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Book reviews

Life in the Universe

Jeffrey Bennett, Seth Shostak and Bruce Jakosky

Benjamin Cummings (*2003*)
346 pages · Price $86.00 · ISBN 0 8053 8577 0
DOI: 10.1017/S147355040321168X

Bennett, Shostak and Jakosky's *Life in the Universe* is explicitly designed for emerging courses in astrobiology at early undergraduate level, particularly those for liberal art majors. For this, the course text works extremely well and fills a gap between the more advanced textbook (such as Jakosky's *The Search for Life on Other Planets* by Cambridge University Press) and the popular science book (such as David Darling's *Life Everywhere*). It bears some similarities to the well-known *The Search for Life in the Universe* by Donald Goldsmith and Tobias Owen but the latter is a more advanced text with a stronger emphasis on astronomy. *Life in the Universe* is well designed as a course text as one would expect from an American textbook and possesses a useful end-of-book glossary – each chapter includes background boxes, to "think about" questions, endless colour pictures, and end of chapter review and discussion questions, problems, and even web projects. Furthermore, it is supported by an accompanying website www.astronomyplace.com and a separate *Life in the Universe: Activities Manual* (ISBN 0 8053 8735 8) with class projects. The level of mathematical sophistication required for the book is very modest as befits a course suitable for liberal art majors.

The book is divided into four sections which provide a good, balanced introduction to astrobiology in its broadest context. The first section comprises a cosmological perspective to astrobiology and the nature of science (Chapters 1 and 2). The second section concentrates on life on Earth. Chapters 3 and 4 introduce the biological and geological background to terrestrial life respectively while Chapter 5 covers the origin and evolution of life on Earth. The third section covers the search for life in our solar system. Chapter 6 discusses technological aspects of the search for life in our solar system while Chapters 7 and 8 cover Mars and the Jovian moons respectively. Chapter 9 discusses the concept of habitable planets and the sun's habitable zone and its temporal variation. The final section concentrates on extrasolar astrobiology. Chapter 10 discusses extrasolar planets, the possibility of Earth-like planets and the astronomical detection of biomarkers. Chapter 11 covers the search for extraterrestrial intelligence (SETI) by radio astronomy while Chapter 12 discusses the possibility of interstellar travel (and an excursion into UFOs). Both of these chapters lead into Chapter 13 on the Fermi paradox and the problem of nil detection of extraterrestrial intelligence, and the text concludes with Chapter 14 discussing the implications of the discovery of extraterrestrial life.

The authors suggest that the text would be suitable for a popular market, but I believe that the style and structure of the book mark it as a course textbook, unlikely to appeal to the popular reader. But the value of this book is that is specifically designed as a course text to which purpose it is ideal. Although the text is suited to the US university education system, it fits less well within the UK approach to university education with its emphasis on more specialised technical courses: nonetheless, *Life in the Universe* would be useful as a secondary or supporting text in first year degree level astronomy, geology, biology and other courses with relevance to astrobiology.

Alex Ellery
Kingston University, London, UK

Life Everywhere – The Maverick Science of Astrobiology

David Darling

Basic Books, New York (*2001*)
206 pages · Price US$15.00 · ISBN 0 465 01563 8 PB
DOI: 10.1017/S1473550403221686

David Darling's book *Life Everywhere* is a broad sweep across the field of astrobiology with an unabashed positive slant on the field. It is firmly placed in the popular science title pigeon-hole but it is no vague, glossy fodder. It is extremely well written without being simplistic or shying away from complex concepts which the author covers with engaging and clear expositions. In addition, the book is about the scientific discovery process and some of the individual quests in astrobiology. Much of the beauty of this book is how it illustrates the scientific method in action. What is perhaps most surprising is that it covers a lot of material without compromise within such a short page count. Darling is obviously a gifted science writer.

The first chapter considers the nature of life in the context of a generalised biology weaving together findings from artificial life, Gaia, and more conventional molecular biology. The second chapter describes how research in origin of life studies suggests how life may have arisen on our own planet bringing in modern discoveries in palaeobiology, extremophilic microbiology and palaeobiochemistry plus a brief excursion into the pitfalls of creationism. The third chapter discusses the biological potential of comets and

asteroids with a serious discussion on panspermia theories, both ancient and modern. The fourth chapter covers the case for Mars, Europa and Titan with a critical discussion of the ALH84001 Mars meteorite. The fifth chapter discusses habitable zones around different types of stars and the discovery of extrasolar planets and their implications for astrobiology. The sixth chapter is in part a response to Peter Ward and Donald Brownlee's famous *Rare Earth* book and critiques this work thoroughly, and even suggests that some of the Rare Earth arguments have their origin in theological motivations. The seventh chapter discusses biological evolution with an emphasis on the Gould/Conway Morris debate, the oxygen catastrophe, Margulis-Sagan endosymbiosis, and a fascinating discussion on the nature of intelligence. The eighth chapter discusses the difficult problem of biomarkers and proposed planetary and astronomy missions which will we hope give us more insight into the astrobiology question. The final chapter brings everything together to suggest how extraterrestrial life may be found and the implications.

The book is supported by good supporting notes with a solid references list, further evidence of the solid scientific head Darling brings to popular science writing. I thoroughly enjoyed this book and I believe it is one of the best popular accounts of astrobiology on the market. Despite Darling's easy style, the book is packed full of up-to-date information without sacrificing detail. I would recommend this book to all scientists, astrobiologists or no, and those with an interest in science. I would certainly recommend it as background reading to any course in astrobiology-related fields as I am recommending it as background reading for my final year undergraduate engineering course in Space Systems & Applications.

Alex Ellery
Kingston University, London, UK

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