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THE FIRST RESOURCE FOR MATHEMATICS

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Architectural and urban subsymmetries. (English) Zbl 1511.00011

Mathematics and the Built Environment 6. Cham: Birkhäuser (ISBN 978-3-031-08945-9/hbk; 978-3-031-08946-6/ebook). xiv, 266 p. (2022).

The book consists of two parts. In the first part the concept of symmetry group and its subgroups is explained, emphasizing their representation by Cayley diagrams, which is visually more appealing to non-mathematicians. The second part is larger and discusses the use of symmetry in architecture both in the design of buildings and in broader urban design.

First, point symmetry (dihedral groups D_n) is illustrated and discussed as it is used in the Pantheon in Rome and later in the design of fortified cities and in buildings (mostly Italian), the latter reaching a peak during the Renaissance.

Modern architecture also uses reflections and rotations on substructures but in a more subtle or complicated way which makes the result less boring. Examples from Frank Loyd Wright, Rudolf Michael Schindler, and Gregory Ain are discussed as well as some new possibilities to apply these modern ideas in individual buildings or city blocks.

Next, two chapters are devoted to illustrate the use of frieze and wallpaper groups (streets, housing clusters, stacked housing blocks, facades, cities). They involve realized and proposed projects, but also proposals for new, as yet unexplored possibilities that result from using the underlying mathematical properties.

In a final chapter the author lists 5 principles that have been illustrated that can be used to make new designs based on symmetries without resulting in a dull design.

Reviewer: Adhemar Bultheel (Leuven)

MSC:

00A67 Mathematics and architecture
00-01 Introductory exposition (textbooks, tutorial papers, etc.) pertaining to mathematics in general

Keywords:

symmetry groups; frieze group; wallpaper group; architectural design; urban design

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