal shape is the best indicator of growth rate and the dendritic crystals contain the highest levels, skeletal crystals intermediate levels, and the equant, euhedral crystals the lowest. Usually these minor elements are related to cooling rate (2), but not in all cases. Melts cooled at slow rates without readily available nuclei will not have crystals growing immediately. They will nucleate at some increased degree of supercooling and the growth rate will depend on the degree of supercooling when growth is initiated. In the experiments, barred pyroxene grew in charges cooled as slow as 5°C/hr at a relatively high degree of supercooling and have higher levels of Al than equant crystals grown at the same cooling rate. Without knowing the precise growth rate of the crystals, it is impossible to quantify the relationship between minor element content and growth rate; and knowing the growth rate does not necessarily translate directly to a cooling rate for the reasons stated above.

**Fig. 1.** Photomicrographs of natural (on left) and experimentally produced (on right, Lofgren and Russel, 1986) chondrules compared. a & b. Porphyritic pyroxene chondrules from ALHA 77038, 0.9mm dia. and by experiment, 3.3mm dia. c & d. Dendritic pryoxene chondrules from ALHA 77038, 1.6mm dia. and by experiment, 3mm dia. e & f. Barred pyroxene chondrules from ALHA 79045, 0.9mm dia. and by experiment, 3.5mm dia.

**REFERENCES CITED:** [1] Lofgren, G.E. and Russell, W. J. (1986) Geochim. Cosmochim Acta, 50,1715-1726. [2] Hewins, R. H. et al. (1981) Proc. Lunar Planet. Sci. Conf., 12B, 1123-1133.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