

The culture filtrate after 20 days incubation, at which period the crude filtrate showed the maximum antibiosis, was extracted exhaustively with ether. The residue was further extracted with benzene and chloroform. The solvent extracts and the crude filtrate were evaporated to dryness under reduced pressure. Varying concentrations of the dried material were taken in alcohol and screened for antibiotic activity on *S. aureus* by the cup plate method.

The minimum inhibitory concentration of the extracts on *S. aureus* was determined in the liquid nutrient broth medium by the serial dilution technique. The extent of inhibition after 24 hours incubation was estimated by turbidimetric measurements.

Considering the possibility that oxalic acid which is one of the main metabolic products of this organism might itself be the antibiotic principle, the amount of oxalic acid present in the culture at the time of antibiotic assay of the culture filtrate was determined by permanganate titration method.<sup>9</sup> Oxalic acid at this level and also three times this concentration were taken in nutrient broth and tested for antibiotic activity. The culture filtrate which favoured the maximum oxalic acid synthesis was also tested for antibiotic activity. The ether extract showing potent antistaphylococcal activity was chromatographically analysed for the presence of oxalic acid using Whatman No. 1 filter-paper, butanol : acetic acid : water (4 : 1 : 5) as the solvent and 0.04% bromophenol blue in 95% alcohol as the spraying agent.

RESULTS

The crude culture filtrate exhibited inhibition of growth on only *Staphylococcus aureus*. The extent of inhibition during incubation is shown in Table I.

TABLE I  
Anti-staphylococcal activity of the culture filtrate

Days of incubation	4	8	12	16	20	24	28
Zone of inhibition (in mm.)	20	21	26	30	30	28	20

TABLE II  
Inhibitory activity of the ether extract of *S. rolfsii*

Concentration/ml.	5 mg.	1 mg.	100 µg.	50 µg.
Zone of inhibition (in mm.)	48.5	41	37.5	25.5

Maximum antibiotic activity appears to have been reached by about sixteen days.

The ether extract of the culture, tested in various concentrations on *S. aureus*, gave the following inhibition (Table II).

The serial dilution study showed the ether extract to be bacteriostatic at 1 µg./ml. level and bactericidal at 100 µg./ml.

Benzene and chloroform extracts obtained from the residue were inactive.

That oxalic acid was not the inhibitory agent was proved by the absence of this acid in the ether extract by chromatographic analysis as also by the non-inhibition of staphylococcal growth in concentrations three times than that present in the cultures. Also, the culture filtrate from glucose peptone broth medium inducing maximum oxalic acid was non-inhibitory to *S. aureus*.

It is thus seen that *S. rolfsii* produces, besides oxalic acid, antibiotic substances specifically active against *S. aureus*. Glucose peptone medium, the most favoured one for oxalic acid synthesis, exhibits the least antibiotic activity while nutrient peptone medium, a poor supporter for oxalic acid production is a good medium for antibiotic production. The antibiotic is easily extractable with ether and is bacteriostatic to *Staphylococcus aureus* even at 1/1 million dilution.

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FISH REMAINS FROM THE MIDDLE  
PALAEOZOIC OF THE KASHMIR  
HIMALAYAS

WHILE engaged on investigations in the Palaeozoic rocks of the Kashmir Himalayas the author found some specimens, *in situ*, of fish remains near Margan Pass (33° 44' : 75° 32') from the black calcareous shales immediately underlying the white Muth Quartzite exposed on the talus covered slopes, S.W. of Margan Pass.



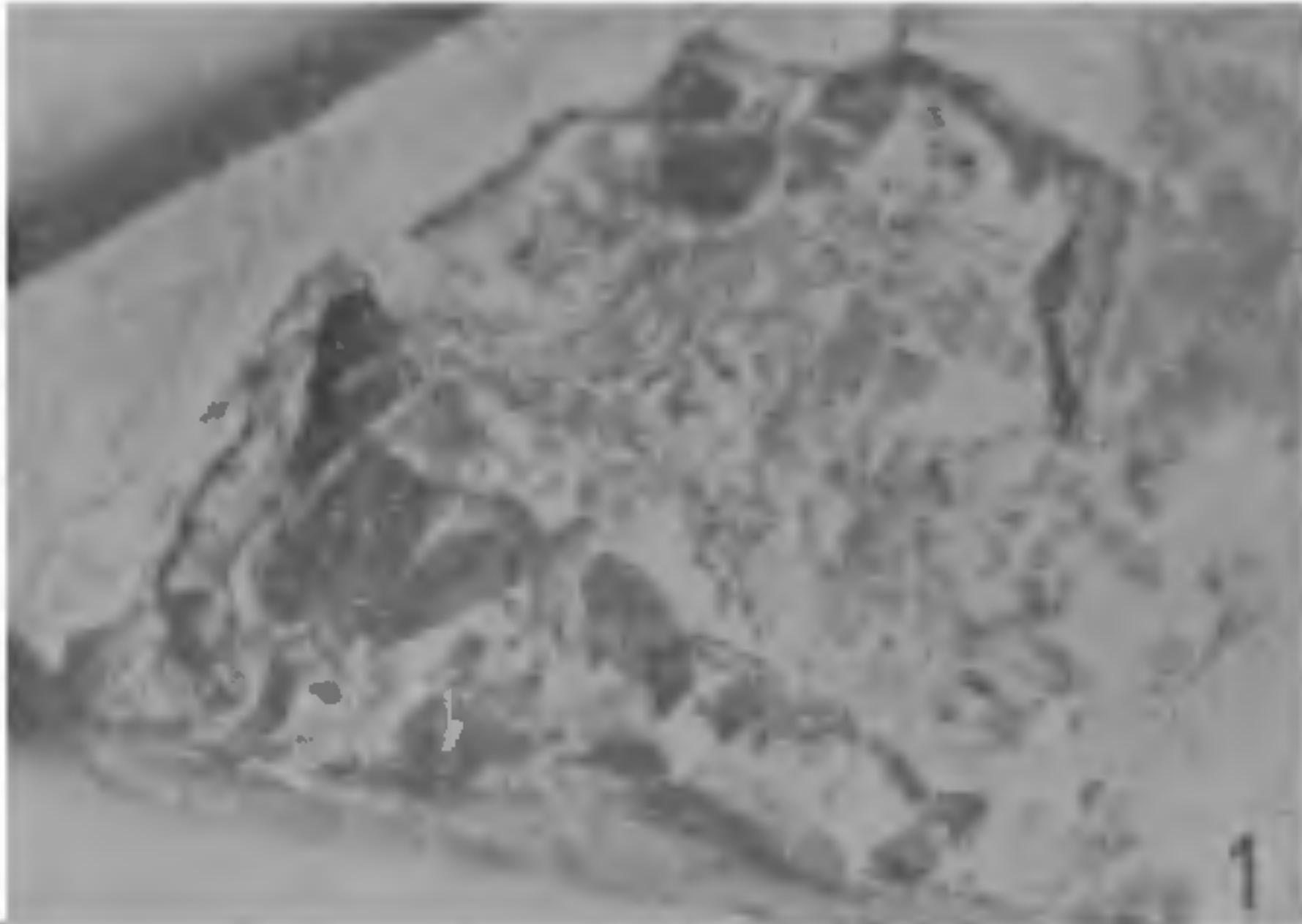


FIG. 1. Medio-dorsal plate

This is the first find of fish remains from the Middle Palaeozoics of the Indian Sub-continent.

The present specimen has a medio-dorsal plate (Fig. 1) and a few scales (Fig. 2). It can be tentatively identified as a species of *Holonema* Newberry and resembles *Holonema* sp. idet as described by J. Rade<sup>1</sup> from the Mt. Jack Area, New South Wales, Australia. Gross<sup>2</sup> has described a medio-dorsal plate of *Holonema eifeliense* Kaysen which resembles Kashmir specimen but with small pits on the anterior part of the plate.

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### LAMPROPHYRIC DYKE FROM CHANNAKAL BETTA, KUSHALNAGAR, MYSORE STATE

A LAMPROPHYRIC dyke is observed amidst granite, at Channakal Betta  $\Delta$  3295 (N.  $12^{\circ} 28' 57''$ ; E.  $75^{\circ} 59' 25''$ ), near Kushalnagar, Coorg District, Mysore State.

The dyke is one mile long and trends N.  $30^{\circ}$  E, with an average width of about 5-6 ft. Both the dyke and the country rock are traversed by two sets of vertical joints trending N.  $30^{\circ}$  E. and N.  $30^{\circ}$  W. The dyke rock has a dark grey colour with Sp. Gr. of 3.09. It is fine-grained at the margins and relatively coarse towards the centre.

Under the microscope the rock is essentially composed of pyroxene, olivine and plagioclase

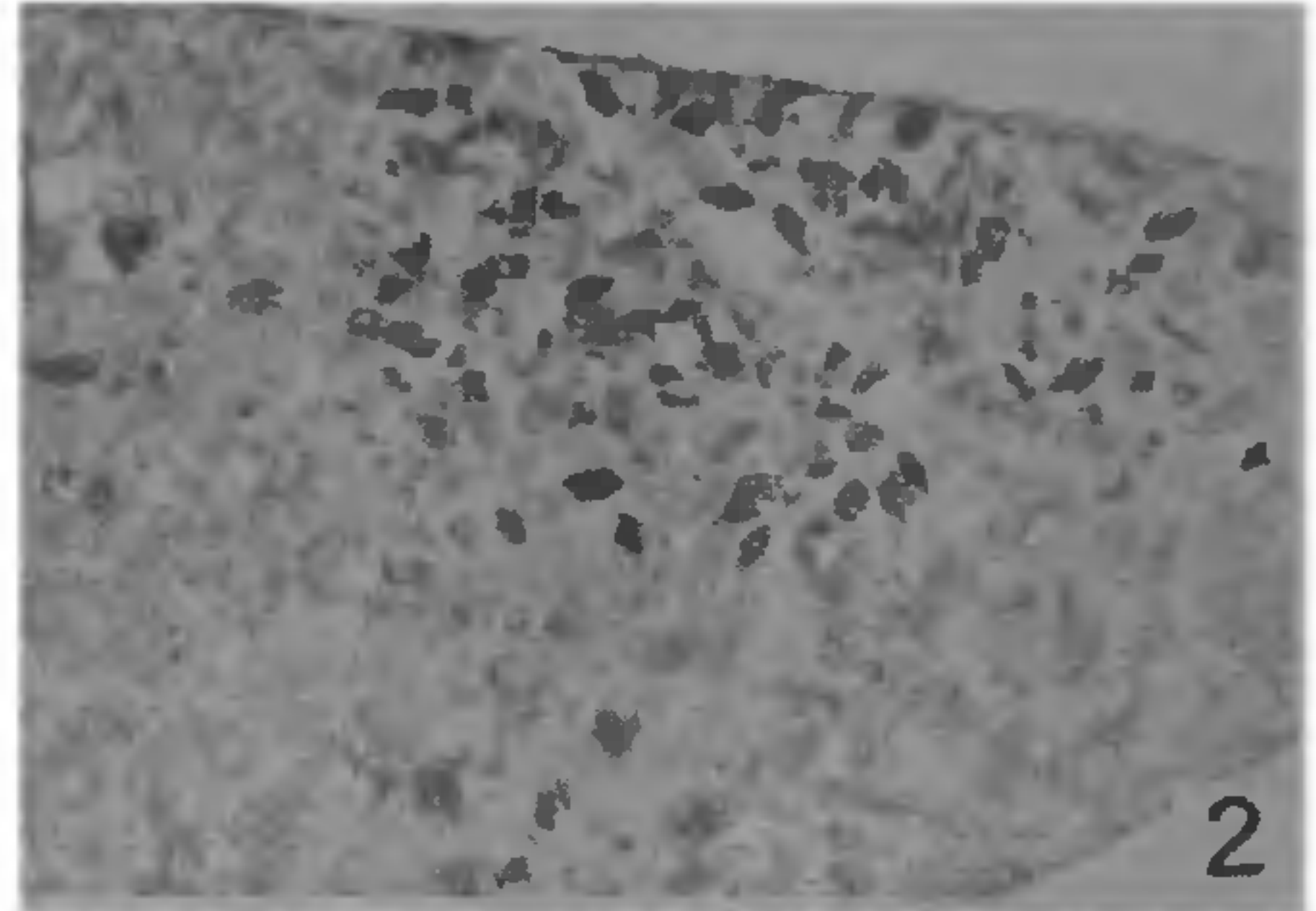


FIG. 2. Fish scale.

feldspar with accessory minerals like biotite and iron ore.

The olivine is euhedral to subhedral with a pale brown colour, and feeble pleochroism due to the presence of dusty inclusions. It is biaxial positive with  $+2V = 84^{\circ}-90^{\circ}$  and birefringence  $= 0.027-0.038$ . The dominant pyroxene is nearly colourless and occurs as euhedral grains and prismatic plates with two sets of cleavages cutting at  $90^{\circ}$ . A few grains exhibit simple contact twinning with composition plane parallel to 110. Cruciform twinning is rarely observed in a few grains (Fig. 1). It

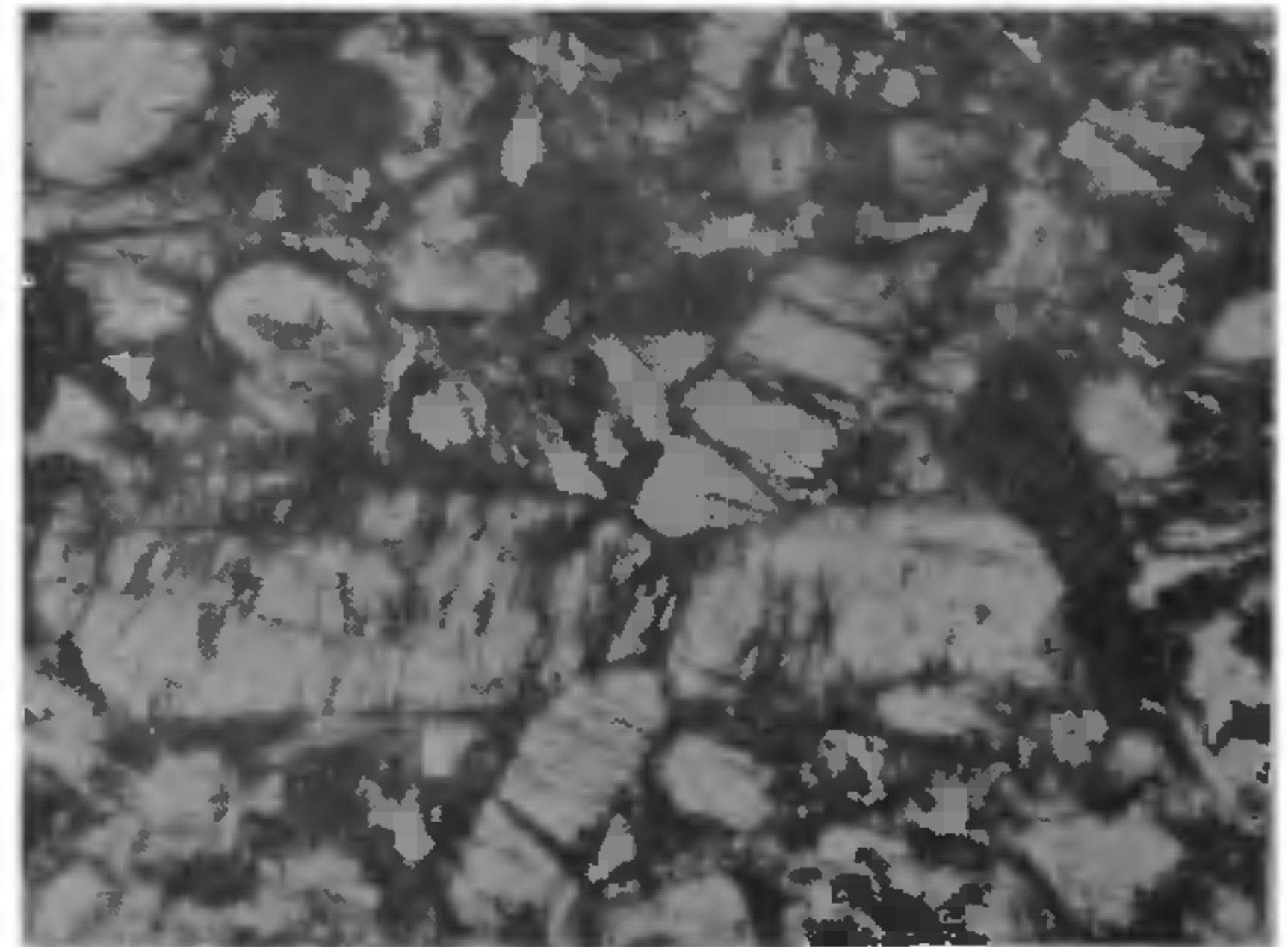


FIG. 1. Cruciform twinning in pyroxene. Plane polarized light,  $\times 40$ .

is optically biaxial positive with  $+2V = 78^{\circ}-88^{\circ}$  and birefringence  $= 0.007-0.011$ . The above characters indicate the mineral to be enstatite.

Plagioclase is the only silic mineral of the dyke. It occurs in the form of slender twinned laths forming the matrix along with smaller grains of pyroxene. Out of the 15 grains examined for the twin laws, 7 exhibited Albite law, 3 exhibited complex Manebach-Ala Acline law, one each Manebach-, Baveno-, Carlsbad-,