

## 1.14: Bravais flock

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Space groups that are assigned to the same Bravais class belong to the same **Bravais flock of space groups**.

The introduction of the concept of Bravais flock is necessary in order to classify space groups on the basis of their Bravais type of lattice, independently from any accidental metric of the lattice.

An orthorhombic crystal may have accidentally  $a = b$  have a tetragonal lattice not because of symmetry restrictions but just by accident. If the Bravais types of lattices were used directly to classify space group, such a crystal would be go in another category with respect to an orthorhombic crystal without specialized metric. The concept of Bravais flock solves this ambiguity.

A space group  $G$  is *assigned* to a Bravais class on the basis of the corresponding point group  $P$  and the arithmetic crystal class associated with it:

- If the arithmetic crystal class of  $G$  is a Bravais class, then  $G$  is assigned to that Bravais class;
- if the arithmetic crystal class of  $G$  is not a Bravais class, then the Bravais class to which  $G$  is assigned is obtained as follows:
  - those Bravais classes are retained whose point group  $B$  is such that  $P$  is a subgroup of  $B$ ;
  - $G$  is assigned to that Bravais class, among those selected above, for which the ratio of the order of the point groups of  $B$  and of  $P$  is minimal.

For example, a space group of type  $I4_1$  belongs to the arithmetic crystal class  $4I$ , to which two Bravais class can be associated,  $4/mmmI$  and  $m\bar{3}mI$ . The second condition uniquely assigns  $G$  to the Bravais flock of  $4/mmmI$ , despite the fact that the Bravais class of the lattice may be  $m\bar{3}mI$  as a result of accidental symmetry.

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