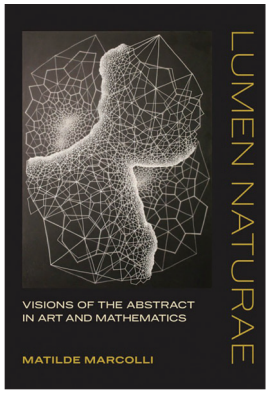
BOOKSHELF

New and Noteworthy Titles on our Bookshelf
September 2021



MIT Press, 2020, 392 pages. Cover is courtesy of the MIT Press.

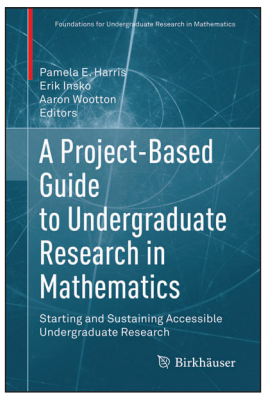
Lumen Naturae: Visions of the Abstract in Art and Mathematics
by Matilde Marcolli

This unique book resists pigeon-holing in a particular genre. It is too mathematical to be an art book or a popular-science book. It delves too deeply into art, particularly modern and contemporary art, to be a mathematical book. Simply put, *Lumen Naturae* is wholly unique: it is a personal reflection from a world-class mathematician on the relationship between mathematics, physics, and art.

Marcolli touches upon sophisticated mathematics, particularly that of a physical nature, throughout the book. For example, the Maxwell-Boltzmann distribution for the Riemann gas, chain complexes and homology, and the Einstein-Hilbert action functional for gravity all make appearances. However, mathematics does not dominate the book, for art is omnipresent and central. There are 237 color illustrations, which yields roughly one figure or painting on any pair of pages. Most of these are from modern or contemporary artists.

Besides the introduction, the ten remaining chapters are "Still Life as a Model of Spacetime," "The Notion of Space in Mathematics through the Lens of Modern Art," "Entropy and Art: The View beyond Arnheim," "Structures of Randomness," "Plentiful Nothingness: The Void in Modern Art and Modern Science," "The Geometry and Physics of Numbers," "Matter and Forces," "Can You Hear the Shape of the Cosmos?," "The Train and the Cosmos: Visionary Modernity," and "Mathematical Illuminations." Each chapter ends with a generous bibliography, split according to the relevant subjects from the chapter.

This book is ideal for someone with a basic knowledge of art, art history, physics, philosophy, and/or mathematics. *Lumen Naturae* bridges between these fields in an organic and branching manner, so that a reader with a point of entry will surely gain from the experience.



Birkhäuser, 2020, 324 pages. Cover is courtesy of Springer Nature.

A Project-Based Guide to Undergraduate Research in Mathematics: Starting and Sustaining Accessible Undergraduate Research
edited by Pamela Harris, Erik Insko, and Aaron Wootton

This edited volume is the third title in the new Birkhäuser book series "Foundations of Undergraduate Research in Mathematics." The aim of the series is to equip instructors with projects, methods, and tools to successfully sponsor undergraduate research. Although undergraduate research is a high-impact activity that many instructors wish to break into, an initial entry point often proves elusive. Moreover, undergraduate research can seem like a series of one-off projects, as opposed to an intentional pipeline of self-sustaining activities. *A Project-Based Guide to Undergraduate Research in Mathematics* contends with these issues and focuses on the development of sustainable, self-perpetuating research programs that can give rise to multiple projects spanning several years.

This volume features eleven chapters contributed by a host of authors who have extensive experience leading undergraduate research. These span a broad range of topics in mathematics, from combinatorics and computational biology, to number theory and analysis (the author of this review has contributed to this volume). Each chapter suggests a list of courses from the standard undergraduate curriculum that are prerequisites for the topic at hand. The chapters tend to be long, with the shortest weighing in at twenty-four pages. Several exceed thirty pages in length. Consequently, the pace is friendly and many of the chapters are at a level that an ambitious student might read independently. Routine exercises, more difficult challenge problems, and open problems appear in most of the chapters. Carefully curated bibliographies provide select sources for further readings. *A Project-Based Guide to Undergraduate Research in Mathematics* is a suitable starting point for any college-level mathematics instructor seeking to find a path toward sustainable undergraduate research.

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