It is worth noting that, in other cases of ordering in framework silicates (for instance in basic plagioclases), antiphase domains develop, but this would not be so in the case of garronite, the domains of which would not be superimposed by translation alone, as required in antiphase domains. In basic plagioclases the domain structure develops in those crystals with anorthite structure but with a ratio Si:Al > 1: garronite itself has a ratio Si:Al = 1·5, which may favour these partial domain orderings in a structure proper for Si:Al = 1.

If our hypothesis is right, this would not be the first example of an order-disorder polymorphism in zeolites: the tetragonal natrolite (Andersen, Danø, and Petersen, 1969) is beyond any doubt the disordered form of the common orthorhombic natrolite, as has already been clearly stated by Pabst (1971), who found a particular association of natrolite crystals akin to twinning, which can be considered as an ordering in macro-domains of a previous disordered tetragonal natrolite.

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Confirmation of Sabatier's Nevada twin in Mont-Dore sanidine

IN a previous issue of this Magazine, G. Sabatier (1973) has described the second occurrence of the Nevada twin in a sanidine crystal of composition $Ab_{53}Or_{47}$ (mole %), which he had collected in the altered trachyte (sancyite) on the SW. slope of the Mont-Dore old volcano in the Massif Central (France).

Only one specimen showed twinning. Owing to its large size (over 2 cm across) and its earthy lustre, it was unsuited for reflection goniometry. Sabatier was nevertheless able to decipher the twin law by means of a contact goniometer. He identified the twinning operation as a 180° rotation about [$\bar{1}$12]; Mont-Dore thus became the second occurrence of the rare twin law established by Drugman (1938).

In view of the importance of the twin identification, we proposed to investigate the specimen by X-rays. Dr. Sabatier kindly placed it at our disposal.

The friable specimen was impregnated with Epoxy cement so that it could be sawed. A slab 2 mm in thickness was cut in a planar direction passing approximately through b^* and $[\bar{1}01]^*$, so as to be nearly parallel to the reciprocal-lattice net plane $(101)^*$. It turned out to be too thick for X-ray work, but its orientation was satisfactory, as it showed the contact between the two crystals in the twin. A thinner slab (< 1 mm) was cut, parallel to the first one, and served for precession work.

A first exposure, taken with the slab approximately perpendicular to the direct beam, with the latter hitting crystal No. 1, gave an orientation pattern, and minor adjustments immediately yielded the desired reciprocal-lattice net plane. Its net was identified as $(101)^*$ by means of the list of reciprocal-lattice-vector lengths calculated from the sanidine cell dimensions, which have been reported by Taylor *et al.* (1933) on a Vesuvius specimen: a 8·4, b 12·9, c 7·1 kX, β 116°. The crystal setting of Taylor was retained for the sake of comparison.

With all rotational adjustments kept constant, the specimen was translated to bring crystal No. 2 in front of the beam. Care was taken not to have any part of crystal No. 1 in the path of the beam: the difference in lustre between the two differently oriented crystals in the slab section made this task easy. The pattern of crystal No. 2 was thus obtained in a plane rigorously parallel to that of the reciprocal net $(101)^*$ of crystal No. 1. The orientation pattern showed a nearly adjusted net in crystal No. 2, in which the rows[1] $[\underline{13\bar{1}}]^*$, $[\underline{15\bar{1}}]^*$, $[\underline{010}]^*$ were identified by means of two criteria: *angle*, measured on the stereographic projection (plotted for the two twinned crystals), and *length*, obtained from the calculated list mentioned above.

The row $[\bar{1}\bar{3}1]^*$, along with $[0\bar{2}1]^*$ and $[110]^*$, belongs to the reciprocal net $(\bar{1}12)^*$, which is the locus of all directions common to the two crystals in the twin. Each row has its sense reversed by twinning: for example, $[\underline{13\bar{1}}]^*$ corresponds to $[\bar{1}\bar{3}1]^*$.

We note that $[\bar{1}12]$ misses, by only 1 to 2°, lying in the net plane $(101)^*$. To a first approximation, we can produce the pattern of crystal No. 2 by rotating that of crystal No. 1 about a line contained in its plane at 6° from $[\bar{1}11]^*$ toward $[010]^*$. The two patterns (one of No. 1 after 'twinning'; the other, taken of No. 2) can now be superposed thanks to the fiducial lines provided by the two light dots on the precession films. The required coincidences are observed: that of $[\underline{13\bar{1}}]^*$ with $[\bar{1}\bar{3}1]^*$ is perfect, that of $[\underline{15\bar{1}}]^*$ with $[\underline{\bar{1}\bar{5}1}]^*$ is nearly perfect too, but the farther (angularly speaking) the row is from $[\underline{13\bar{1}}]^*$, the larger the departure from coincidence becomes. The $[\underline{010}]^*$ direction is definitely out of the plane $(101)^*$: the row appears as a loop on the film, which is as it should be. The recorded observations thus confirm the twin law $[\bar{1}12]_{180°}$.

The inadequacy of the alternate definition of the twin, by means of a twin plane $(\bar{1}11)$, is shown on the stereographic net: $[\bar{1}\bar{5}1]^*$ reflected in $(\bar{1}11)$ would give $[\underline{\bar{1}\bar{5}1}]^*$, which is 11° from the direction $[\underline{15\bar{1}}]^*$ obtained by $[\bar{1}12]_{180°}$.

The observation, made by Sabatier, of an irregular composition surface is valid. The penetration twinning, however, renders it difficult, if not impossible, to ascertain any composition plane. Whether the composition plane is $(0\bar{2}1)$, as suggested by

[1] The symbols referring to crystal No. 2 are underlined.

Sabatier, or the 'rhombic section', according to theory, we cannot decide even though these two planes make an angle of 40° (measured on the Wulff net). Such a composition plane could exist only in the early stages of growth and would become obliterated by later growth, which would account for one crystal wrapping itself around the other (this explanation goes back to G. Friedel, 1926).

Addendum. Dr. Sabatier informs us (letter dated 1 February 1974) that more good specimens of the Nevada twin have been collected in the same locality by Dr. Fabien Cesbron.

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Sapphirine in the Sittampundi complex, India

DURING recent work on the Sittampundi anorthosite intrusion, Salem District, Tamil Nadu (Madras) State, India (Subramaniam, 1956) we discovered a plagioclase(*c*. An_{78})-rich rock with colourless gedrite ($2V_\gamma$ 82°) and nearly colourless clinoamphibole, corundum, chrome spinel, rare prismatic sillimanite, rare phlogopite, and a little pale granular sapphirine, a mineral not previously recorded from this intrusion. The sample occurs between chromitite layers 2 km north-east of Pamandapalaiyam. The corundum is a vermicular, skeletal ruby that occurs mostly in association with the perfectly fresh plagioclase, sometimes as thin strips following the plagioclase grain boundaries, but a few skeletal grains also occur inside the amphibole. The sapphirine has $2V_\alpha$ $50\pm2°$, occurs in isolated granules or prismatic crystals that are sometimes skeletal, is usually associated with the plagioclase, and has a very pale sapphire to colourless pleochroism. The rock contains some late chlorite, especially replacing the gedrite, and patches of an unidentified colourless mica-like mineral occurring in aggregates that sometimes are radiating.