"III Congreso Latinoamericano de Astrobiología (2021)"
Revista Mexicana de Astronomía y Astrofísica Serie de Conferencias (RMxAC), **55**, 26–28 (2023)

https://doi.org/10.22201/ia.14052059p.2023.55.05

ASTROBIOLOGY: A TRANSDISCIPLINARY VISION ABOUT THE LIFE IN THE UNIVERSE

G. Cordero Tercero[1], L. Montoya Lorenzana[2], and S. I. Ramírez Jiménez[3]

RESUMEN

En esta contribución describimos el contenido y propósito de un libro sobre Astrobiología escrito por investigadoras e investigadores de habla hispana. Este es el primer libro de texto escrito en español cuyo objetivo es fungir como un libro de consulta, estudio y reflexión para estudiantes de bachillerato, licenciatura y posgrado interesados en la Astrobiología.

ABSTRACT

We describe the content and purpose of a book about Astrobiology written by Spanish-speaking researchers. This is the first textbook written in Spanish whose objective is to be useful for studing, enquyring and thinking about Astrobiology. This is addressed to high school, undergraduate and graduate students.

Key Words: astrobiology

Traditionally, Astrobiology has been defined as the discipline that studies the origin, evolution, distribution, and destiny of life in the Universe. This definition is simple, but the issue is not. Astrobiology is a complex scientific discipline whose main objectives can only be carried out involving other sciences like Chemistry, Physics, Biology, Astronomy, Engineering, Medicine, even Philosophy and History.

On November 2000, the Mexican Astrobiology Society (SOMA by Sociedad Mexicana de Astrobiología) was officially established. Students and researchers from several Mexican academic institutions were affiliated and began to interact with each other as they participated in the different activities organized by SOMA. At the beginning they felt that they possessed only a little piece of information related to the study of the Universe, but soon they realized that their research topics and academic interests were interconnected in one way or another, and that all that knowledge was related to the study of life.

The idea of a book, written in Spanish, about the main topics associated to Astrobiology came up when Rafael Navarro-González served as the President of SOMA. One of the reasons was that at some Mexican Universities astrobiology courses or astrobiological topics had been taught and almost all the specialized information existed only written in English. For high school and undergraduate students this was a serious barrier, even for some of the graduated students who were looking to develop a thesis project, this represented a huge challenge. Besides, there were (and still are!) very few books written [Amaris Alvarez et al. 2015, Gimenez Cañete 2015, González Fairén 2005, Luque et al. 2009, Tancredi and Lemarchand, 2010), or translated (Mix 2010, Dartnell 2013) to Spanish. Most of the time they are oriented to specific audiences, either with an astronomy or physics scope or with a strong biology point of view. In some other cases the academic level is the difficulty as they are presented as an outreach reference material or as a book not adequate for a nonspecialized user. So, the motivations were there. We wanted a book that could be read for Spanish-speaking audiences, written with the proper astrobiological vocabulary and formalisms, devoted to university audiences, and that could be used as a textbook.

Currently, several courses related to Astrobiology are dictated at different Schools of Mexican Universities. For example, at Universidad Nacional Autónoma de México (UNAM) Astrobiology is taught to undergraduate and graduate students, Planetary Chemistry, Planetary Atmospheres and Geology, as well as two research workshops (Astrobiological aspects of Mars, and Stability of relevant organic compounds for Astrobiology), and a selected topic about Space Sciences (Looking for life on Mars) are also taught. At Universidad Autónoma del Estado de Morelos (UAEM) located at the southeast of Mexico, and at Universidad Autónoma de Baja California (UABC) in the northwest of our national ter-

[1]Instituto de Geofísica, UNAM (gcordero@igeofisica.unam.mx).
[2]Facultad de Ciencias Biológicas, UAEM (lilia.montoya@uaem.mx).
[3]Centro de Investigaciones Químicas, UAEM (ramirez_sandra@uaem.mx).

III Latin American Congress of Astrobiology (3CLA)(Virtual-Modality, August 3-6, 2021)
Editors: Leticia Carigi, Sandra I. Ramírez Jiménez, Miguel Chávez Dagostino, and Millarca Valenzuela - DOI: https://doi.org/10.22201/ia.14052059p.2023.55.05

TABLE 1

CONTENT OF THE BOOK ASTROBIOLOGY: A TRANSDISCIPLINARY VISION ABOUT THE LIFE IN THE UNIVERSE

Chapter	Authors
1. Astrobiology and its development in Mexico	Sandra Ignacia Ramírez Jiménez
2. The Universe	Leticia Carigi Delgado
3. Planetary Systems	Antígona Segura Peralta
4. The Earth as a habitable planet	Sandra Ignacia Ramírez Jiménez and María Guadalupe Cordero Tercero
5. The fossil record of minerals	Elizabeth Chacón Baca, Esther M. Cruz Gámez, and Augusto A. Rodríguez Díaz
6. Life on Earth	Irma Lozada Chávez
7. The origin of life on Earth	Irma Lozada Chávez and Peter F. Stadler
8. Biological evolution	Irma Lozada-Chávez, Lilia Montoya Lorenzana, María Guadalupe Cordero Tercero, Cruz Lozano Ramírez and Julio E. Valdivia Silva
9. Extremophiles and extreme environments	Lilia Montoya Lorenzana and Sandra Ignacia Ramírez Jiménez
10. Astrobiology on Mars	María Guadalupe Cordero Tercero and Julio E. Valdivia Silva
11. Astrobiology of some of the Solar System's satellites	Sandra Ignacia Ramírez Jiménez Lilia Montoya Lorenzana María Guadalupe Cordero Tercero and Elva Escobar Briones
12. Life in the Universe	Antígona Segura and Leticia Carigi Delgado
13. The astrobiological meaning of life on Earth	Irma Lozada-Chávez and Roberto Aretxaga-Burgos

ritory, Astrobiology courses are also taught. Many of the members of SOMA, including the authors of this communication, have participate in specialized courses that habilitate pre-university teachers in different science-related strategies. We have also organized five Mexican Schools of Astrobiology in 2011, 2013, 2015, 2017 and 2019.

To support the students enrolled in all the mentioned training activities, specially the youngest that are not ready to understand books written in English, to bring together the research activities made by Mexican scientist, and to introduce Astrobiology to wider audiences interested on this topic, there was clear that an astrobiology Spanish-written book was necessary. With this objective in mind, we began to coordinate the content proposals, the design initiatives, the style, and scope of our ideal book. After some years, a little more than expected at the beginning, we had the final contents of Astrobiology: a transdisciplinary vision about the life in the Universe (Montoya et al. in edition). This book is divided into 13 chapters. Each chapter was prepared by a Spanish-speaker scientist who had the opportunity to communicate his or her experiences not only at a technical level but also as they were active in the field, or at the laboratory. Most of the authors are Mexican, but some colleagues from Spain, Germany, and Peru collaborated with us.

The content of our book is shown in Table 1. The first chapter summarizes the history of Astrobiology in Mexico that is closely attached to the history of SOMA, and the activities organized by the Society to promote Astrobiology in Mexico. Chapters 2, 3 and 12 describe the characteristics of the Universe, the synthesis of the chemical elements in the stars, as well as the formation of planetary systems and the characteristics that made them habitable worlds. Chapter 4 is about the geological and atmospheric peculiarities that allow Earth to be the only known planet that shelters life. Chapters 5, 6, 7 and 8 ad-

dress to the fossil record, some aspects about the current ideas on the origin of life on Earth, and biological evolution. Chapter 9 explains the characteristics that place extremophiles as appropriate biological models to investigate the capacity of terrestrial organisms to adapt to harsh environments. The astrobiological relevance of Mars and some of the icy satellites is described in Chapters 10 and 11. Finally, Chapter 13 introduces some philosophical considerations about life on Earth. Some activities devoted to motive curiosity, a deeper reflection, or a detailed investigation into a specific or current topic are proposed to our readers at the end of each Chapter together with a substantial list of references useful for readers who want to gather for specialized information from the original sources. The book also contains a Glossary where some of the astrobiological jargon terms are explained in a simpler way in the case they are faced by nonspecialized readers.

We think this book can become into a good starting point to all those Spanish-speaking persons interested in Astrobiology and a mandatory reference to students formally enrolled into an Astrobiology course at a university level. We believe that the book contents can guide the readers into their own astrobiological adventures showing them the wealth of the Astrobiology itself and that of a transdisciplinary scientific field.

Acknowledgments

The authors are grateful to Instituto de Ciencias Nucleares, Coordinación de la Investigación Científica, and Dirección General de Apoyo al Personal Académico (DGAPA) at UNAM for their support in the final steps of the book configuration through the grant PE111720 from the PAPIME program. SIRJ acknowledges funding from the CONACyT grants 377887 and A3-S-65162. ILC acknowledges support from CONACyT grant 185993 and from the Max Planck Institute at Leipzig, Germany. The authors are thankful to the graphic designers for their artistic illustrations that the readers will soon enjoyed throughout the pages of the book.

REFERENCES

Leal Leal, M. A., Escobar Calderón, J. F., Amaris Álvarez, A. F., et al. 2015, Universidad Nacional de Colombia

Dartnell, L. 2013, Alianza Editorial, España.

Gimenez Cañete, A. 2015, CSIS, España

González Fairén, A. 2005, Sirius, España

Luque, B., Ballesteros, F., Márquez, A. et al. 2009, Akal, Madrid, España

Mix, L. J. 2010, Crítica, Barcelona, España

Montoya Lorenzana, L., Cordero Tercero, G. & Ramírez Jiménez, S. I., 2021, FCE, México

Tancredi, G. & Lemarchand, G.A. 2010, UNESCO, Montevideo, Uruguay