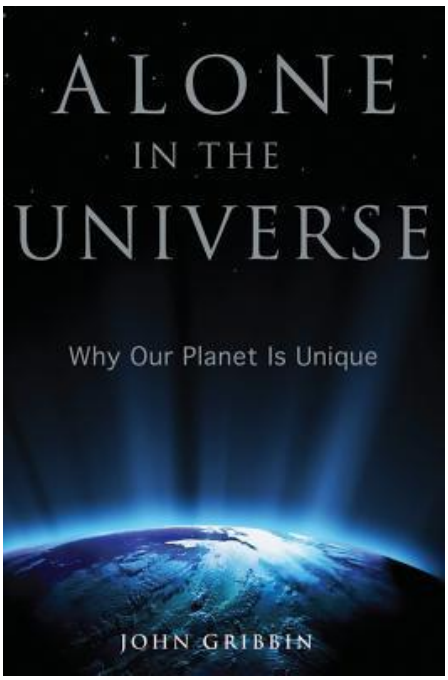

Alone in the Universe: Why Our Planet Is Unique

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The acclaimed author of *In Search of Schrödinger's Cat* searches for life on other planets

Are we alone in the universe? Surely amidst the immensity of the cosmos there must be other intelligent life out there. Don't be so sure, says John Gribbin, one of today's best popular science writers. In this fascinating and intriguing new book, Gribbin argues that the very existence of intelligent life anywhere in the cosmos is, from an astrophysicist's point of view, a miracle. So why is there life on Earth and (seemingly) nowhere else? What happened to make this planet special? Taking us back some 600 million years, Gribbin lets you experience the series of unique cosmic events that were responsible for our unique form of life within the Milky Way Galaxy.

Written by one of our foremost popular science writers, author of the bestselling *In Search of Schrödinger's Cat* Offers a bold answer to the eternal question, "Are we alone in the universe?" Explores how the impact of a "supercomet" with Venus 600 million years ago created our moon, and along with it, the perfect conditions for life on Earth

From one of our most talented science writers, this book is a daring, fascinating exploration into the dawning of the universe, cosmic collisions and their consequences, and the uniqueness of life on Earth.

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From Reader Review Alone in the Universe: Why Our Planet Is Unique for online ebook

Mark says

Until I read this book, I was of the opinion that intelligent life somewhere in the Universe was a foregone conclusion. With all the billions of galaxies and stars out there, how could intelligent life not be all over the place? The Drake Equation helped frame up the numbers for me. Certainly the Fermi Paradox (Where are they?) gave me pause, but still the unimaginable numbers of possible stellar systems meant that they were out there, even if they haven't visited us. Well, I'm not so sure anymore. This book did a good job of explaining just how unusual we are, and actually how likely it is that we are the only intelligent life in the Milky Way, if not the Universe, although the book really focuses on our galaxy. I was also interested to read that we probably have 'only' a million years left before an observed star (forget the name - Gliese something) which has been carefully monitored and shown to be on its way passes near enough to our solar system to send a barrage of asteroids, comets, etc. into the inner solar system, many of which will collide with the earth. Previously, I had thought we had until the Sun expanded and engulfed the earth as it died, billions of years from now. Bummer.

Jose Moa says

John Gribbin is a great popular science writer and in this book he has made a great job.The book is the complement to the Rare Earth by Ward and Brownlee but the Gribbin book takes a more step an asks for technological inteligent life not only complex life, and makes more emphasis in the astronomical aspects at the light of last breakthougts as our very special position in the galaxy, by why our sun is not common,by why our solar sistema and planet earth are unlikely;the more unlikely is that our planet has a big moon that stabilices the tilt of the earth axis,favoures the plate techtonics ,the magnetic field and long time ago great tides that aided the pass of complex life from ocean to land.In resumen our inteligence is the product of many unlakely steps tha makes the product near to zero.By other hand the existence of inteligence not necesarily drives to technology,for example the dolphins can be te other inteligent specie in our planet but dont have hands,fire nor metal and by that no technology
The conclusión of Gribbin is that we are alone in the entire Galaxy and perhaps in the entire observable universe

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Jim says

Intelligent life is amazingly unlikely and rare; perhaps we should take better care of the only planet where it exists.

Jared says

This book wasn't quite what I expected, its basically an overview of all the things that had to go right in order for intelligent life to arrive on earth. So it goes from galaxy to star to planet formation in a fair amount of

detail. I felt like this was the author's strong point that he has the best understanding of and it was interesting. He also spends a lot of time on the history of the earth and moon and seemingly unimportant things that had a significant effect on allowing intelligent life to evolve on earth.

The author stops talking about probabilities and odds about halfway through the book when he finishes talking about the types of stars that could possibly support intelligent life. After that the improbability of life is largely implied through talking about specific things that exist on the Earth that allowed for the development of intelligent life.

I felt that the book is an extremely good history of the earth and where it came from in an astronomical view. I felt that the author made his point that intelligent life developing on Earth only came about through extremely unlikely occurrences that would probably not be replicated on other planets.

Overall the book was more about why our planet is unique than about being alone in the universe, which is why it gets 4 instead of 5 stars. I am glad that I read it though and I probably would not have read it if it was titled about how our planet is unique.

David says

In this book, the author (a prominent British scientist) lends one more voice to the stark conclusion, which several other authors have raised lately, namely that we are alone in the Milky Way. Yes, this is in spite of the numerous recent discoveries of potentially habitable planets around other stars.

This all stems from Fermi's paradox -- in 1950, noted nuclear physicist Enrico Fermi, while having lunch with colleagues, suddenly blurted out "Where is everybody". He reasoned that if there was any other technological civilization in the Milky Way, then it was almost certainly many thousands or millions of years more advanced, and, if so, then surely some from that civilization would have explored and colonized (at least with robotic probes) all reasonably habitable locales in the Milky Way, including ours. Yet we do not see any evidence of such visits. So they must not exist.

After a rather thorough discussion of all of the ways in which our own planet is, apparently, unique, Gribbin comes to a similar conclusion:

"On a planet like the Earth, life may only get one shot at technology -- we have exhausted the easily accessible supplies of raw materials, so if we destroy ourselves the next intelligent species, if there is one, won't have the necessary raw materials to get started. There are no second chances. And that is the last piece of evidence that completes the resolution of the Fermi paradox. They are not here, because they do not exist. The reasons why we are here form a chain so improbable that the chance of any other technological civilization existing in the Milky Way Galaxy at the present time is vanishingly small. We are alone, and we had better get used to it."

Nola Redd says

Anyone who has taken a significant number of science classes will likely come to this book with the same

bias I have, having been repeatedly taught that the Earth, the solar system, and the Milky Way are in no wise special. But Gribbin argues a perspective different from most scientists - that in the galaxy, at least, intelligent life is a rare occurrence, and that the Earth is likely exceedingly special, if not completely unique.

Gribban's arguments are often hampered by the fact that they are frozen in a book. Anyone who has followed the updates of NASA's Kepler mission will raise their eyes at the fact that, at publication, only Jupiter-like planets had been discovered. Similarly, Gribbin knocks out red dwarfs as potentially hosting habitable planets, though research in the last few years suggests life could thrive. Such problems are, of course, not the fault of the author, who can only work with the data available and not what will one day be known.

Leaving that slight problem behind, Gribbin does an excellent job of walking the non-scientist through conditions that make the sun, the solar system, and the Earth unique. He lays out his arguments for the conditions necessary for life to evolve, and why it would take a fortuitous string of actions to allow it. If you want to know a bit more about the galaxy, he provides clear descriptions of what makes it tick.

But. While his arguments are logical and well laid out most of the time, they also feature flagrant omissions that frustrated me. Here are just a few:

*Gribbin argues that the extrasolar planets observed at the time were 'hot Jupiters' - large gas giants that stay close to the sun. He does note in passing that observational techniques are skewed toward finding such planets - when studying planets that gravitationally tug at their parent star, large, close bodies will be easiest to spot. Despite this, he uses the dominance of these discoveries to argue that small rocky planets are rare. Of course they were rarely seen; the observations were (admittedly) biased toward large planets due to technological limitations!

On a side note, NASA's Kepler has shown, instead, that rocky planets abound throughout the galaxy.

*Gribbin also argues that a moon that is proportionately as large as its planet as Earth's is rare. However, he is basing it off the observation of four rocky planets, which is a 25% probability. He is careful to note that no FULL SIZED planet has such a moon; this is because the dwarf planet, Pluto, has a similarly large moon that likely formed the same way.

These are only two examples, but several abound.

Similarly, the author never uses footnotes and rarely cites his claims. There were a few points he brought up that I was unfamiliar with and so googled. He does occasionally mention sources by name but not frequently. And in at least one case - the idea that the mass extinctions in the Younger Dryas period was caused by an impact - he neglects to note that many scientists oppose this idea, and that the group that has proposed it has no simulations to back up their theory. (In fact, recently a group of scientists from a number of fields published a paper in a respected journal refuting the claim, including an impact specialist who demonstrated that the physics proposed were not possible...and he used simulations.) Similarly, I found very little published work linking extinctions with the passage through the galaxy's spiral arms.

Often, in fact, the author relies on the argument that 'we don't know how a could have caused b, but it makes sense' to state his case, a lousy case for a scientist to make. Then he strings these conceptual possibilities together to assert that humans are it for intelligent life in the Milky Way.

Another trick he frequently employs is the use of the phrases 'like us' or 'as we know it.' The conditions he describes may well mean that there are no other humanoid-like aliens on rocky planets virtually identical to

earth - but that doesn't mean another, different form of life could not have come into play on another, dissimilar planet. even now, scientists think life could have evolved on Jupiter's moon, Europa, which orbits outside the defined habitable zone but contains a sheet of ice insulating water, or Saturn's moon, Titan, where liquid ammonia prevails instead of water.

As a side note, having interviewed a number of astrophysicists, astronomers, and planetary scientists, I've noticed that, when asked about the possibilities of life or habitability, they tend to respond with 'that's not my field' and point me toward astrobiologists.

There were a number of points that the author raised that I would like to explore more, but I take most of his arguments with an enormous grain of salt. Still, in most cases, he managed to explain very technical arrangements quite clearly, so he gets points for that. Separating fact from speculation, however, could be a challenge for those who know little about the field.

Erik says

I think the book relied too heavily upon our own, incompletely understood, story of intelligent life on earth (a big assumption!) to argue for the absence of all other forms of intelligent life in the universe. Yes, our story requires some lucky accidents and links in a chain, but there may well be other chains and other stories. The odds of an exact replication of our story and just that story probably are infinitesimal, but that's fallacious reasoning. The odds of an exact repetition of any sufficiently complex event are infinitesimal, but that doesn't rule out the occurrence of many other events sufficiently similar to qualify under a definition of what "similar enough" means. The Fermi paradox is mentioned quite a lot but this argument by absence too presumes that "they" are like "us" as a basic premise, and so is vulnerable to objections. I'm an optimist about intelligent life in the universe, but it is likely so different we would not, in our present state of understanding, even recognize it as such, nor its goals and manifestations in other species. Read Stanislaw Lem's Fiasco for a nice reminder of this.

Elwood D Pennypacker says

Professor Killjoy over here says anyone interested in making contact with extra-terrestrial intelligent civilizations should give up now. Probably none exist at all and if they do, too far away. But that's not all - the clocking is ticking on the human race (on this he's hard to argue with) so we'll probably wipe ourselves out if an asteroid doesn't get us first so it's all really pointless.

I kept reading for the moment in which, as he posits that the development of the human race and its advancement is such a fluke chance of a series of multiple steps that didn't have to happen (written nicely in a series of episodes from the dawn of the Solar System to the climate hurdles and pushes that occurred as our ancestors started to bang the rocks together), that we should take a moment to appreciate this unique (and it's the true definition of unique) outlier in the realm of the Universe. But nah.It's an ice cold (albeit exquisitely worded) survey of how all things got to here, where they are headed, what's (not) out there, and man is it all grim. A scientific "eat it".

Hopefully, one day our half-robot descendants will figure all this out, defy the fates, and bring back a reconstituted Mr. Gribbin, and we'll have a good laugh over some RAM chips at the Rigellian Cantina.

Ushan says

In 1986, Polish science fiction writer Stanis?aw Lem reviewed a fictional book called *Das kreative Vernichtungsprinzip*. The book wonders why, after several decades of search, SETI failed to find an extraterrestrial civilization capable of sending interstellar radio signals. The answer, according to the fictional author, is that there is only one civilization capable of doing it in the Milky Way, our own, which appeared and acquired this ability due to a series of improbable destructive catastrophes. This nonfiction book, published 25 years later, says the same thing.

Earth's astronomic and geologic history is unique and unlikely. Its magnetic field protects life from energetic charged particles in the solar wind. The field is generated by currents in Earth's liquid outer core. A significant source of the heat that keeps it liquid is decay of radioactive potassium, thorium and uranium. Where did these radioactive isotopes come from? From a supernova that exploded close to the Solar System as it was forming. Without the supernova, Earth would have no significant magnetic field. If, on the other hand, the supernova had exploded a few billion years later, it would have burned out life on Earth. Early in the history of the Solar System, Earth seems to have collided with a Mars-sized planet named Theia; the iron cores of the two planets merged, and the debris of the collision formed the Moon. Without the collision, Earth's core would have been smaller, and its crust too thick for plate tectonics, and there would have been no Moon, which stabilizes Earth's rotation. Whether there would have been life on Earth in this case, no one knows, but with Earth's axis of rotation wobbling around, definitely not in the present form. In the Cryogenian geologic period, all or almost all Earth was covered with ice several times; the Cambrian Explosion, when most modern phyla of animals appeared in the fossil record, followed less than 100 million years ago. If the latter is a consequence of the former, and the former was caused by cosmic events such as the tail of a gigantic comet nucleating ice crystals in the upper atmosphere of Earth and increasing Earth's albedo, then without this comet there would have been no complex animals. And so on.

The problem with this argument is that we only have one example of a planet with life, let alone a technological civilization. A few species of extremophile bacteria can withstand massive amounts of radiation. On a planet with no magnetic field, would this be true of all life, or would there be no life other than these bacteria? No one knows. The brain size of hominids has been slowly increasing since the time of the australopitecines till the present; this period is also the time of the Quaternary ice age, the first one in 200 million years. Were the climactic changes driving the increase in brain size, so if a planet with australopitecine-like animals is not in an ice age, they won't evolve into humans? No one knows.

This book tries to convince the reader that the humanity is the only technological civilization in the Milky Way. It convinced me that no one knows whether this is so.

Jack says

I thought that the author was actually a little weak on the science. Gribbin would make certain assertions about why particular conditions or processes in evolution were likely to be uncommon, attempt to support with one or two facts, but would then use these assertions later in the book as assumptions that formed the basis of other assertions. For example, he discussed the possibility of the earth crossing certain boundaries of density in the intergalactic medium made by the arms in the spiral of the Milky Way, and attempts to link

these crossings with historical mass extinctions in the history of life on earth. However, except for making plausibility arguments for these connections, he is not able to show that readers should accept his assertions - i.e. while the connection is possible, there isn't much scientifically provided to support believing that such a connection is true. He then uses these crossing events to claim that planets nearer the galactic center would experience extinctions more frequently because their orbits are shorter, and therefore intelligent life couldn't evolve on these planets because of these crossings. Thus, assertions become assumptions, and I found this book less than scientifically satisfying.

Junhao says

An easy read, this book lays out the numerous conditions necessary for the evolution of a technological civilisation (ours), and makes the argument that because of all of them, it is likely that we are alone in the universe (duh). While the author did elaborate on the many different and logical requirements for our evolution, it is still not entirely convincing as the author made the decision not to quantify the likelihood of technological civilisations evolving after he got to 0.06% of all the stars in the galaxy. This decision does make some sense in that it's hard to put a number on all the conditions identified but this also affects the strength of the argument (after all, there are a trillion stars in the Milky Way galaxy).

Nevertheless, the book does bring up a number of conditions which I have not thought of before and helps me to understand the significance of the Drake Equation and the Fermi Paradox. Lastly, his final conclusion that Earth has only one chance of evolving technological civilisations (and that's us) did strike a chord in me. All in all, do read it if you are looking for an easy introduction to SETI.

Ron says

Another discussion of the extraordinary events in the creation of the solar system where it is in the galaxy, how it seemed to have formed, how the earth seems to have formed, and endured, despite all sorts of assaults from without (the Late Heavy Bombardment, the Chixulub impact, the Tunguska event) and within (massive volcanic activity, continental formation and drifting, Snowball Earth and subsequent Ice Ages) that all contributed to the formation of life, and eventually to intelligent, technological life. The premise of the book, its argument and its conclusion are that the circumstances that have led to us, here, now, were so extraordinary that we are very likely the only ones anywhere. I find the argument of placement in the galaxy, where there were sufficient metallic elements in the cosmic mix to create a multifarious Earth, and far enough away from young, big stars that will go supernova and wipe out everything nearby, to be new to me, and compelling.
It reiterated many of the issues in Rare Earth, but from enough of a different angle that it was always interesting. For a short, 20 page book, it took me an unusually long time to get through it.
It gives me some solace in the fact that my genes will predispose me to shuffle off this mortal coil within a decade or so, so I won't be around for the inevitable environmental breakdown once greenhouse gases hit the tipping point and boil everything up. Now to find some arguments for the other side, which will have to be damn good to shove aside those made by this book and Rate Earth.

Scott Lupo says

Super interesting book taking the view that Earth, and the technological, intelligent beings inhabiting Earth, is a totally rare event in a galaxy the size of the Milky Way. I come from the view that with billions of stars in a galaxy and billions of galaxies throughout the universe that it just comes down to pure numbers. There has to be intelligent life out there somewhere. John Gribbin does a good job of saying "Hold on!", maybe we are the only intelligent life in the universe. He consedes that life certainly exists on other planets, but intelligent life, that's a whole different ballgame. The events that occurred over billions of years in our solar system, and there are a lot of them, Gribbin believes is unique and is most likely improbable to happen again. He makes a good argument on how improbable it was that we exist today. Things had to go a certain way in terms of geologic time and circumstances. Of course, we are talking about millions of years at a time (100's of millions, billions) which means really anything could have happened. Of course, we can infer quite a bit of information from core samplings, rocks, meteorites that hit Earth, etc. While he really does make some good arguments I still think we are missing something or that this type of science is still too new to come to any concrete conclusions. However, I always like to read both sides of a discussion to get all points of view. This point of view made by Gribbin is good but I think future evidence will show that we are not alone in the universe.

John Sheahan says

Well argued, accessible, informative … But, it was an argument for the emphatic conclusion that there is no other technologically advanced species in our neck of the cosmic woods. Some of the statistical glosses irked me, for example the implication that 0.06% of the stars in our galaxy is a minuscule number. It isn't. When there are an estimated 100 billion stars (not including red dwarfs) in the galaxy, that small percentage comes to 60 million stars.
That we are 'special' in the universe I can accept, but utterly, undoubtedly unique? No.

B Kevin says

Bad news for SETI enthusiasts. Our intelligent, technological species and civilization are the result of a long chain of very low probabilities. Multiply together a string of very small numbers, (i.e. the Drake Equation) and you get a vanishingly small number. Gribbin, as usually, provides a clear, cogent review of how we came to be. Finally an antidote to the Drake/Sagen groupies who think the universe is teaming with radio astronomers. Fermi's unanswered question. "Where are they?" has been answered. They are not there.
