LIFE ON ALIEN WORLDS pdf

1: Extraterrestrial (TV program) - Wikipedia

Even on alien worlds covered by water, a new study shows that there's a chance for life to survive for a long time â€" despite previous research showing that's unlikely.

Discoveries regarding extrasolar planets were first published in raising the prospect of whether life as we know it or imagine it could be supported on other planets. It is currently believed that for this to happen a planet must orbit in a relatively narrow band around its parent star, where temperatures are suitable for water to exist as a liquid. This region is called the habitable zone. The sensitivity of current detection methods makes it difficult for scientists to search for terrestrial planets smaller than this. Senate have all but canceled the program. Whereas life on Earth has formed around a stable yellow dwarf , solar twins are not as common in the galaxy as red dwarf stars which have a mass of less than one-half that of the Sun and consequently emit less heat , or bigger, brighter blue giants. Therefore, it may be prudent to consider how life might evolve in such environments. Aurelia[edit] The first episode of the series focused on Aurelia, a hypothetical Earth-sized extrasolar planet orbiting a red dwarf star in our local area of the Milky Way. Planetary concept[edit] The scientists on the project theorized that aiming the TPF at a red dwarf star might yield the best opportunities for seeing smaller planets. Due to the slow rate at which they burn hydrogen , red dwarfs have an enormous estimated lifespan, allowing plenty of time for life to evolve on surrounding planets. Also, red dwarfs are very common in the universe. Therefore, if they support habitable planets, it substantially increases the chances of finding life in the universe. However, being much dimmer than other stars, it will be harder to detect planetary systems around them. In addition, lower gravity would limit the potential size of a system. The discovery of Gliese g raises hopes of finding more red dwarf systems, including potentially habitable ones. The cost of such an orbit would be that an Earth-sized body would become tidally locked. When this happens, the object presents the same face to its parent at all times as it orbits, just as the Moon does with the Earth more technically, one sidereal day is exactly equal to one year for the orbiting body. Traditional scientific theories proposed that such a tidally locked planet might be incapable of holding on to an atmosphere. Having such a slow rotation would weaken the magnetic effect that protects the atmosphere from being blown away by solar wind see Rare Earth hypothesis. Their estimations suggested such a planet could indeed hold on to its atmosphere, although with freakishly unusual results by Earth standards. Aurelia would be gravitationally locked. The other half would contain a giant, unending hurricane with permanent torrential rain at the point directly opposite the local star. Between these two zones, it would be suitable for life. The giant hurricane might generate enormous waves in the ocean, which would migrate outwards. They would be wind-driven and would not reach the top of an ocean to the bottom, as a tsunami does. Nonetheless, waves as big and as devastating as those humans call freak waves might be regular. Lifeforms of Aurelia[edit] In continued speculation, and assuming that there was land in this habitable zone, it would be likely to form large networks of river deltas and swampland , due to rain runoff from the nearby storm. At the far end of assumptions about Aurelia were attempting to construct lifeforms based on Earthly evolutionary models and how ecosystems might develop. The scientists involved in the project hypothesized that the vast majority, if not all, of extra-solar biology, will be carbon-based. This assumption is often referred to by critics as carbon chauvinism , as it may be possible for life to form that is not based on carbon. They decided upon a plant-like creature called a Stinger Fan. It has five hearts and limited mobility. Its hearts pump them around its body. They use their long, continually growing thumb claws to cut down a Stinger Fan and dam the river systems, creating artificial lagoons and swamps which provide safety from predators. These 2-meter tall carnivores live socially in packs and display promising signs of intelligence. Finally, there is a second semi-amphibious creature called the Hysteria â€" a cross between a plague of tadpoles and piranha. These tiny, orange creatures can collect together in a manner similar to slime molds and form one huge super-organism, moving together up banks to paralyze and consume other animals. Sabian Slugs that live by the water can fall victim to the Hysteria, but it can take something as large as a Gulphog to satisfy them. Red dwarf stars are unstable and eject frequent solar flares. Such intense ultraviolet radiation is deadly to all carbon-based life forms as it

breaks down the atomic bonds formed by organic compounds. The Gulphogs have adapted by having an ultraviolet light sensitive eye on top of their heads. Stinger Fans fold up to protect themselves. Mudpods have sensitive backs that can sense the ultraviolet rays. However, the flare stage might only be when the red dwarfs are relatively young. Blue Moon[edit] A hypothetical rendition of the Blue Moon orbiting high above the plane of its parent gas giant planet. The second episode of the program focuses on a fictional moon called Blue Moon, which orbits an enormous gas giant that is itself orbiting a binary star system. Planetary concept[edit] The Blue Moon is covered in life-giving water and an atmosphere so dense that enormous creatures hypothetically can take flight. The Blue Moon orbits a Water Cloud Jovian planet a Jupiter-like planet that is cool enough to have visible rain clouds in its atmosphere orbiting a close binary star system. A distinguishing feature of Blue Moon is that it has no polar ice caps: There is also a greenish haze over the moon from large carpets of floating moss and algae. The denser atmosphere allows more massive creatures to remain airborne than on Earth. Skywhales, gargantuan whale -like animals which evolved away from the ocean into the air, fill the ecological niche this creates. Because of the increased muscle power from excess atmospheric oxygen, these creatures can have wingspans of ten meters and remain airborne their entire lives. They feed on the previously mentioned Air Moss. They evolved from seagoing animals into flying ones in one evolutionary leap. Carbon dioxide levels are thirty times higher than on Earth making the air clammy and warm. Lifeforms of the Blue Moon[edit] Skywhales are prey to the insect -like caped Stalkers, colony-living predators that have several different tasks. Scouts find skywhales and mark them with a special scent, then return to the nest to spread the word. Workers then swarm out in huge numbers, detecting the whale and working together to bring them down from the sky and kill them. Finally, there is a queen, who stays in the nest and constantly lays eggs that become new stalkers. The Stalkers are also prey, for the Pagoda branches are draped with the lethal webs of the plant-like ghost traps. Once a Stalker is caught in a ghost trap web, the carnivore uses its tentacles to lift its catch up into its mouth, to be digested by the acid in a primitive stomach. As well as Skywhales, giant Kites also fly above the forest canopy. Helibugs have a trilaterally symmetrical body plan, with three eyes, three wings, three legs, three mouthparts and three tongues. Their hollow leaves collect rainwater since the trees are too tall to draw it from the ground. Balloon plants release their seeds by filling them with hydrogen to float in the dense atmosphere, in a way similar to kelp on Earth. At the foot of the pagoda forest there is a completely different ecosystem, governed by bioluminescent beings. A wide range of fungi , such as giant mushroom , helibugs and other creatures lurk in the shadows, waiting for any creature from the bottom to fall into their trap. The fungi species have an alert system that warns when the body of a creature falls dead, which soon ends up being digested by them. The Blue Moon is threatened by mass wildfires that can wipe out entire pagoda forests. Balloon plants grow in the gaps resulting. The floating balloons released by the plants are full of explosive hydrogen, and when a fire hits, they explode like bombs, releasing seeds flying through the air. Skywhales and Kites will gain altitude until the fire ends. The ghost traps sway from branch to branch like monkeys using their tentacles. Home video releases[edit] Channel 4 provided a DVD release of the whole documentary at a run length of minutes in January

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2: Alien Worlds: Your Guide to Extraterrestrial Life by David A. Aguilar

Humanity is on the verge of discovering alien life, (April 7) during a panel discussion that focused on the space agency's efforts to search for habitable worlds and alien life.

Search Share Earth-sized alien worlds are out there. Now, astronomers are figuring out how to detect life on them By Daniel Clery Nov. The images are just a few pixels across and nearly featureless. Yet Kane, an astronomer at the University of California, Riverside, has tracked subtle changes in the pixels over time. They are enough for him and his colleagues to conclude that the planet has oceans, continents, and clouds. That it has seasons. And that it rotates once every 24 hours. He knows his findings are correct because the planet in question is Earth. Kane took images from the Deep Space Climate Observatory satellite, which has a camera pointing constantly at Earth from a vantage partway to the sun, and intentionally degraded them from 4 million pixels to just a handful. The images are a glimpse into a future when telescopes will be able to just make out rocky, Earth-sized planets around other stars. Kane says he and his colleagues are trying to figure out "what we can expect to see when we can finally directly image an exoplanet. Does a planet harbor life? Finding conclusive evidence of life, or biosignatures, on a planet light-years away might seem impossible, given that space agencies have spent billions of dollars sending robot probes to much closer bodies that might be habitable, such as Mars and the moons of Saturn, without detecting even a whiff of life. But astronomers hope that a true Earth twin, bursting with flora and fauna, would reveal its secrets to even a distant observer. To prepare for the coming flood of exoplanet data, and help telescope designers know what to look for, researchers are now compiling lists of possible biosignatures, from spectral hints of gases that might emanate from living things to pigments that could reside in alien plants or microbes. There is unlikely to be a single smoking gun. Instead, context and multiple lines of evidence will be key to a detection of alien life. An image from the Deep Space Climate Observatory satellite left , degraded to a handful of pixels right , is a stand-in for how an Earth-like planet around another star might look through a future space telescope. But neither mission got off the drawing board. Altogether they have identified more than confirmed exoplanets, including about 30 roughly Earth-sized worlds capable of retaining liquid water. But such surveys give researchers only the most basic physical information about the planets: In order to find out what the planets are like, researchers need spectra: Subtracting the two spectra should reveal traces of the planet. Teasing a recognizable signal from the data is far from easy. Most scientists would be "surprised at how horrible the data is," says exoplanet researcher Sara Seager of the Massachusetts Institute of Technology in Cambridge. In spite of those hurdles, the Hubble and Spitzer space telescopes, plus a few others, have used these methods to detect atmospheric gases, including sodium, water, carbon monoxide and dioxide, and methane, from a handful of the easiest targets. Most are "hot Jupiters"â€”big planets in close-in orbits, their atmospheres puffed up by the heat of their star. And it will be sensitive to the infrared wavelengths where the absorption lines of molecules such as water, methane, and carbon monoxide and dioxide are most prominent. Once astronomers have such spectra, one of the main gases that they hope to find is oxygen. Not only does it have strong and distinctive absorption lines, but many believe its presence is the strongest sign that life exists on a planet. Oxygen-producing photosynthesis made Earth what it is today. It uses a prolific source of energy, sunlight, to transform two molecules thought to be common on most terrestrial planetsâ€”water and carbon dioxideâ€”into sugary fuel for multicellular life. Meadows reckons it is a safe bet that something similar has evolved elsewhere. Fifteen years ago, when exoplanets were new and researchers started thinking about how to scan them for life, "Champagne would have flowed" if oxygen had been detected, Meadows recalls. But since then, researchers have realized that things are not that simple: Lifeless planets can have atmospheres full of oxygen, and life can proliferate without ever producing the gas. That was the case on Earth, where, for 2 billion years, microbes practiced a form of photosynthesis that did not produce oxygen or many other gases. To learn what a genuine biosignature might look like, and what might be a false alarm, Meadows and her colleagues at the VPL explore computer models of exoplanet atmospheres, based on data from exoplanets as well as observations of more familiar planets, including Earth. They also do physical experiments in vacuum chambers. They recreate

the gaseous cocktails that may surround exoplanets, illuminate them with simulated starlight of various kinds, and see what can be measured. Over the past few years, VPL researchers have used such models to identify nonbiological processes that could make oxygen and produce a "false positive" signal. For example, a planet with abundant surface water might form around a star that, in its early years, surges in brightness, perhaps heating the young planet enough to boil off its oceans. Intense ultraviolet light from the star would bombard the resulting water vapor, perhaps splitting it into hydrogen and oxygen. The lighter hydrogen could escape into space, leaving an atmosphere rich in oxygen around a planet devoid of life. Discovering methane in the same place as oxygen, however, would strengthen the case for life. Although geological processes can produce methane, without any need for life, most methane on Earth comes from microbes that live in landfill sites and in the guts of ruminants. Methane and oxygen together make a redox pair: If they both existed in the same atmosphere, they would quickly combine to produce carbon dioxide and water. But if they persist at levels high enough to be detectable, something must be replenishing them. Some argue that by focusing on oxygen and methaneâ€”typical of life on Earthâ€”researchers are ignoring other possibilities. And studies of extremophiles, microbes that thrive in inhospitable environments on Earth, suggest life can spring up in unlikely places. Exobiology may be entirely unlike its counterpart on Earth, and so its gaseous byproducts might be radically different, too. But what gases to look for? Seager and her colleagues compiled a list of 14, compounds that might exist as a gas at "habitable" temperatures, between the freezing and boiling points of water; to keep the list manageable they restricted it to small molecules, with no more than six nonhydrogen atoms. About are made of the biogenic atoms carbon, nitrogen, oxygen, phosphorus, sulfur, and hydrogen, and about are actually produced by life on Earth. Transit spectroscopy When a planet transits in front of its star, some light passes through its atmo.

3: Signs of Alien Life Will Be Found by , NASA's Chief Scientist Predicts

Earth's natural history may now serve as a guide for astronomers to spot exoplanets. About million years ago, this planet had a different light signature due to the dominance of moss.

Mostâ€”if not allâ€”of these worlds are unlikely to harbor life, but what if we put it there? In an essay published last month in Astrophysics and Space Science , theoretical physicist Claudius Gros of Goethe University Frankfurt in Germany suggests we do just that. His proposed Genesis Project would send artificially intelligent probes to lifeless worlds to seed them with microbes. Over millions of years, they might evolve into multicellular organisms, and, perhaps eventually, plants and animals. This interview has been edited for brevity and clarity. Claudius Gros Courtesy of Dr. What inspired you to dream up the Genesis Project? Much of it was science fiction. When I was younger, I read I still watch things like Stargate and Avatar and it makes me wonder what kind of life exists, or could exist, on other planets. What would the starting microbes look like? There are two strategies: Or, the AI could just send down the same kind of microbes on many planets. The first would have better survivability, but the second would have more opportunities to branch off and create different speciesâ€”though many would perish in harsher climates. How would AI facilitate the process? AI is important because we will not be around to direct anything once the probes arrive at a planet. The robots will have to decide if a certain planet should receive microbes and the chance to evolve life. The AI would be aboard the Genesis probe, which would only be about the size of a smartphone. Once the probe arrives, it would fall into orbit around the planet and, after double checking the planet was lifeless, begin the seeding process. First, the AI would seed with photosynthesizing microbes. These would make oxygen accumulate in the atmosphere so that other kinds of life, like animals, could live there. When oxygen levels were high enough, which the probe would measure from orbit, eukaryotic microbesâ€”which have more specialized cell machinery and make up multicellular lifeâ€”would be sent down, too. Then, the probe would stop. That is where evolution would begin on a planet, and over millions of years, there might be many kinds of alien plants and animals. What happens if life is already there? That is very important. So AI would scout for uninhabited planets from orbit to make sure there was no life there. The probe could spot larger, more complex organisms pretty easily, but smaller organisms might also be detected with technology that already exists called spectrometry. This technique is how we saw that there might be water on Mars. What kind of organisms would you like to see evolve from these seeds? The dream would be something intelligent. There is a theory that we became an intelligent species when we began to develop language. So I think that any animal that would evolve to be what is referred to as intelligent life would have to be a social being. For example, I like to imagine a planet where gravity is more intense. Animals would be heavier then, so perhaps they would evolve with more limbs to spread out their weight more evenly. With more limbs, maybe they would be excellent climbers and live in forest communities. They could even have a type of sign language instead of a vocal language to use the extra limbs to their full potential. I would also find it fascinating if there would be a moving plant. In my mind, this looks like [a] flat green sheet of paper that crawls like a larva. But maybe it would live in the mountains and lay on a rock all day to gather energy, and crawl down to a water source when it got thirsty. How soon would this kind of project be ready to launch? Optimistically, a Genesis probe could be sent in 50 years. We could build the small probe in a decade or two once we figure out solar sailsâ€”which the Starshot mission is already doingâ€”but the real challenges would be to program the [AI], and also be able to gather more data about the exoplanets we would send the probe to. It would be a waste if we sent a probe to a planet that was completely uninhabitable, like planets in extreme temperature zones or that are not tectonically active. So why do it? Personally, I think life is beautiful. We should give it chance to flourish, even if we never see the result. It is a question of if humans really want to change part of our cosmos actively, or do we want to just observe passively? The Genesis Project gives humans a chance to leave a legacy.

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4: Extraterrestrial life - Wikipedia

Over the past two decades, thousands of exoplanetsâ€"worlds that orbit other starsâ€"have been discovered. Some of these alien places could potentially host life, spurring scientists to develop.

This hypothesis relies on the vast size and consistent physical laws of the observable universe. According to this argument, made by scientists such as Carl Sagan and Stephen Hawking , [6] as well as well-regarded thinkers such as Winston Churchill , [7] [8] it would be improbable for life not to exist somewhere other than Earth. Alternatively, life may have formed less frequently, then spreadâ€"by meteoroids , for exampleâ€"between habitable planets in a process called panspermia. Numerous discoveries in such zones since have generated numerical estimates of Earth-like planets â€"in terms of compositionâ€"of many billions. One of the study authors, Sam Levin, notes "Like humans, we predict that they are made-up of a hierarchy of entities, which all cooperate to produce an alien. At each level of the organism there will be mechanisms in place to eliminate conflict, maintain cooperation, and keep the organism functioning. We can even offer some examples of what these mechanisms will be. It has been suggested that this capacity arises with the number of potential niches a planet contains, and that the complexity of life itself is reflected in the information density of planetary environments, which in turn can be computed from its niches. Sufficient quantities of carbon and other elements, along with water, might enable the formation of living organisms on terrestrial planets with a chemical make-up and temperature range similar to that of Earth. It is also conceivable that there are forms of life whose solvent is a liquid hydrocarbon , such as methane , ethane or propane. These six elements form the basic building blocks of virtually all life on Earth, whereas most of the remaining elements are found only in trace amounts. The carbon atom has the unique ability to make four strong chemical bonds with other atoms, including other carbon atoms. These covalent bonds have a direction in space, so that carbon atoms can form the skeletons of complex 3-dimensional structures with definite architectures such as nucleic acids and proteins. Carbon forms more compounds than all other elements combined. The great versatility of the carbon atom makes it the element most likely to provide the basesâ€"even exotic onesâ€"for the chemical composition of life on other planets. Planetary habitability , Habitability of natural satellites , and Exobiology Some bodies in the Solar System have the potential for an environment in which extraterrestrial life can exist, particularly those with possible subsurface oceans. Important insights on the limits of microbial life can be gleaned from studies of microbes on modern Earth, as well as their ubiquity and ancestral characteristics. If extraterrestrial life was found on another body in the Solar System , it could have originated from Earth just as life on Earth could have been seeded from elsewhere exogenesis. The Nobel prize winner Francis Crick , along with Leslie Orgel proposed that seeds of life may have been purposely spread by an advanced extraterrestrial civilization, [46] but considering an early " RNA world " Crick noted later that life may have originated on Earth. However, between an altitude of 50 and 65 kilometers, the pressure and temperature are Earth-like, and it has been speculated that thermoacidophilic extremophile microorganisms might exist in the acidic upper layers of the Venusian atmosphere. Life on Mars Life on Mars has been long speculated. Liquid water is widely thought to have existed on Mars in the past, and now can occasionally be found as low-volume liquid brines in shallow Martian soil. Scientists have indications that heated subsurface oceans of liquid water may exist deep under the crusts of the three outer Galilean moons â€"Europa, [37] [38] [75] Ganymede , [76] [77] [78] [79] [80] and Callisto. Life on Europa Internal structure of Europa. The blue is a subsurface ocean. Such subsurface oceans could possibly harbor life. Enceladus Enceladus , a moon of Saturn, has some of the conditions for life, including geothermal activity and water vapor, as well as possible under-ice oceans heated by tidal effects. The temperature and density of the plumes indicate a warmer, watery source beneath the surface. Life on Titan Titan , the largest moon of Saturn , is the only known moon in the Solar System with a significant atmosphere. Data from the Cassiniâ€"Huygens mission refuted the hypothesis of a global hydrocarbon ocean, but later demonstrated the existence of liquid hydrocarbon lakes in the polar regionsâ€"the first stable bodies of surface liquid discovered outside Earth. Fred Hoyle and Chandra Wickramasinghe have proposed that microbial life might exist on comets and asteroids. This is in contrast with the oceans that may

be inside larger icy satellites like Ganymede, Callisto, or Titan, where layers of high-pressure phases of ice are thought to underlie the liquid water layer. Direct search Lifeforms produce a variety of biosignatures that may be detectable by telescopes. It is designed to assess the past and present habitability on Mars using a variety of scientific instruments. The rover landed on Mars at Gale Crater in August However, significant advances in the ability to find and resolve light from smaller rocky worlds near their star are necessary before such spectroscopic methods can be used to analyze extrasolar planets. To that effect, the Carl Sagan Institute was founded in and is dedicated to the atmospheric characterization of exoplanets in circumstellar habitable zones. The molecule was found around the protostellar binary IRAS , which is located light years from Earth. This finding suggests that complex organic molecules may form in stellar systems prior to the formation of planets, eventually arriving on young planets early in their formation. The length of time required for a signal to travel across the vastness of space means that any signal detected would come from the distant past.

5: Alien Worlds and Androids | U.S. Space & Rocket Center

One Life, Many Worlds (New Edition , Color Version): My Journeys Through the Heavens and Hells of Extraterrestrial Worlds. Julliena Okah out of 5 stars 4.

6: Q&A: Should we seed life on alien worlds? | Science | AAAS

Astronomers have detected more than planets beyond our solar system, and just a couple weeks ago they discovered an Earth-like planet in the solar system next door. Mostâ€”if not allâ€”of.

7: Alien Life Could Exist on Worlds Overflowing with Water, New Research Suggests

Slashdot reader sciencehabit quotes an article from Science magazine: Astronomers have detected more than planets beyond our solar system, and just a couple of weeks ago they discovered an Earth-like planet in the solar system next door.

8: What Will Extraterrestrial Life Look Like? | Science | Smithsonian

Even on alien worlds covered by water, a new study shows that there's a chance for life to survive for a long time â€” despite previous research showing that's unlikely. Past research has said.

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