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**Massimo Nespolo\*** ([massimo.nespolo@crm2.uhp-nancy.fr](mailto:massimo.nespolo@crm2.uhp-nancy.fr)), BP 70239, Boulevard des Aiguillettes, 54506 Vandoeuvre-les-Nancy, France, **Mohamed Amine Marzouki** ([mohamed-amine.marzouki@crm2.uhp-nancy.fr](mailto:mohamed-amine.marzouki@crm2.uhp-nancy.fr)), BP 70239, Boulevard des Aiguillettes, 54506 Vandoeuvre-les-Nancy, France, and **Bernd Souvignier** ([souvi@math.ru.nl](mailto:souvi@math.ru.nl)), Toernooiveld 1, 6525 ED Nijmegen, Netherlands. *The staurolite enigma solved through the analysis of the pseudo-eigensymmetry of crystallographic orbits*. Preliminary report.

Staurolite is an enigmatic mineral characterized by a high degree of pseudo-symmetry, which frequently occurs twinned. It gives two twins with different occurrence frequency, the Greek cross (lower frequency) and the Saint Andrews cross (higher frequency) but to date no explanation has been found for their different occurrence frequency. We have analyzed the structure of staurolite in terms of the pseudo-eigensymmetry of the crystallographic orbits building this structure and found that: 1) the set of oxygen atoms has a pseudo-cubic eigensymmetry which contains the twin operations of both twins, which justifies the high frequency of twinning of this mineral; 2) a subset of the tetrahedral cations has an eigensymmetry which contains the twin operation of the Saint Andrews cross, but not that of the Greek cross; 3) a subset of the octahedral cations has an eigensymmetry which contains the twin operation of the Greek cross and a larger subset has an eigensymmetry which contains the twin operation of the Saint Andrews. The substructure approximately restored by the twin operation is thus more important for the Saint Andrews cross, which justifies its higher occurrence frequency (Received January 10, 2014)