Space on the Page Podcast
Life Jim, but Not as We Know It

>> Lucas Mix: What does it mean to look for alien life? Are we ready to meet something that is just a bit like us, but substantially different? Today's guests have spent many years thinking about life, but not as we know it. They're here for a conversation of the boundary of known and unknown, where science meets fiction, and the two come together to shape our imagination. Welcome to Space on the Page. My name is Lucas Mix, and I am an astrobiologist, a scientist working to understand the origin, extent, and future of life in the universe. I am currently working at the Library of Congress studying the interaction between science and science-fiction in astrobiology. This podcast brings together scientists and authors to talk about astrobiology, and the role of the imagination as we take our first steps into space. In this episode, author John Scalzi, and astrobiologist Frank Rosenzweig talk about how alien aliens might be, and what they might tell us about ourselves.

>> John Scalzi: Hi, I'm John Scalzi. I'm a science-fiction writer, and I'm probably best known for Old Man's War, which is a story about humans who meet aliens and go to war with them. I also have written a number of other science-fiction books and have worked in television, most notably recently on the Love, Death and Robots TV series for Netflix.

>> Lucas Mix: I am going to share with our audience that you have an undergraduate degree in philosophy that shows up a good bit. You have served as the President of the Science Fiction and Fantasy Writers of America and have a blog at whatever.scalzi.com.

>> John Scalzi: These are all true statements. I cannot deny a single one of them.

>> Lucas Mix: Do you have anything coming up in the near future that you would like to tell us about?

>> John Scalzi: In March, I have a book that is called the Kaiju Preservation Society, so it's almost like talking about an alien species, except on an alternate Earth, and with very, very large creatures, indeed.

>> Lucas Mix: I wanted to follow up briefly. You mentioned Love, Death and Robots. I am a huge fan of your short story When the Yogurt Took Over. It's an elegantly brief satire of human complacency and notions of human superiority. You describe genetically engineered yogurt taking over the world before launching itself into space. The story ends with these lines, life on Earth is going to the stars, it just may not be human life. What happens if the yogurt goes to the stars without us? What happens if it goes and leaves us behind forever? And now I have spent considerable time on the myths we tell about evolution and about spaceflight, so this story hit all the right buttons for me. In exactly 1,000 words, you managed with incredible humor, to question many of our basic assumptions about the relationships between humans and the cosmos. Can you say a little bit about what inspired you to write it?

>> John Scalzi: What inspired me to write it was actually a friend asking me to write a review of Atlas Shrugged by Ayn Rand, and one of the things that I noted was the hero of
that book is valorized for the things that he does, but if we were to imagine the same motivations and actions in say a cup of yogurt, we would recognize them as sociopathic and go, my goodness, that cup of yogurt is trying to kill us all. Somebody eat it before it can do that. And having done that, somebody I just started thinking about, you know, a cup of yogurt taking over the world and how it would happen, and I was like, well, now I have to write this, and in writing it, I wanted to actually hit, as you mentioned, literally all the tropes of a classic science-fiction story, which is outlandish premise, a little bit of scientific grounding to give it a plausibility, quote-unquote plausibility, a arc of a story that seems positive, but at the end leaves us a deep, philosophical and existential question about our own place in the universe, and as you say, get it all done in 1,000 words, so that, you know, you're quick in and quick out. So that's what I did. I wrote it in about 45 minutes, and now it's a episode on TV for Love, Death and Robots. My life is weird.

>> Lucas Mix: It's wonderful. Clearly a man of culture, so.

>> John Scalzi: Oh.

>> Frank Rosenzweig: Oh, oh my goodness.

>> John Scalzi: You went there.

>> Lucas Mix: I couldn’t help it.

>> John Scalzi: Yeah.

>> Lucas Mix: Frank, could you give us an introduction? Sure. So my name is Frank Rosenzweig. I'm a professor at Georgia Institute of Technology. My background is a little complicated. I've had a few lives like, in fact, most of us. I started graduate school late, largely because I pursued literary studies in my younger days. But since going to graduate school and working through academia, I've been interested in evolutionary questions, chiefly the genetic basis of adaptation, and over the last decade or so, those interests have sort of been elevated to try to understand at the genetic level, some of the major steps that have taken place during the course of evolution, leading to really changes in complexity, such as the evolution of multicellularity, but also, we're interested in the evolution of other sort of cooperative arrangements, including those leading to the existence of present day organelles, like chloroplasts and mitochondria, and towards that end, I was lucky enough to be one of the last leaders of one of the NASA Astrobiology Institutes and that particular project, which was a multi-disciplinary and multi-institutional project that was focused on trying to recapitulate some of these major transitions using experimental techniques in the lab, where we could follow those changes and establish their genetic basis. One of my formative influences was my mother, who was a lit professor, but who was obsessed with science-fiction, and one of my happiest memories, were or was sitting in my great-grandmother’s garage, where she had a steamship trunk full of fantasy and science-fiction, you know, all of these old periodicals from the ’30s and ’40s, with their -- Fantastic Universe was one of them, if I recall correctly, with these incredible illustrations, and just devouring these stories, so I’ve been a big science-fiction fan all my life.
Lucas Mix: I will share that from 2016 to 2017, you were a fellow at the Center of Theological Inquiry at Princeton looking into the societal implications of astrobiology, and something that I found fascinating, you have a bachelor's in comparative literature, which shows up at the strangest times, but really quite wonderfully. Can you say something about what it means to look for life, but not as we know it, and how your own research into the history of life on Earth informs the search for life elsewhere?

Frank Rosenzweig: I would say that we've already encountered life as we could not have imagined it 100 years ago or even 50 years ago, in the so-called extreme environments on our own planet, and so organisms that are able to serve as batteries essentially glommed on to rocks, or to live under conditions that would sterilize hospital implements, and do so just as happily, if I can even use that word as, as we just sitting in our comfortable surroundings here, and so there's -- I think there's a fair amount of consensus in the scientific community that is concerned with origins, that these, what we would consider to be hostile and extreme environments, are probably the birthplace of life as we know it. And so it's therefore not -- it's easy for me to imagine the sort of prospecting that we're going to be doing for the next 10 years, 100 years, hopefully 100,000 years, trying to recognize alien life and all the bizarre varieties that I hope that we'll discover.

Lucas Mix: Well, that's a great segue, because I wanted to ask John, what is the most alien alien you have written about? And what do you think that reveals, either about life or about the limits of your own imagination?

John Scalzi: I would say it's an interesting question, because what I do is not only about speculating about what kind of alien life could exist, right? But I'm also having to make that alien life at least slightly comprehensible to the people who are reading my books, because otherwise, some of them will fall down and not quite get what I'm doing, so as a writer of fiction, I have to often humanize the aliens in a way that actually would take them further from what I as a person would imagine an alien creature would be, because they have to have conversations with the humans, you know? Or they have to have recognizable motives, so all of my alien-building as a practical sense, is bounded by how are they going to fit into the story and how can I make them work? Left to my own devices, I can think of some genuinely alien aliens, and I feel pretty good about that in terms of my imagination. Now, I just have to write a story in which genuinely alien aliens are part of the whole -- the narrative. One of the stories that you could do, for example, and is like, for example, a story where humans have colonized for some reason, a gas giant, right? And one of the ways that we imagine that intelligence would happen in a gas giant, would you basically you would have these jellyfish-like creatures who float in a strata of the atmosphere that's basically oxygenated and able to, you know, exist within that one bound. The point of them would not be that the humans are communicating with them. Right? The point would be that the humans are coexisting with them, and then the question becomes, for example, are humans in fact coexisting with them or are humans going to do what humans going to do every time they meet up with a megafauna that they don't understand, but might be tasty, or have some resources that they could actually benefit from like oil or whatever, and basically hunt them through to extinction? And so that is one of the things that you can absolutely think about, is if we can't communicate with an alien species, how do we know it's intelligent? If we don't know if it's intelligent, do we find a way to basically monetize them
and use them for resources? And if we do find that they are intelligent, do we care because -

>> Frank Rosenzweig: [inaudible] exactly.

>> John Scalzi: Yeah. Because once again, humans are not -- do not have a great track record of meeting up with other intelligent species, which on Earth, would be other humans, and basically treating them as equals to begin with.

>> Frank Rosenzweig: But we don’t we have a good track record with whales, for example. You know?

>> John Scalzi: Yes. Yes, that’s exactly right. We don’t have a good track record with whales. We don’t have a good track record with other primates. We don’t have good track record with elephants. We have a reasonably good track record with crows, but that’s because crows and other corvids can fly away from us, so when it comes down to it, a lot of the issue of imagining a truly alien alien in connection to with humans is not can we imagine a truly alien alien, but can we imagine humans doing anything other than damage to these aliens because they do not understand them?

>> Frank Rosenzweig: Well, here’s a question for you, John. So is -- is it okay [inaudible] popping in here? So the word intelligence has been bandied about here, and so is intelligence, first of all, is it is it inevitable? Just as people ask me all the time is multicellularity and cellular differentiation inevitable?

>> John Scalzi: Given enough time, I think it’s likely to happen. I don’t know that it’s always inevitable, and then even when you get intelligence, does that come to the point where we are talking about the sort of intelligence that humans have, you know, the theory of self, for example, that humans have, that other advanced animals have? Does that mean also -- because I wrote about this once about a species that had intelligence, but did not have individual consciousness -- does intelligence require consciousness? Does consciousness absolutely need intelligence, all of these sorts of things? The problem that we have is that we have one working model to go on. And, actually, we have more than that, but we don’t arrogate to other species the same level of consciousness and situational intelligence that we have ourself. Well, one of the things that I think is really interesting, and again, to go back to science-fiction which is kind of my home territory, what’s really interesting is that in so much of science-fiction, humans go out to the stars, and they meet their peers, you know? Alien or not, there’s a certain level of cognizance of intelligence. Even when we try to create alien aliens, we try to ascribe some sort of intelligence to them, but if you look, as you mentioned, statistically speaking, 900 times, you know, 999 times out of 1,000, the alien life we are likely to meet, is likely to be, you know, bacterium or the equivalent of bacterium, the equivalent of slime mold, the equivalent of these very, very simple creatures because once again, and again, we only have Earth as a model, but if we do use Earth as a model, 95% of the time of life on Earth is bacteria and slime mold, and then all of a sudden, oh, now we have oxygen. Now we can start doing things. But and so it’s kind of interesting, you know, knowing from a scientific point of view that the aliens we are most likely to meet are going to be tiny, tiny, tiny, little creatures.
>> Frank Rosenzweig: Is it limiting? Would it really be a -- would it be just a boring story, if you couldn't drive the action with some sort of conflict?

>> John Scalzi: Well, you know, the thing about it is, when I talk about, well, science-fiction does this, and science-fiction does this for a reason. There are things that we are sort of eliding, and the first is, as you say, you know, it's easier to create conflict in interest if you have the funhouse mirror version of yourself and having to, you know, deal with that and possibly surmount it. The other thing is that we do not write stories in a vacuum. For example, you know, the, quote-unquote, golden age of science-fiction was basically driven by one man, editor Joseph Campbell at Analog, because that was the market to which everybody wrote, and if you didn't sell to Analog, then you took that story to all the other places, and they took it or they didn't, so everybody was -- not everybody, but a lot of writers were basically writing to one man's tastes, you know, and that really bent science-fiction to what that one man liked, for better or for worse, you know? And so, if we had an editor who was like, no, I really want slime mold drama, then we would have a lot more slime mold drama stories. So and the other thing is, is that, you know, yes, it's easier to do the conflict when you're looking in the funhouse mirror, but could you do a story where the aliens are indeed completely incomprehensible? Could you do a story where the survival of a slime mold is actually part of the story and does that slime mold, for example, say have the same right to life that we would arrogate to ourselves? And yes, you could create a story where the rights of xenobiology, even in the abstract, are a real crisis for the story and drive the narrative, but you have to be really good.

>> Frank Rosenzweig: Yeah, that -- I mean, that could be very powerful, but maybe that's just -- I mean, maybe it's one good story there. I mean --

>> John Scalzi: Yeah.

>> Frank Rosenzweig: -- how many times can you tell that particular story?

>> John Scalzi: Oh, come on. Science-fiction is like all the rest of the literature. We have -- we come back to a lot of the same stories over and over again, for a number of reasons. You know, one, because the audience 20 years on is not the same as it was 20 years before. You have new readers who have not read that type of story before, or you have stories where you're interrogating the same precis from a completely different point of view. We come back to the same stories over and over, so yes, we could perennially come back to the rights of slime mold in science-fiction. I mean, that's a World Con panel in and of itself. But, you know, the question is, do we? Do we because -- do we as authors have our own interest in this? And do we, because the market will allow us to write that story and sell it?

>> Lucas Mix: Yeah, I was thinking, Ursula LeGuin's The Word for World Is Forest and your Fuzzy Nation deal very specifically with this question of the rights of an indigenous species, which, you know, initially may or may not be considered intelligent.

>> Frank Rosenzweig: It may be that this slime mold or the cyanobacterium, you know, does not have intelligence as most people would envision it, and yet they carry out some important ecological function, you know, on a local or global scale, without which this world would collapse, and so --
>> John Scalzi: Sure.

>> Frank Rosenzweig: -- then, you know, that complicates the encounter, but we might not
know this --

>> John Scalzi: Sure.

>> Frank Rosenzweig: -- until --

>> John Scalzi: Well, no, I mean, the funny thing about humans is we barely look beyond,
you know, our own noses when it comes to the consequences of the things that we do,
which, of course, is a perennial topic, but absolutely. I mean, we all -- I mean, we know that
we would not exist now, if, in fact, you know, many, many years ago, you know, the
bacterium did not start producing oxygen as a waste product. This is a, you know, a big
tension, I think, in science-fiction, and when we’re talking about life as we don’t know it,
that we literally have a hard time comprehending, you know, the timescales involved, the
biology and chemistry that is involved. All of these things make it very difficult for us to
create a model in our mind of these creatures that we can somehow care about. We have all
heard about the idea of, you know, charismatic megafauna. Right? It’s easier to try to save
the pandas than it is to try to save a particularly disgusting form of beetle, right? --
something that, you know, eats poop or something, go whatever, right? And that’s just on
planet Earth. We’re more than willing to go bend over backwards to save the Sumatran
tiger -- which by the way, we should. Let’s do that -- than we are to save the, you know, the
tick that that exists on that tiger’s backside.

>> Frank Rosenzweig: Circling back to astrobiology, so I mean, I didn’t get my first bolus of
NASA funding until about a dozen years ago, but being in this community has been really
exciting for me and enlightening in that I’ve grown to appreciate, as I think, you know, any
literate citizen does now, the ubiquity of water in the solar system, probably in the
universe, the ubiquity of hydrocarbons, so that much more than when Yuri and Miller did
d their experiments back in the '50s, it seems that the ingredients, the available ingredients
are far more widely dispersed than we ever possibly could have imagined, even maybe a
generation ago. So, you know, going back to the subject of this conversation, life as we, you
know, don’t know it, I think everybody in the astrobiology community that is actually doing
bench science is thinking along the lines of what we’ve been talking about, namely that
some replicating entity, it may not necessarily be based on, you know, a nucleic acid code, it
may not necessarily be, you know, proteinaceous, but it’s going to be some sort of, you
know, carbon-based, you know, aqueous-inhabiting creature, and so in your science-fiction
musings, what do you think -- musings and readings -- what do you think are some of the
most interesting examples that are scientifically plausible that go beyond the notion of life
somehow being dependent on water, carbon, hydrogen, and oxygen?

>> John Scalzi: I mean, I think one of the most interesting concepts would be the idea of life
that is not planet-bound. Right? Not -- and when I talk about planets, I’m not just talking
about like Earth, but like moons or like basically, that there’s a rock or an atmosphere that
they attach themselves to, because we know from a first approximation that it’s happened
before, because hi, we’re talking on this thing now. And then from there, it gets
progressively less likely. Like for example, in our own system, the places that are likely,
most likely to have life are the places where there’s going to be liquid water, and we know that there are moons of Jupiter and Saturn that have basically, oceans underneath, you know, hundreds of miles thick of ice. Now, what are those things going to be like, is going to be a completely, you know, ques -- you know, a wild question because we don’t know, because the world that they have developed and is completely different from ours, such high pressure, no light. Are the -- what’s the available energy there? Now, they’re -- you know, there’s these huge tidal, you know, motions due to, you know, them basically, being around gas giants but, you know, they don’t have rotation, and so all of these things are, you know, things that you ask yourself, what are the mechanics that are available that will develop the life there, and the further you get away from the standard Earth model, the wilder that they are going to be, right? We might be able to recognize, you know, a liquid moon life as being life. Would we recognize nebular life as being life? Would we actually be able to detect it, as our instruments went through it and so on?

>> Lucas Mix: So, Frank, I know you’ve looked at multiple origins of multicellularity, and so I’m going to, I guess, throw out there the idea that multicellularity is not one thing, but that there are multiple multicellularities.

>> Frank Rosenzweig: Yeah.

>> Lucas Mix: Is that reasonable?

>> Frank Rosenzweig: That’s reasonable to say. And, you know, I think, if you even want to use the word encouraging, the fact that it has -- that multicellularity, whether clonal, or aggregative, it’s arisen, you know, two or three dozen times in lineages that haven’t had anything to do with one another in hundreds of millions of years, and so, you know, the fact that we observe this happen repeatedly, in very different environments, in very different clades of organisms, suggests that once a body is populated with sufficiently complex organisms, that this is a likely outcome.

>> Lucas Mix: So with that in mind, I’m going to take your question to John and throw it back at you and say, do you -- what do you think? Is intelligence going to arise, and are there going to be multiple intelligences in the way there are multiple multicellularities?

>> Frank Rosenzweig: I would say, absolutely. If cephalopods, you know, have a clearly a very different type of intelligence than we do --

>> Lucas Mix: Not everyone will know what cephalopods are. Can you say more --

>> Frank Rosenzweig: Oh, the octopi and squid, these organisms that live these incredibly brief lives, and yet within those brief lives, you know, have, you know, a very rich and for my money, extremely intelligent way of operating in their worlds, and also but, you know, neurologically, they are profoundly different from us and have this sort of intelligence that’s literally distributed through their bodies in a very different way from our sort of organization into the central nervous system, so I mean, that’s a low-hanging fruit of an example. I would urge anybody who hasn’t seen it, to see My Octopus Teacher, which is a really glorious piece of cinematography, but yeah, I think there’ll be different types of intelligence, and it’s something that I said earlier, and that is that the type of intelligence
that is required, you know, to write a piece of haiku, or even a great 1,000-word piece of science-fiction, you know, that that’s only -- in the galaxy of intelligences, that’s only one. I’ve spent a lot of time with corvids and I can tell you that that’s a different kind of intelligence. It has aspects that are familiar to us, but if you think about having a brain that is always half on and half off, so this is literally the case that, you know, these extremely intelligent birds, you know, half of their brain will be sleeping, and the other half will be awake and alert to all the dangers in the environment. I wish I could do that, but I cannot, so I think even within the familiar examples that we would -- that everybody would accept as advanced animal intelligence, that they’re very different ways of thinking and being here on our own planet. And, you know, given those observations, I think we’re likely to encounter, you know, if we have the hundreds of thousands of years necessary to meet others, to meet others very different from ourselves.

>> John Scalzi: I agree with that 100%, and I think the thing that, again, to come back to is not the issue of whether or not there is intelligent life out there, but whether or not we will get over our own arrogance and prejudice towards our own model of intelligence, to understand that different modes of intelligence exist. You were mentioning the corvids. You mentioned, you know, the cephalopods, the whales, and the, you know, cetaceans. All of these creatures are hugely intelligent creatures, but even after the point where we decided that we probably shouldn’t wipe them all out, we were still discounting the sort of intelligence that they have, because it wasn’t our intelligence, and I got to tell you, you put a human in the same, you know, in the same environment, as a octopus, they’re not going to look that smart, right? -- because --

>> Frank Rosenzweig: That’s exactly right.

>> John Scalzi: -- the intelligence that they have is not tuned to that particular environment. If you put a human in the same environment, you know, as a dolphin, or a whale, the same sort of thing. A lot of what we describe as our intelligence is hugely contextually dependent on the world that we apprehend on a daily basis. We will have to acknowledge as we go out into the universe, that the creatures that we meet are not going to be forehead aliens, are not being written by science-fiction authors, that they will have naturally evolved in their own environment in their own context, and we need to be prepared to not understand what we meet, first, in order to then understand them and move forward with them.

>> Lucas Mix: I also want to bring up Ted Chiang has a great story called The Great Silence which is all about parrots, reflecting on the fact that they’ve been talking to us for a long time, and we haven’t noticed. Meanwhile, we’re wiping out their habitat and looking for life, specifically with the Arecibo telescope. We ask this question of whether we’re alone, and of course, we never are alone. We’re always surrounded by other organisms, and we’re always surrounded by other life, and identifying it and understanding it is one of the big challenges.

>> Frank Rosenzweig: I have found, as I think a lot of us, through the pandemic as we’ve been in isolation -- I’ve always had animals -- but I can say that, you know, my animals, and the presence of that Other has been of particular importance to me on a level that I can’t even really describe without, you know, getting a lump in my throat. Just having that
connection during a time when we have been so disconnected and so, you know, as we venture out, it does seem to me that some of us, you know, who are motivated by wanting a glimpse of the other and that contact --

>> Lucas Mix: Yeah.

>> Frank Rosenzweig: -- and I think that's -- there's something very sweet and noble, as well as romantic about that, so I'll stop with that.

>> John Scalzi: I have nothing to add. That's actually a perfect place to stop.

>> Lucas Mix: I agree. Thank you both so much. John, thank you for all that you write. I'm looking forward to the slime mold fiction. And Frank, as you know, it is always a pleasure. I hope we get a chance to talk again soon.

>> Frank Rosenzweig: Very good. John, my Pleasure to meet you. Keep up the great work.

>> Lucas Mix: This is Space on the Page, a podcast from the Kluge Center at the Library of Congress. Our original music was composed and performed by Andrew Breiner. In our next episode, we will join astrobiologist, Betul Kacar, writer Nnedi Okorafor to discuss remembering our future in space, the complex relationship between time and history and what we carry with us as we journey outward. I'm Lucas Mix. See you next time.