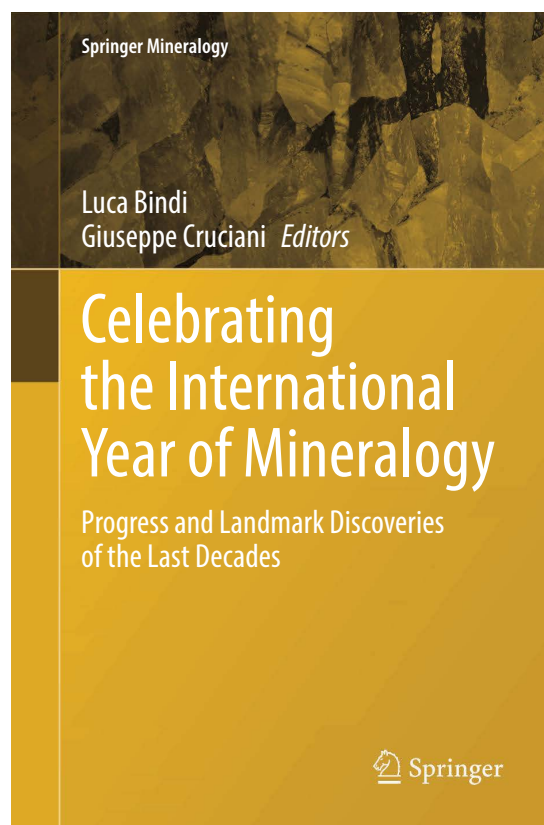


BOOK REVIEW

Book Review: *Celebrating the International Year of Mineralogy: Progress and Landmark Discoveries of the Last Decades.* (2023) By Luca Bindi and Giuseppe Cruciani, Editors. Springer Cham. Pages 359. DOI <https://doi.org/10.1007/978-3-031-28805-0>.

Celebrating the International Year of Mineralogy is a seminal work that encapsulates the remarkable progress and landmark discoveries in the field of mineralogy over recent decades. The book, skillfully divided into thirteen chapters, is a testament to the dynamic and evolving nature of mineralogical science. The most fascinating feature of this book is that it touches every facet of the Earth, focusing on complex minerals (like quasicrystals in Chapter 1 and hydrogen-bearing species in Chapters 7 and 13), simple minerals like diamonds (Chapter 10), deep-time mineral evolution (Chapter 2), modern mineral discovery (Chapter 4), the Earth's deep interior (Chapters 8 and 9), its surface (Chapter 12), and outer space (Chapter 11). It also explores the present status and future directions of mineral informatics (Chapters 3 and 5) and computational methodology (Chapter 6). Each chapter, penned by experts with deep knowledge and understanding of their respective areas, delves into different cutting-edge aspects of mineralogy, making the book an invaluable resource for a wide array of scholars, especially geoscientists.

When it comes to mineralogical complexity, one of the best examples is how a single element can produce strikingly different physicochemical states and properties in different minerals (e.g., carbon in fullerene and diamond, and hydrogen in hydrous silicates and hydrogen ion-incorporated species). Luca Bindi's narrative weaves a compelling story around the discovery of extraordinary structures like fullerenes and quasicrystals (Chapter 1), emphasizing their profound impact on scientific thought and technological innovation. The chapter is not just a recitation of facts but a vivid tale that captures the reader's imagination, underscoring the transformative nature of these findings. Although diamonds have the same elements as fullerenes, they have completely different properties and uses. The tiny inclusion found within diamonds is also a critical window into the Earth's deep interior, reflecting big geological problems beyond human imagination (Chapter 10). This chapter is a gem in itself, revealing how diamonds can also inform us about the Earth's deep history. Chapters 7 and 13 together accentuate the role of hydrogen in mineral diversity. The structural flexibility of hydrogen and its derived species



within a crystal lattice shows us that there is still much to learn. These chapters are a profound reminder of the elemental forces that shape the complexity of minerals, with even the smallest element making a difference.

When it comes to mineral evolution, Chapters 2 and 4 provide different perspectives. The expertise of Robert M. Hazen and his team brings to life the concept of mineral evolution, offering a window into the Earth's past. Mineral evolution seems to be an informative “time capsule” that can provide a unique context for understanding Earth's evolution. The development of mineral evolution also emphasizes the constant renewal of our knowledge and the need for improved methodologies. Pekov and Pushcharovsky's chapter (Chapter 4) turns our attention toward the discovery of new minerals, in which we do not even know where new minerals can be found and how many of them

may already exist. It underscores the pivotal role of advanced analytical techniques and provides poignant examples from various geological contexts.

When it comes to the spatial distribution of minerals, they are definitely ubiquitous. From the Earth's core to outer space, this book thoroughly explores these environments among several of its chapters. Specifically, Chapters 8 and 9 focus on high-pressure and high-temperature minerals in the Earth's mantle and core, respectively. The well-compiled tables in Chapter 8 present a list of all currently approved high-pressure minerals, making this chapter a useful reference for scholars. In Chapter 9, a comparison of core structures among the Earth, Venus, and Mars, and the light elements (e.g., carbon, sulfur, oxygen, etc.) distributed within them, highlight the unique nature of our terrestrial planets. An overview of mineralogical discoveries that have profoundly shaped science, technology, and our daily lives is presented in Chapter 12. Additionally, this book also offers an exhaustive introduction to the Hayabusa2 spacecraft and its trophy-like collection of samples from the Ryugu asteroid (Chapter 11). This captivating and unique content will undoubtedly attract readers from many different fields. Furthermore, this chapter highlights how these samples advance our understanding of the Solar System's history and composition, which is indeed an area of growing research interest worldwide.

When it comes to methodology, two non-experimental methods are rapidly growing in popularity. One is mineral

informatics, which is based on big data and mathematical formulation (Chapters 3 and 5). The integration of traditional mineralogical methods with cutting-edge data analytics is a theme that resonates throughout these chapters, heralding a new era in the study of mineral evolution. The sphere of influence of mineral informatics is expanding all around the world, especially with the emergence of artificial intelligence technology. The other non-experimental method is computational mineralogy, whose current state is presented in Chapter 6. One of the chapter's highlights is a comprehensive list of computational methods used in mineralogy; all of which are available to researchers for quick comparison and selection.

In conclusion, *Celebrating the International Year of Mineralogy* is more than just a collection of scientific essays; it is a celebration of the field's vibrant history and its promising future. Every word in this book perfectly confirms the sentence proposed by editors in the preface: "mineralogy is a living science". This book pays homage to the many researchers whose tireless efforts have expanded our understanding of the mineral kingdom and is a must-read for anyone interested in mineralogical stories that inform us about our world and beyond.

ANHUI LU
Past IMA President, Professor
School of Earth and Space Sciences
Peking University, Beijing, P.R. China