

Lecture on topological crystallography

Toshikazu Sunada

Received: 4 October 2011 / Revised: 9 November 2011 / Accepted: 21 November 2011

Published online: 26 March 2012

© The Mathematical Society of Japan and Springer Japan 2012

Communicated by: Toshiyuki Kobayashi

*Commemorating the fourth centennial anniversary of the publication of
Kepler's pamphlet "New-Year's gift concerning six-cornered snow" (1611)*

Abstract. This is an expository article on modern crystallography based on *discrete geometric analysis*, a hybrid field of several traditional disciplines: graph theory, geometry, theory of discrete groups, and probability, which has been developed in the last decade. The mathematical part relying on algebraic topology is fairly elementary, but may be still worthwhile for crystallographers who want to learn how well-established mathematics is effectively used in the practical science. A brief history of crystallography is also explained.

Keywords and phrases: topological crystal, canonical placement, discrete geometric analysis, discrete Abel–Jacobi map

Mathematics Subject Classification (2010): 05-01 (primary), 05C63, 31C20, 39A12, 74E15 (secondary)

T. SUNADA

Meiji Institute for Advanced Study of Mathematical Sciences, Meiji University, 1-1-1 Higashimita, Tamaku, Kawasaki 214-8571, Japan and

WPI Advanced Institute for Material Research, Tohoku University, 2-1-1 Katahira, Aoba-ku, Sendai, 980-8577 Japan

(e-mail: sunada@isc.meiji.ac.jp)