The orientation of sections used for the x-ray analysis is identical to that of the Yule marble experiment, except that the plane of the stereo-net for the dunite represents the horizontal.

EVALUATION OF DIFFERENCES BETWEEN OPTIC AND X-RAY DATA

Although there is good correspondence in major detail between the optic and x-ray results there are certain noticeable differences in some of the dia grams. Examples are (1) the small-circle girdle of *B*, plate 2, that is not present in the optic data of *A* (Fionne Allt quartzite), (2) the weak point maximum of *D*, plate 2, that is not apparent in the optic diagram, *C* (Yule marble), and (3) the existence of a more broad girdle of strong maxima in *D*, plate 3, instead of a point maximum as seen in the optic data, diagram *C*. (Cypress Lake dunite).

The small-circle girdle of *B*, plate 2, might be related to the symmetry of this type of net. Sufficient results have been obtained with this net to show that it should be discarded in favor of the one having four sections inclined to the primitive circle section rather than just two. Results obtained so far with the former net have shown no reproduction of minor detail.

The differences in the x-ray and optic data for the Yule marble and Cypress Lake dunite might result from one or more of the following causes:

(1) The difficulty in obtaining the correct powder intensity data for calcite because of the excellent cleavage.

(2) The inability for one working with the universal stage to record orientations for the fine-grained fraction. The x-ray technique is completely non-selective in this respect.

(3) Inhomogeneity of fabric.

(4) The occurrence of "false" triple points (see p. 312-313).

Future work with calculated intensities, or other methods of handling the data that would eliminate the need for a powder pattern, will tend to remove (1) as an error factor. It is not likely that problems resulting from (2) can ever be eliminated. In consideration of (3) it should be obvious that any comparisons made must rely on homogeneity of the fabric, at least within the realm of the hand specimen, otherwise fabric differences would result in unavoidable differences in both the optical and x-ray results. Point (4) has already been discussed in detail (p. 312-313) and is probably a greater source of uncertainty than the other three items listed above.

COMPARISON WITH PRESENT TECHNIQUES

Once the small-circle net and points of small-circle intersections are established for each mineral they are permanent and need not be considered in the time consumed in producing an x-ray diagram. With this consideration it would be desirable to compare the time necessary to turn out a petrofabric diagram by the x-ray method and by the Universal stage method. The following is a comparison of times consumed by an experienced person in each technique. The sample is assumed to be a coherent quartzite of moderately coarse grain (¼ to ½ mm).

The contouring time for the x-ray method comes solely from the drawing of iso-lines around approximately four hundred numbers. The contouring time for the universal stage method, however, includes for each point of the grid the summation of c-axes within a circular area representing 1 percent of the entire net area, using the usual point counter, and then actually contouring the approximately three hundred points of the net.

SMALL-CIRCLE NET

	hours
Sample Preparation	1.50
Scanning[6]	2.50
Table compilation	0.75
Summations and results to net	6.00
Contouring	0.25
Total	11.00

UNIVERSAL STAGE

Sample Preparation (two thin sections)	1.50
Axes measurements (300 grains)	5.00
Transfer results to Schmidt net	2.00
Contouring	2.00
Total	10.50

The estimated time for the x-ray technique is for the case of hand summation of the intensities at the intersections of small-circles, rather than summation[7] by high-speed computer. Nevertheless, the data can be typed out on program cards (45 min) and added to a program stack (already punched out and considered permanent) for computer summation.[8] This reduces the summation time to one hour and therefore makes the x-ray technique far superior to the Universal stage technique when considering actual operator time. A further reduction in operator time comes from continuous scanning of the rock pieces in which the operator merely mounts and removes the sample. A person experienced in the use of the diffractometer and in the small-circle net technique can turn out a diagram in five hours.

Furthermore, the above comparison assumes a sample material of quartzite, optical measurements from which are relatively simple. Minerals of lower symmetry (orthorhombic, monoclinic, triclinic) are much more complex in optical properties, and measuring time on the Universal stage increases to perhaps 10- or 20-fold. Crystallographic properties also become more complex which means considerable more time in construction of the small-circle net. But once this net is complete it is permanent; the time needed to complete an x-ray diagram from this net is no greater than for one based on a quartz net.

[6] Operator scans only desired lines.

[7] Summation of intensities assigned to small circles at every intersection of three or more small-circles over the net.

[8] This has been done and successfully tested for calcite using IBM 7090.