NOTES AND NEWS

OCCURRENCE OF "CHANNELS" IN THIN SECTIONS

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In a recent paper (this Journal, vol. 38, pp. 815–26, 1953) A. F. Frederickson states that lower index "channels" appear to crisscross some thin sections. This can be verified easily even with hand lens examination.* The writers disagree, however, with Frederickson's interpretation of these "channels" as being features of the rock itself; we have observed them many times in the past and feel that they are merely the result of diffusion phenomena in the mounting media used to prepare the sections.

Figure 1 is a photomicrograph of one of a number of recently prepared thin sections† showing "channels," photographed using highly inclined illumination as recommended by Frederickson. The "channels" can be seen to adjoin fractures, grain boundaries, inclusions within grains, and alteration spots, and occur around the entire edge of the section. The letter "F" indicates a "channel" following a scratch accidently put on the top surface of the slide by a grain of coarse abrasive during the final grinding; this scratch could be traced completely across the section and out onto the cooked balsam used to mount the chip. On close examination this scratch was seen to consist of a series of fractures in "chatter mark" pattern, penetrating through to the lower surface of the section. All of these "channels" appear lower in index than the adjacent material. When these slides were heated gradually and examined during the heating, the "channels" were seen to spread wider, get more diffuse, and finally disappear. They did not reappear on cooling, but when the cover glass was removed and the top of the section washed with xylol, the "channels" reappeared in the same locations and spread as much as 0.1 mm. laterally from each crack, etc., in 60 seconds, and disappeared again on heating. When the slide was warm they could be made to disappear by moving the rock section relative to the glass slide; moving the cover glass relative to the rock section had no effect. When the thin section

* Focus on the slide using transmitted light from a high contrast area such as the edge of a window.

† These slides were prepared in the usual way, being mounted with "cooked" balsam cementing the chip to the glass slide and soft (xylol-plasticized) balsam cementing the cover. Gentle warmth was used to soften the plasticized balsam enough to squeeze out the excess without appreciably softening the cooked balsam cement.

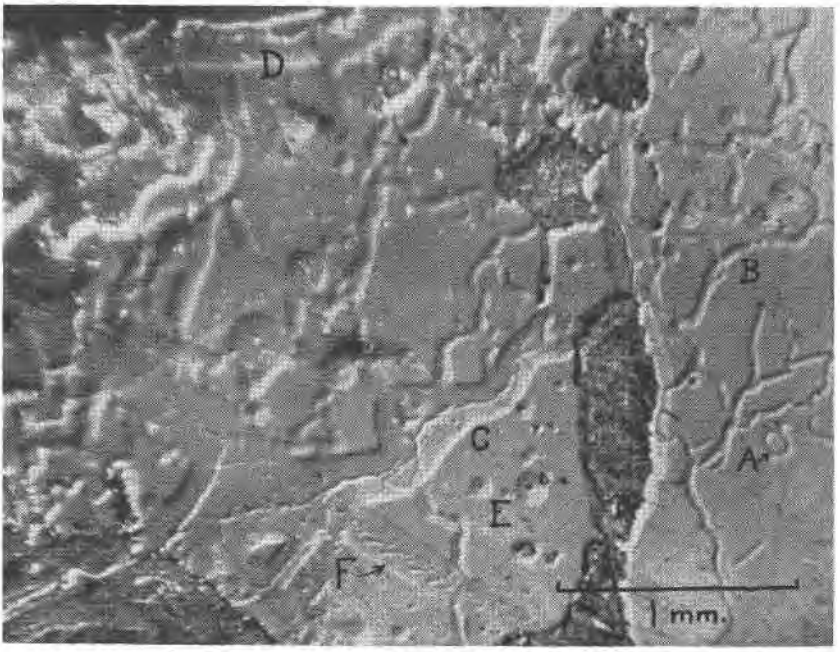

FIG. 1. Granite, Climax, Colorado. Highly inclined plane-polarized light. Light gray—quartz (polycrystalline), darker gray—partially altered orthoclase. *A*—"Channel" completely surrounding grain of quartz of different orientation than the matrix; *B*—"Channels" along quartz grain boundaries; *C*—"Channel" along fracture through quartz and feldspar; *D*—"Channel" at edge of thin section; *E*—"Channels" at holes and inclusions in quartz; *F*—"Channel" following series of "chatter marks" made across entire slide during final grinding by a stray grain of coarse abrasive.

containing the "channels" was removed from the balsam mount, washed thoroughly with xylol, dried and remounted in media having uniform index of refraction† no "channels" were visible. These data prove that the "channels" illustrated in Fig. 1 are due to xylol from the soft balsam above the section diffusing down through cracks, grain boundaries and holes, and spreading out in the cooked balsam beneath, lowering the index of this material and hence giving a low-index "channel." Not all balsam slides show them since many are heated sufficiently during the cover mounting to level out the composition gradients causing the "channels."

† The following media were tried: Methyl acrylate monomer polymerized with benzoyl peroxide; "Castolite" (methacrylate polymer); cellulose nitrate in acetone; Canada balsam in xylol; immersion liquids. When the acrylic resin mounts were washed with ethylene dichloride and when the cellulose nitrate mount was washed with acetone, "channels" formed as with balsam and xylol above.

Frederickson's statements of evidence against the phenomena of "channels" being due to mounting media (pp. 825–6) are as follows:

1. The relief features of calcite and other mineral grains change during rotation of the stage.
2. Optically polished surfaces on the thin sections did not eliminate the "channels."
3. Old slides also show "channels."
4. Several different mounting media yield the "channels."

It would appear to the authors that the variation in relief of calcite with rotation of the stage (p. 825) merely indicates that the lighting used enhances the relief features to be expected from a highly birefringent mineral like calcite and proves nothing about origin of the "channels." The presence of "channels" even with optically polished surfaces on the thin section does not eliminate the possibility of mounting media variations which could still appear as "truly an optical phenomenon." The presence of "channels" in old slides is merely a result of the use of the same mounting medium (balsam in xylol), in that diffusion boundaries in balsam, once arrested by cooling, may exist for years. As to the use of other mounting media, any media involving two materials of different index such as a resin (balsam) and solvent or plasticizer (xylol) will give gradients in index wherever composition gradients exist, and hence will show "channels."

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CHANNELS IN THIN SECTIONS—A REPLY*

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Messrs. Stringham and Roedder (1954) have commented on my paper (Frederickson, 1953*a*) which illustrated the fact that inclined transmitted illumination revealed much more detail in thin sections than vertical illumination techniques. It is gratifying to find that they confirm this view.

Their comments are primarily directed, however, at some of the details shown in the photomicrographs in spite of the fact that in the original paper (p. 826) it was explicitly stated that

"No attempt would be made . . . to 'explain' the origin and significance of the 'channels.' "

The word channel was enclosed in quotes and was intended to mean a passageway in the rock or mineral through which matter may have

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