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Book reviews

Touch the Universe: a NASA Braille book of astronomy

Noreen Grice

Joseph Henry Press, USA (2003)
68 pages (spiral bound) · ISBN 030908332X
DOI: 10.1017/S1473550404211922

Never had read a book like this before, it proved to be very interesting indeed. It starts of with an introduction which tells us about the stars, planets and the sun. It also describes galaxies and the telecope. It goes from this to describing the Hubble Space Telescope onto a description of the planets in turn from Jupiter, Saturn, and Uranus. Then it goes onto the planetary nebula, the Ring Nebula, which is reaching the end of its life. Then follows a discussion about the Hourglass Nevula which is about 8000 light years away. There is a description of three more stars and then we travel through our Milky Way galaxy. We then visit another galaxy, NGC 4603. We read how the galaxies are grouped in clusters. Then we come to a description of hoe telescopes see into space. There are then the final thoughts when we read that this book only covers some of the outstanding views. It is full of pictures.

For a visually impaired person as myself, who's a fluent Braille reader, the book is great and gives many clear explanations. The pictures are raised up so they are tactile, though I do think they should be raised up more as this would make it easier to feel them.

Although the book is very easy to understand because it is so well written and the author has obviously thought about how to describe all the galaxies, down to the very fine detail of the shapes of them, I do think that the headings could be a bit more spaced out and done in italics instead of just capitals.

The blurb on the back of the book should be more raised as it's not as clearly brailled as it could be, and there could be a picture of some kind on the front cover such as of the Earth or the Gemini constellation as this is mentioned within the book and a small description at the side of it, just to make it look a little more interesting to its readers.

Other than these things I've mentioned, it is a great book, very enjoyable to read and makes you want to read the next book, if there is one.

Vicki Manley
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Touch the Universe: a NASA Braille book of astronomy

Noreen Grice

Joseph Henry Press, USA (2003)
68 pages (spiral bound) · ISBN 030908332X
DOI: 10.1017/S1473550404221929

Despite being blind almost from birth, astronomy was one of my childhood enthusiasms: the mind-bending dimensions and distances; the insoluble questions and mysteries enthralled me. When the 'Kevin' syndrome kicked in, of course, I lost interest in it and most other things which didn't depend on angst or apathy for their pursuit. Renaissance occurred when I began to study philosophy, which touches upon such things, at university, though here I had also to contend with the possibility that there was no universe to contemplate, or that it only existed within one's conscious … well, you get the idea. Before, or after, those Kevin years though, I would have liked this book.

Touch The Universe carries a fulsome testimony from Dr Kent Cullers, the world's only blind radio astronomer: 'It has oft been said that a picture is worth a thousand words. Well, for the first time in my career, I get the picture.' As far as a tactile user is concerned, this surely claims too much: the transcendent beauty often perceived by a sighted person contemplating visual images of celestial features cannot, regrettably, be conveyed through tactile illustrations. Nevertheless, *Touch The Universe* is a fine achievement by Grice, the result of a thorough and committed approach to her concept. She can largely justify her dedication of the book to 'science enthusiasts of all visual abilities.'

Touch The Universe uses some of the results yielded by the Hubble Space Telescope, which has been extending astronomical horizons since 1990, as pegs on which to hang an elementary introduction to the known universe. The book begins with a potted history of astronomy, focusing on the fact that although scientists believe our universe has been around for several billion years, our understanding of it has only made significant advances during the last four hundred, thanks to the invention and evolution of the telescope. The HST represents the current state of telescopic art. Being continuously in orbit above the earth, its observations, free from our planet's clouds and atmosphere, are as good as it gets.

The bulk of *Touch The Universe* is tightly structured around fourteen sections, beginning with two about the Hubble telescope itself: the first describes its physical structure; the second the kind of work Nasa keeps it busy with up there.

Grice then takes us through the solar system, with respective sections on Jupiter, Saturn and Uranus. Sections six to eleven lead us on a hop around some constellations, to illustrate a handful of stars and nebulae. With section twelve, we stop being so provincial and move beyond the Milky Way to look at other galaxies.

Each section is, effectively, a three-page package: some general information about the object concerned is followed by notes about the colours and textures used in the illustration which represents it on the third page. These notes

are always held over for the left hand page so that, very conveniently, one can have them open simultaneously with the illustration. The text is shown in Braille, overlayed by large print and refreshingly, the formats are exact duplicates.

Unusually for a book of this kind, there are no pages given over specifically to texture or Braille keys. In a couple of cases, a texture symbol and its reference are given beneath an illustration, but all other features are described with sufficient detail and accuracy in the notes specific to each.

The universe being, as it goes, a large place, it takes an agile mind to edit it down to a dozen illustrations with a side or two of description a piece. Grice has all the requisite knacks though: the text is concise and lucid, and some of the illustrations, particularly those showing star and galaxy clusters, are classics of their kind: here, the fundamental problem of translating the three-dimensional photographic perspective into two-dimensional tactile illustration is tackled with ingenuity and imagination. In an illustration of the romantically named Globular Cluster NGC 6093, for instance, where, given the scale involved, the stars are necessarily shown as minute, Grice has still managed to build in a sense of relative distance, using subtly distinct degrees of faintness and clarity for individual stars. in the illustration of Galaxy Cluster Abell 2218, where the same constraints of size and scale apply, numerous tiny examples of four specific shapes are used to distinguish different types of planet with equally effective subtlety.

This book has two significant weaknesses as far as those who are dependent on its tactile illustrations are concerned. Some of the earlier examples – notably that of Jupiter – are very congested. There is some very clever use of shape to distinguish various features, but little use is made of clear texture contrast. The result is that one needs experienced and very sensitive finger-tips to get to grips with them. The other problem, to which I alluded earlier, is, frankly, an unbridgable gap: Many sighted people, however ephemeral their interest in astronomy, will be awestruck by a photograph of a planet, a constellation, or a meteor shower. Do the illustrations in *Touch The Universe* blow my mind? No, and that can't be done: ultimately, any one of these illustrations is a customised sheet of paper, and that is not analogous to arguing that a photograph is merely a collection of chemicals which have been exposed to light and subjected to various processes. That illustration of Globular Cluster NGC 6093 derives its meaning for me from the accompanying information, and the wow factor comes from knowing that it is one of innumerable such clusters grouped around the centre of the Milky Way, each of which contains hundreds of thousands of stars, and that it hangs out 28,000 light years from Earth.

Reservations notwithstanding, however, Grice has accomplished something which, unless you are worryingly short on the capacity to stand back in amazement, will enrich your life.

Malcolm Ferries
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If the Universe is Teeming with Aliens – Where is Everybody: Fifty Solutions to the Fermi Paradox and the Problem of Extraterrestrial Life

Stephen Webb

Praxis-Copernicus Publishers, Chichester, Sussex, UK (2002)
288 pages · ISBN 0-387-95501-1
DOI: 10.1017/S1473550404231925

Already the winner of a prize awarded by the SETI (Search for Extraterrestrial Intelligence) League, *Where Is Everybody?* is an excellent discussion of the intricacies of the famous Fermi paradox. See the publishers's website: http://www.praxis-publishing.co.uk/space/whereis.htm. Stephen Webb is a physicist at the Open University in the UK and he proposes 50 solutions to this paradox spanning a wide spectrum of analyses. These 50 solutions are divided into three major categories: they are here (solutions 1–8), they exist but have not yet communicated (solutions 9–30), and they do not exist (solutions 30–50).

The book begins with a brief excursion into the notion of paradox, and in particular, stresses how Olber's paradox might have been interpreted to predict that the universe is expanding. Likewise, the Fermi paradox might be interpreted to predict that extraterrestrial intelligence do not exist. The book is then divided into three generic sections of solutions to the Fermi paradox. The 'They Are Here' solutions are mostly variations on the Zoo hypothesis (which Webb correctly points out is not an hypothesis rather than a scenario as it is not disprovable) which have essentially been demolished by Hart. The 'They Exist But Have Not Yet Communicated' section was, for me, the most interesting section as it explicitly described the essence of the Fermi paradox in that it is premised on the central role of technology. This section also describes the difficulties and assumptions of the SETI radio search quest. Rather unusually, this book looked into Geoffrey Landis' percolation theory of Galactic colonisation in greater detail than the more established and Newman-Sagan models. This is perhaps because those earlier models are older and have been published in a number of books, and the percolation model is less well known making it a laudible selection. As pointed out by Webb, all these models of Galactic colonisation have their holes (no pun intended …). My own interests lie particularly with the solution 12 and 22 which describe the concept of self-replicating robots. Frank Tipler presented this idea in the early 1980s which spawned a series of retorts and counter-retorts between Tipler and the late Carl Sagan in the *Quarterly Journal of the Royal Astronomical Society*. Like Frank Tipler, I thought this should have gone into the final section 'They Do Not Exist', but Webb offers alternative interpretations of such a concept. The final section is probably the most astrobiologically-oriented section and includes the solutions proposed in Brownlee & Ward's controversial *Rare Earth* book, among others. For Webb's own solution – that they do not exist – he uses a sieve procedure that bears strong resemblence to the Drake equation, but with more detailed factors examined earlier in the book.

I liked this book very much. Webb writes well and describes each proposed solution simply and fully without the use of mathematics, but includes more detailed notes and a good reference list in the back of the book. Webb puts the whole of the SETI quest into perspective by assessing the wider picture. This is the only book to my knowledge which focusses on the Fermi paradox as the vehicle for exploring the idea of extraterrestrial intelligence. It is this focus which gives it its wide sweep. Furthermore, the book weaves in a wide range of ideas and issues from different branches of science.

I agree fully with the SETI League that this is an excellent book which contributes significantly to SETI lore.

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Children of the Stars: our origin, evolution and destiny

Daniel Altschuler

Cambridge University Press, Cambridge, UK (2002)
257 pages · ISBN 0-521-81212-7
DOI: 10.1017/S1473550404241921

This popular science book is difficult to classify. The most attractive thing about it is the large number of colour photographs and artists' impressions from the cosmos and the imagination. As stated by the author, director of the Arecibo Observatory, the story he purports to describe is the story of our place in the cosmos. However, I was struck by the lack of a coherent story. The book begins with an astronomical context to the core of the book (chapters 4 and 5) which focusses on the history of life on Earth. These two chapters are good and supported by good explanatory diagrams and pictures. Subsequent chapters then take the reader off in a number of different directions with little in the way of linking them together coherently.

Chapter 1 provides a short history of astronomy and how our view of our place in the cosmos has changed. This is followed by consideration of the sun and how it provides the energy to support life on our planet. Chapter 2 takes us further afield to examine how supernovae seed the elements of life into the interstellar medium. Chapter 3 describe how interstellar clouds, laced with organic material, collapse to form planetary systems, and how our own solar system in particular has its current structure. Chapter 4 describes the Earth and its physical properties in detail, with some historical background, and how biogeochemical cycles sustain life on Earth. Chapter 5 describes, in a nutshell, the history of life on Earth, and its biochemical basis. Chapter 6 discusses comets and asteroids and their role as impactors on Earth. Chapter 7 discusses the possibility of biological habitats on other planets of our solar system, and even extrasolar planets. Chapter 8 discusses the effects of human activities on the Earth's climate. Chapter 9 of only a few pages concludes by admonishing us for our destructive activities.

The last two chapters were disappointing in terms of the overall direction of the book. This was not where I had expected to end up – back on Earth, today. Despite my agreement with the author's worries about our treatment of our planet, I was hoping to be taken on a journey towards our destiny (as in the sub-title). This destiny I presumed to have astronomical relevance given the starting point from an astronomical perspective. There were, in addition, a few niggling little platitudes dotted around here and there, but the writing style was competent, if a little sermonising. There was a Further Reading section but no further references. I was a little disappointed by the book personally but it might provide a useful introductory background reading book for a science foundation course given its coverage.

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Life in the Solar System and Beyond

Barrie Jones

Springer-Praxis Publishers, Chichester, UK (2004)
317 pages · ISBN 1852331011
DOI: 10.1017/S1473550404251928

This book, written by a professor at the Open University, provides a comprehensive overview of astrobiology. It is a course textbook, suited for a first year undergraduate course (with a modest mathematical capability), in astrobiology and is supported by end of chapter questions (with end of book answers).

Chapter 1 introduces the solar system and its planets and their formation. It progresses into a short overview beyond the solar system to the stars, the galaxies and beyond. This chapter provides the context for the rest of the chapters. Chapter 2 briefly discusses the Earth and then introduces cellular biochemistry with an emphasis on energy metabolism, protein synthesis, extremophiles and the evolutionary tree of life. Chapter 3 builds on the previous chapter by considering the origin of life, earliest terrestrial life, atmospheric oxygen accumulation, cambrian explosion with an emphasis on the early history of life. Chapter 4 considers the notion of the habitable zone, and other potential habitats such as sub-surfaces and Titan. Chapter 5 concentrates on Mars with a good overview of the planet including the possibility of water and the search for life. Chapter 6 focusses on Europa and the potential for a sub-surface ocean to support life. Chapter 7 is unique in that it considers the future evolution of the sun in the context of survival. Chapter 8 moves to the stars, introducing the basics of stellar astrophysics and considers what stars might be suitable for supporting life. Chapter 9 focusses on technology, introducing direct methods of extrasolar planet detection through telescopy and interferometry. Chapter 10 discusses indirect methods for extrasolar planet detection through astrometry and spectroscopy. Chapter 11 describes the theory of extrasolar planets and their incidence. Chapter 12 considers spectroscopic techniques to detect evidence of life on extrasolar planets. Chapter 13 considers the SETI (search for extraterrestrial intelligence) programme and how interstellar flight might enhance this quest. The book is supported by a glossary, a bibliography of similar textbooks on similar and related areas, and a list of useful websites.

The textbook has a strong emphasis on astronomy (particularly with regard to technologies, emphasising the '… and Beyond' part of the title), reflecting the background of the author, making this suitable as a course text in this subject with an emphasis on astrobiology. Conversely, the book is well designed for a course in astrobiology with an emphasis on astronomy. Furthermore, the inclusion of a modicum of mathematics makes it highly appropriate for courses in UK first year undergraduate programmes.

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Rare Earth – why complex life is uncommon in the universe

Peter Ward and Donald Brownlee

Copernicus Publishers, New York, USA (2000)
335 pages · ISBN 0-387-95289-6
DOI: 10.1017/S1473550404261924

Most readers of this journal are almost bound to be familiar with *Rare Earth* as a ground-breaking book. It has virtually defined the astrobiology quest for the 21st century. However, the authors are at pains to stress that they are representing a widely held view amongst members of the astrobiologically-interested scientific community. It is important to re-iterate, as the authors have done, that their view is fully consistent with the widespread incidence of life in the cosmos, but that this life is likely to be in primitive form, ie. prokaryotic cell-based bacteria (or similar). Regrettably, the media (who pounced on this book with relish on its publication) have not always recognised this, preferring to interpret *Rare Earth* as much more sweeping in its denial than it is. Given the current emphasis of astrobiology on extremophiles, *Rare Earth* is thus astrobiology-supportive. The two authors, one a palaeontologist, the other an astronomer, have teamed up to provide a withering onslaught on the SETI (search for extraterrestrial intelligence) venture. They suggest, upfront, that multicellular life (and by direct implication, intelligent life) is likely to be rare in our Galaxy and the universe as a whole. The majority of the book carefully builds up the case to support their view. Again, the individual arguments for why multicellular and intelligent life might be rare are not original and well known. There was nothing revolutionary *per se* about this idea of the rarity of multicellular life as it has been voiced many times before for a host of reasons, but what is unique are the threads of evidence carefully woved together into the tapestry that is their conjecture. Yes, it is a conjecture, but the case they build is a strong one. The *Rare Earth* hypothesis is based on scientific evidence from our own solar system, and the authors have used the Copernican principle, so beloved by many SETI advocates, in applying this evidence to other potential habitats around other stars (most subsequent attempts at refutation have suggested that *Rare Earth* applies the Copernican principle too rigidly).

An introductory preface briefly presents the *Rare Earth* hypothesis in the context of what they refer to as the astrobiology revolution. Subsequently, each chapter is devoted to specific lines of evidence to support the thesis. Chapter 1 discusses terrestrial (and possibly extraterrestrial) extremophiles while Chapter 2 discusses the notion of habitable zones around stars, galaxies and the universe. Chapter 3 describes the creation of the elements and the formation of our Earth. Chapter 4 describes the origin of life, including panspermia, and extremophiles. Up to this point there is little controversial, but Chapter 5 describes the evolution of eukaryotes and the evolution of multicellular animals. Chapter 6 discusses the Snowball Earth hypothesis and its implications for the subject of Chapter 7, the Cambrian explosion of multicellular lifeforms on Earth. Chapter 8 introduces the implications of mass extinctions by bolide impacts and other causative agents. Chapters 9 and 10 describes how the Earth is unique in our solar system in possessing plate tectonics and a large Moon, and that these factors were essential for the maintenance of a stable habitat. Jupiter is also implicated as essential in ensuring that mass extinctions due to bolide impacts did not obliterate life on Earth altogether. Chapter 11 suggests that a number of upcoming missions will provide tests for the *Rare Earth* hypothesis while Chapter 12 attempts to quantify the hypothesis using a variant on the Drake equation. Chapter 13, the closing chapter, discusses our place in the universe in the context of *Rare Earth*. The book is supported by an excellent and thorough bibliography.

This is an important book, and well written and presented. It is important on three counts – it might just be right (but that's a matter of opinion), it is testable and will be tested in the near future through upcoming space missions, and, right or wrong, it has stimulated the scientific community into a new flurry of activity with regard to different aspects of astrobiology. It should be on every astrobiologists' bookshelf, and recommended background reading for all astrobiology courses (with David Darling's retort *Life Everywhere*).

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