BOOK REVIEW

The Science of Citizen Science. **K. Vohland, A. Land-Zandstra, L. Ceccaroni, R. Lemmens, J. Perelló, M. Ponti, R. Samson, & K. Wagenknecht. (eds.). 2021. Springer International Publishing, Cham, Switzerland: vii, 529 pp. ISBN 978-3-030-58277-7; 978-3-030-58278-4. Open Access: https://doi.org/10.1007/978-3-030-58278-4**

Citizen science is not a new concept. It has been practiced for centuries, although the term itself was first coined in the mid-1990s. Initially, citizen scientists were mostly regarded as bird watchers or amateur astronomers, but citizen science as a field of research has been growing in popularity in many scientific areas in recent decades. In the current landscape, where data are valuable assets, citizen scientists are filling gaps in the global collection of data. Their contributions are recognized as revolutionary in innovation and policy impact. *The Science of Citizen Science* endeavors to provide an overview of the diverse aspects of citizen science while reflecting on current developments, the contributions of citizen science, and the different concepts, practices, challenges, and outcomes of this research field. The editors claim that this volume "aims to contribute to the good practice of citizen science to develop citizen science as an acknowledged and broadly practiced approach in universities, other research institutes, and civil society organizations" (p. 9). The book combines the work of the research network, Cooperation in Science and Technology (COST), which is part of the EU-funded European Cooperation in Science and Technology, the intergovernmental framework to "promote creativity, scientific literacy, and innovation throughout Europe" (p. 10).

The book's 26 chapters are divided into four parts. The first three chapters lay the foundational concepts of citizen science, its definition, challenges, and exploration of citizen science across Europe. Part one of the volume (Chapters 4-12) explores the impacts of citizen science on various disciplines such as natural sciences, humanities, health, environmental justice, and social science. The chapters also critically reflect on the debatable aspects of citizen science, such as data quality, managing science as a commons, co-creation of knowledge, and participation methods in research design

commonly adopted in citizen science projects. Part two (Chapters 13-20) takes a deeper dive into the societal impact of citizen science with a focus on policy, innovation, learning, and other aspects like diversity, inclusion, consent, and other ethical considerations. Part three (Chapters 21-25) elaborates on the various instruments and practical tools that aid in supporting citizen science. In part four (Chapter 26), the authors expand on the COST action, providing more context to the past and the anticipated future work in citizen science.

This book is a good comprehensive introduction for beginners who want to learn more about the various processes and aspects of citizen science. The volume's approach to situate citizen science in multiple disciplines and its impacts on the outcomes from these research fields provides a window into the potential of citizen science as its own field. This multidisciplinary perspective would be useful for scientists, policymakers, and academic programs to integrate and expand the use of citizen science in their respective areas. The layout of this book is another notable strength, i.e., organizing the chapters into a theme family enables the reader to develop a cohesive understanding of the broader scope of citizen science before moving into the more specific topics.

The Science of Citizen Science is different from the other books published on this subject, such as *Field Guide to Citizen Science: How You Can Contribute to Scientific Research and Make a Difference* (2020), *Citizen Science: How Anyone Can Contribute to Scientific Discovery* (2019), and *Citizen Science: How Ordinary People are Changing the Face of Discovery* (2016), in terms of its comprehensiveness in addressing a spectrum of topics within the realm of citizen science. This volume provides a survey of topics that are not often addressed, including data quality, ethical considerations, socio-economic-political issues, team building strategies, best practices, and project participants' behavioral aspects. Another aspect that sets this book apart is that each chapter was written by subject experts. The editors acknowledge the limitations and barriers to citizen science. Recommendations are provided for almost all of the subjects addressed in the book; however, often the recommendations are quite broad and there is room for further exploration.

The audience for this book goes beyond academic communities, which the Open Access format supports. As a newcomer to citizen science, I found the book to be heavy reading. To policymakers, project leaders, citizen science practitioners, and the general public, its verbose content could be a limiting factor to the uptake of practical applications covered in the book. However, *The Science of Citizen Science* contributes to a deeper understanding of various aspects of citizen science from interdisciplinary and multidisciplinary points of view, and the dedicated reader will learn much from it.

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