

claims about methods, alignments and overly-broad conclusions out of cultural context could be justifiably criticized. As cultural astronomy has advanced, it is still open to scholarly criticism and vigorous discussion, but at a much higher level. Overall the volume is a significant contribution to the field, a monument to Ruggles and his work, and a reminder of how much the heavens have influenced virtually all cultures on Earth over millennia.

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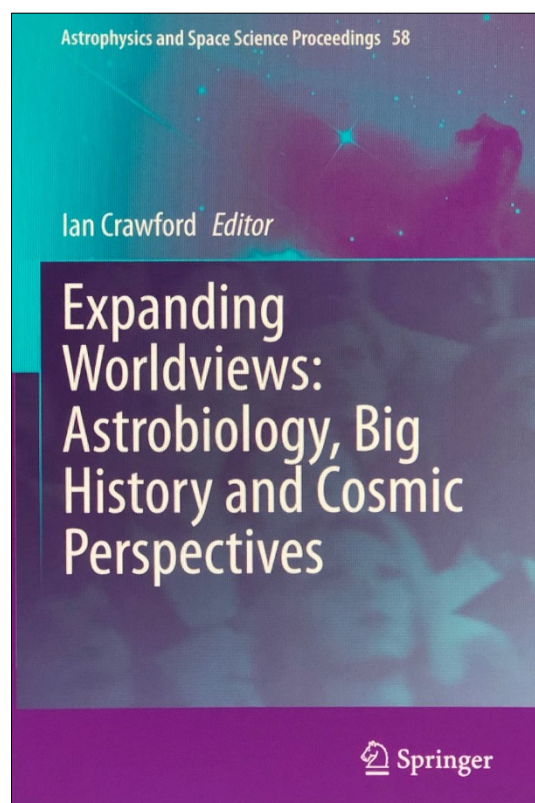
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**Expanding Worldviews: Astrobiology, Big History and Cosmic Perspectives**, edited by Ian Crawford (Cham (Switzerland), Springer, 2021). Pp. vi + 377. ISBN 978-3-030-70481-0 (hardback) 160 × 240 mm, US\$209.

We historians of astronomy tend to revel, and sometimes get lost, in details. All to the good. But on occasion we should address the big picture, the worldviews that astronomy generates more than most other sciences such as biology, chemistry, or geology. Yes, physics gives rise to worldviews in the form of non-intuitive general theories of relativity and quantum mechanics, which few in the general

public understand or internalize in their daily lives. By contrast astronomy and the starry skies above give rise to cosmological worldviews, which throughout history have provided the mental framework within which ancient and modern societies have operated, even if in background, from geocentrism to heliocentrism to the Hubble Deep Field and a biological universe full of life (Dick, 1996), not to mention numerous other cosmologies such as native American.

This volume addresses astronomy's big picture and its effect on society through the four concepts in its title: worldviews, astrobiology, Big History, and cosmic perspectives. Tellingly, not a single historian of astronomy is among the 20 authors, which include scholars in astronomy, history, law, ethics, politics, science fiction, and futurism. This perhaps



says something about the field of history of astronomy and its penchant for smaller history. The volume is the result of papers given at two conferences held at the Australian National University in 2018 and Birkbeck College London in 2019, the latter the editor's home institution. Five of the papers appeared in earlier form in a special issue of the *Journal of Big History* (Volume 3, Issue 3, 2019). Their appearance here allows these big ideas to reach a wider audience, a laudable and practical goal for this subject, even if mitigated by the barrier of price.

After a brief introduction setting the stage by Ian Crawford (the astronomer at Birkbeck

College responsible for the second of the meetings mentioned above), historian David Christian decries how knowledge has become fragmented into narrow disciplines. This is a problem already emphasized some six decades ago by C.P. Snow in the form of the ‘two cultures’ – the sciences and the humanities – and addressed more recently by E.O. Wilson’s concept of consilience (Snow, 1959; Wilson, 1998). The emerging and related fields of Big History, astrobiology, and cosmic evolution, he suggests, may hold the key to new unifying frameworks for knowledge.

Thus enters astronomy in a big way. Over the last three decades Christian himself has become the guru of Big History, which unites the sciences and humanities and places humans in the context of 13.8 billion years of cosmic evolution (Christian, 1991; 2004). The online Big History Project, funded by none other than Microsoft founder Bill Gates, provides detailed curricula that bring home to students of all ages our deep history in cosmic evolution (<https://www.bighistoryproject.com/home>). Two more chapters demonstrate how Big History and the epic of evolution can “... change the world for the better ...” by presenting a unifying story common to all mankind, arguably an entire worldview.

Five chapters (almost one-third of the book) address the Search for Extraterrestrial Intelligence (SETI), now considered an integral part of astrobiology, but they do so in new, creative, and non-technical ways that resonate with the Big History theme of the book. Astronomer Michael Garrett, for example, analyzes the resonances between SETI and Big History, offering constructive criticism about the scope and methodologies of each. Another chapter looks at the relationship between existential risk and the Fermi paradox, arguing that if intelligence is rare, we have even more incentive to take care of our planet and prepare ourselves to be stewards (not masters) of the Universe. This is echoed in a following chapter, where science fiction writer Stephen Baxter lays out the philosophical consequences if we are alone, or not. The following two chapters deal with interstellar messaging (METI), with all its problems about what should be said, who speaks for Earth, and an analysis of what the messages sent so far say about human history and behavior. The message of these SETI/METI chapters is that Big History and human destiny are much different if we live in a Universe full of life, where cosmic evolution has ended not only in humanity but also in many other histories on other exoplanets. Once we have an answer to that burning question of astrobiology, our cosmic perspective is sure to be very different.

The remaining chapters address subjects as diverse as the spatial and biological ‘overview effect’ (seeing the Earth from space or seeing our place in the tree of life), the significance of the Apollo lunar landings, the limits of human ethics in the context of astrobiology, and the formation of a ‘planetary polity.’ These, too, are framed in the context of Big History. Nor are these only academic ruminations. One of the themes of the book is that Big History can have real effects, intellectual, political, educational, and otherwise.

The idea of cosmic perspective has been present throughout the history of astronomy, and has recently become ever more prevalent (Dick, 2020). To some extent astronomers of necessity internalize it as part of their working lives. Already in the 1950s and 1960s Harvard astronomer Harlow Shapley not only held, but evangelized, such a perspective (Palmeri, 2009; Shapley, 1958). It made new strides in the 1970s with Carl Sagan’s book *The Cosmic Connection* and his *Cosmos* TV series, viewed by billions, where the ‘cosmic calendar’ compressed into a single year begins with the Big Bang on 1 January and primitive humans appear during the last hours of 31 December. The cosmic perspective gained more solid ground with the rise of our knowledge of cosmic evolution. That idea too has a deep background (Dick, 2009; Zakariya, 2017), and in modern times has been championed by SETI/astrobiology practitioners, adopted as a research program and guiding principle by NASA and other space agencies, and become grounded in sophisticated science (Chaisson, 2001). It has even reached into the domain of theology. The British biochemist and Anglican priest Sir Arthur Peacocke has called cosmic evolution “Genesis for the third millennium”, arguing that “... any theology – any attempt to relate God to all-that-is – will be moribund and doomed if it does not incorporate this perspective into its very bloodstream.” (Peacocke, 2000: 92). The cosmic perspective and cosmic evolution are the twin guiding principles of this volume.

Astrobiology, Big History, and the cosmic perspective give rise to the ‘expanding worldviews’ of the title. Although worldviews for individuals come in forms large and small, if one considers a concentric shell of worldview hierarchies, then philosophical, religious, cultural and political worldviews would all be present, but the most general worldview surrounding them all are cosmological worldviews. How we gain, lose, and change worldviews has been the subject of considerable research, even in a cosmic context, most recently in Clement Vidal’s (2014) provocative volume *The Beginning and the End: The*

*Meaning of Life in a Cosmological Perspective*. NASA scientist and philosopher Mark Lupisella's article in this volume asks "Is the Universe Enough?," in the sense of people finding meaning and value in their lives from the Universe as opposed to more traditional and mostly supernatural religious worldviews. He concludes that

... the universe, in the form of cosmological worldviews that focus on scientific cosmic evolution, probably isn't enough for most people most of the time, but could be enough for some people some of the time. However, the universe may increasingly suffice as we evolve and as more advanced intelligence evolves. (page 234)

Lupisella has greatly expanded these ideas in his new and thought-provoking book *Cosmological Theories of Value* (Lupisella, 2021).

One critique of this volume is that the vast majority of its authors are grounded in the Western world. This is only partially mitigated by the chapter of Mukesh Bhatt (himself also at Birkbeck College in London) on "Transcultural Perspectives on Astrobiology and Big History". This chapter, rather difficult reading for this Westerner at least, mainly addresses the subject as it manifests in India and China. Much more attention must be paid to non-Western worldviews if Big History is to realize its goal of being all-inclusive and providing a global narrative and worldview.

Meanwhile the very idea of Big History itself also has its critics. It has been accused of being superficial, perhaps inevitably with a 13.8 billion-year scope. Even in this volume, Michael Garrett points out that

... the use of thresholds of complexity is rather artificial, and leads to some crucial aspects of cosmic evolution being rather neglected ... (page 56).

Thus, one of the phases of the canonical Big History jumps from the formation of new chemical elements to the formation of the Earth and Solar System, a gap of over 8 billion years of cosmic evolution. As Garrett points out, this fails to recognize all the countless other solar systems (and possible intelligent life) that we now know developed much earlier in cosmic history, resulting in a picture that is too Earth-centric. While Big History adherents have done much to provide a framework, Garrett argues, they have not made unique contributions, a task that must be performed by scientists. These criticisms are well taken, but in my view do not mitigate the benefits of placing human history in a cosmic context. And over time some of these problems can be remedied by refined thresholds in future form-

ulations of Big History.

Many of the papers in this volume fall under what I have called "... the philosophy of astronomy and cosmology ..." (Dick, 2020b: 631), a subject that has been addressed on occasion at several of the biennial History of Astronomy workshops at Notre Dame University. That field deals with subjects such as the role of theory and observation, the problematic nature of evidence and inference, the role of metaphysical preconceptions, the epistemological status of astronomy and its central concepts, and the mutual interactions of astronomy and cosmology with society over time. This volume fits into the latter category, and the discipline of the history of astronomy with its long backward glance clearly should be an integral part this endeavor. Although there has been a long debate on the merits of the relationships among history, philosophy, and sociology of science, in my view there is no doubt they are mutually beneficial.

In the end, then, this volume inspires at least three challenges for historians of astronomy: to tackle some of the bigger questions that astronomy and cosmology raise, or at least to put the 'small history' of their researches into broader context; to address the impact of astronomy on society over history; and to take up the synergistic challenges of the history and philosophy of astronomy as many historians of science have done in connection with philosophy of science. A new coherent discipline of philosophy of astronomy, akin to the already well-developed fields of philosophy of biology, chemistry and other sciences, each already with their own books on the subject, could join the history of astronomy to raise scholarship in both to a new level.

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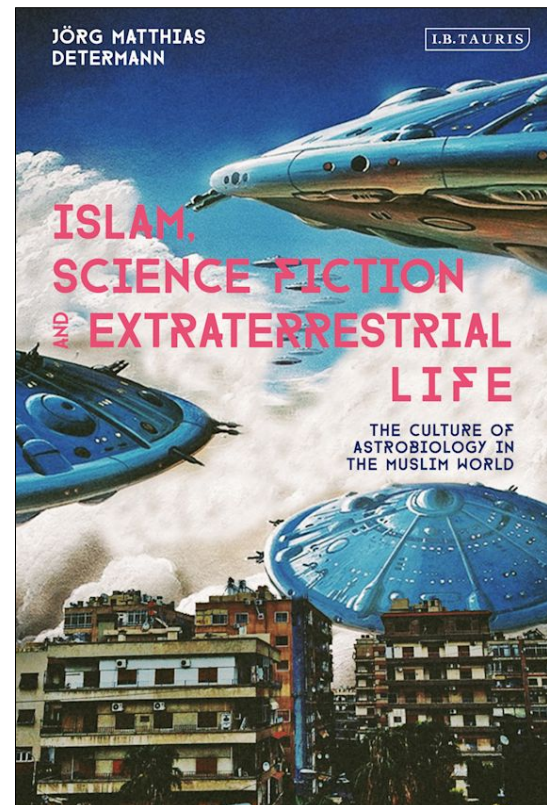
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***Islam, Science Fiction, and Extraterrestrial Life: The Culture of Astrobiology in the Muslim World*, by Jörg Matthias Determann. (London, I.B. Taurus, 2021). Pp. 269, ISBN 980-0-7556-0127-1 (hardback), 234 × 156 mm, US\$115.**

One of the big questions in the now well-documented plurality of worlds tradition (Dick, 1982; 1996; Crowe, 1986; Guthke, 1990) has been to what extent this important theme extends to non-Western cultures. In this book Jörg Determann, Associate Professor of History at Virginia Commonwealth University-Qatar, has given us an answer of sorts. Located in Qatar, and having had the advantage of Research Assistants fluent in a variety of languages, Determann covers texts, films, and other media on the subject of other worlds and other-worldly life in predominantly Muslim countries utilizing the Arabic, Malay, Persian, Turkish and Urdu languages. Needless to

say, the ability to analyze this literature provides new insights not previously widely known in the Western world. In this respect it serves a similar purpose to Determann's previous well-reviewed book *Space Science and the Arab World: Astronauts, Observatories and Nationalism in the Middle East* (I.B. Taurus, 2018).

While the Western tradition of plurality of worlds begins substantially with the ancient Greek atomists and Aristotle, moves on to medieval commentaries on Aristotle's *De Caelo*, and from there to the Copernican, Cartesian, and Newtonian traditions, eventually morphing into the astrobiology of the modern world, Determann's book begins with



a chapter on the 'Lord of the Worlds'. The first verse of the first sura of the Qur'an translates as "praise to God, lord of the worlds," and it is from this scriptural rather than scientific text that the Muslim tradition on the plurality of worlds seems to have begun. Determann finds that "... even strictly literal readings of the scripture seem to support the idea of the plurality of worlds ..." (page 10), where the meaning of "worlds" has evolved with time. Nor is it an obscure passage; the phrase "lord of the worlds" (rabb al-alamin) occurs 42 times in the Qur'an, and "worlds" by itself appears 73 times. Moreover, this first verse is part of the five obligatory daily prayers for Muslims. As Muzaffar Iqbal (2018), General Editor of the seven-volume *Integrated Encyclopedia of the Qur'an* has pointed out, this