originally trapped, but this is unlikely because of the rarity of single-phase inclusions. Partition of elements between the Si-rich phase and the volatile-rich phase would lead to the presently observed distribution of elements. The composition of the material coating the cavities will not be the same as that of the non-fugitive elements in the original volatile-rich phase as some of these elements would not have been precipitated. When the solvent was lost by leakage through or along cleavage planes or during sectioning the remaining dissolved material would also have been lost.

Immediately adjacent to each inclusion there is an albite-rich aureole. The presence of this zone indicates that there was exchange of ions between inclusion and feldspar. This reaction may have led to the angular shape of the silicate inclusions because movement of ions would be facilitated by the plagioclase cleavage, which would thus control the shape of the inclusion.

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Cleavage in pyrite from Tasmania

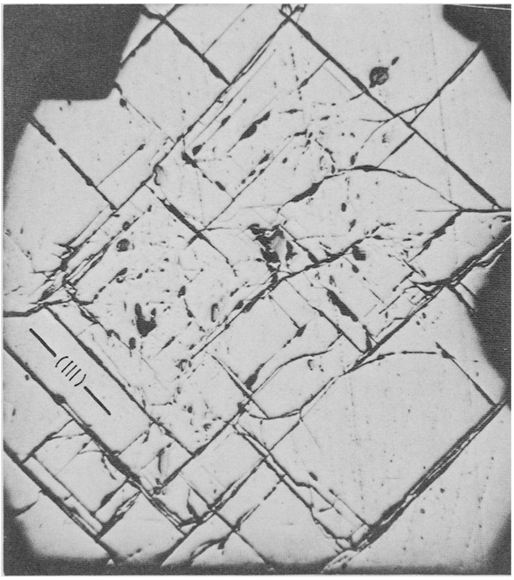
DURING an investigation of Tasmanian mining areas late in 1971, specimens of pyrite crystals associated with muscovite and crystallized quartz were shown to the author by employees of the Hydro-Electric Commission of Tasmania who were engaged in the construction of the Mersey-Forth power development scheme at Wilmot, in the central-northern part of the state. The specimens came from a large fissure-like cavity in granite intersected by the hydro tunnel near Moina, which now supplies water to the Wilmot power station.

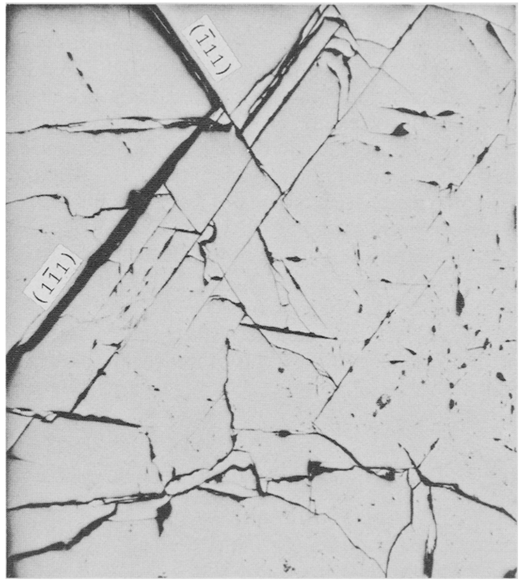
Unfortunately, at the time of the author's visit the tunnel had been completed so that verification of the occurrence and the determination of its associated mineral paragenesis was not possible. However, several interesting specimens were obtained from local mineral collectors.

These specimens showed pyrite crystals, predominantly as striated cube-pyritohedron combinations, directly associated with crystallized muscovite, kaolinite, and/or crystallized quartz. The crystals range in size from 4 mm to over 4 cm in diameter. Complete single crystals, free from any matrix, showing various combinations of cube and octahedron forms up to 2 cm were also seen but their genetic relationship to the cube-pyritohedron crystals is not known.

Crystals with the cube-pyritohedron morphology removed from kaolinite matrix showed what appeared to be small perfectly developed octahedral faces. However, on close examination these faces displayed irregular surface features uncharacteristic of a crystal face. Further investigation indicated that they were due to a very easily produced and very pronounced octahedral cleavage in the pyrite crystals. Only crystals associated with the pyrite-muscovite-kaolinite assemblage showed this phenomenon.

The presence of octahedral cleavage was positively demonstrated by cutting and polishing crystal sections parallel to the (001) and (110) directions. The (001) section showed incipient cleavage cracks meeting at 90° and arranged at 45° to the cube faces (fig. 1). A section parallel to (110)





FIGS. 1 and 2: FIG. 1 (*left*). Pyrite crystal sectioned parallel to the cube face (001) showing incipient octahedral cleavage planes. The crystal is 5 mm in diameter. FIG. 2 (*right*). Pyrite crystal sectioned parallel to (110) showing the incipient cleavage planes $(\bar{1}11)$ and $(1\bar{1}1)$ meeting at $109\frac{1}{2}°$. The crystal is the same as that shown in fig. 1.

on the same crystal showed incipient cleavages intersecting at $109\frac{1}{2}°$ i.e. $(\bar{1}11) \wedge (1\bar{1}1)$ (fig. 2). Indications of a less pronounced cubic cleavage were also evident on both sections.

Electron-probe microanalysis showed no appreciable impurity elements to be present, so that the possibility of this phenomenon being the result of parting caused by the coprecipitation of another mineral along the {111} planes in the pyrite crystals is very unlikely.

Previous investigations into pyrite cleavage. Frenzel and Bloss (1967) investigated the problem of cleavage in pyrite by comparing the structure of pyrite to that of halite and calculating the number of Na-Cl bonds broken per unit area for various crystallographic planes to give some indication of the comparable planes in pyrite most likely to represent cleavage planes. The order of probability was found to be: {100} {210} {110} {311} {211} and the least probable {111}.

They then studied crushed pyrite samples from Rio Marina, Elba, using X-ray diffractometry to determine the relative quantities of different reflecting crystallographic planes. The crushed pyrite was dispersed on a glass slide so that the cleavage planes were in contact with the glass surface. This preferred orientation of the cleavage surfaces caused the intensity of the peaks corresponding to the cleavage planes to be larger in relation to the peaks produced by a standard pyrite grain mount made so as to show no such preferred orientation of the cleavage directions. The results of this work showed that {100} was the most prominent cleavage direction present, with a less-perfect {311} cleavage. The planes {210} {211} and {110} were not considered likely cleavage directions in pyrite and the existence of a {111} cleavage still remained in doubt.

It would appear that the Wilmot specimens described represent the first authentic occurrence of octahedral cleavage in pyrite to be reported.

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