



# Geometry of Crystallographic Groups: 4 (Algebra and Discrete Mathematics)

*Andrzej Szczepański*

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Crystallographic groups are groups which act in a nice way and via isometries on some  $n$ -dimensional Euclidean space. They got their name, because in three dimensions they occur as the symmetry groups of a crystal (which we imagine to extend to infinity in all directions). The book is divided into two parts. In the first part, the basic theory of crystallographic groups is developed from the very beginning, while in the second part, more advanced and more recent topics are discussed. So the first part of the book should be usable as a textbook, while the second part is more interesting to researchers in the field. There are short introductions to the theme before every chapter. At the end of this book is a list of conjectures and open problems. Moreover there are three appendices. The last one gives an example of the torsion free crystallographic group with a trivial center and a trivial outer automorphism group.

This volume omits topics about generalization of crystallographic groups to nilpotent or solvable world and classical crystallography.

We want to emphasize that most theorems and facts presented in the second part are from the last two decades. This is after the book of L Charlap “Bieberbach groups and flat manifolds” was published.

## Contents:

- Definitions
- Bieberbach Theorems
- Classification Methods
- Flat Manifolds with  $b_1 = 0$
- Outer Automorphism Groups
- Spin Structures and Dirac Operator
- Flat Manifolds with Complex Structures
- Crystallographic Groups as Isometries of  $?"$
- Hantzsche–Wendt Groups
- Open Problems

**Readership:** Researchers in geometry and topology, algebra and number theory and chemist.



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