EPISODE 36
LIFE ITSELF

Hi there. Welcome to the end of the world. My name is Michael Folz. And this is Episode number 36 of my podcast Dial It Back Or Die. Now last episode I concentrated on explaining how, first, it is so unlikely that the Universe would exist at all, and, second, how unlikely it is that any planets could exist in which Life could evolve even into a microbe, let alone beyond that. And on this episode I am going to talk about all of the parameters which necessarily exist concerning Life itself.

And, once again, if you don't want to believe me on what I am about to say, you can also find everything summarized in a book. This one is called 'The Vital Question', and it was written by Nick Lane, who is both a prominent biologist and a prominent science writer. Now by and large Mr. Lane has drunk the atheistic biology Kool Aid. But he is also honest enough to point out all of the rather large gaps which exist in our understanding of both the origin and the evolution of Life. So that—although you will have to be somewhat familiar with organic chemistry—I do recommend that you read it.

Okay, with that out of the way, let's get started.

Now all throughout the last episode you might well have been saying to yourself, 'Sure, but all of those constraints are for life as *we* know it. The Universe is a pretty big place, though, and if science has shown us anything it is that all sorts of strange, unforeseen possibilities are possible. What's more, science has a long history of new discoveries which have totally upended what we had thought that we knew.'

Well, that last statement is certainly true as far as it goes.

You have to remember, however, that the way that science works is that it is always bounded by its current level of knowledge. Once again: Wishful thinking has no place in the scientific method. No matter how cool it would be if an anti-gravity device were possible, present day science says that it is flat out impossible. And it will remain that way *unless and until* somebody incontrovertibly proves a larger vision of science that shows that anti-gravity can exist.

Moreover, as I've already pointed out, one of the most astonishing properties about the Universe is that the same laws of physics apply throughout its entire expanse. A quark will act like a quark not only on the other side of our galaxy, but also in a galaxy five billion light years away. Unsurprisingly, what is true for physics is also true for the laws of chemistry and for the mechanics and energy flows of chemical equations. And it just so happens that there is precisely one element, Carbon, which because of its arrangement of electrons is capable of forming molecules complex enough to even pretend to be the precursors of life. Further, for many physical and chemical reasons, the only place where these molecules can form and reactions take place is in water, which is only liquid in a relatively small band of temperatures. Plus, for other technical reasons, carbon dioxide is also required, at least to get the process started.

Fortunately, C, H_2O, and CO_2, if not always at the temperatures one wants, are still relatively common among the interstellar debris which planets coalesce from. Which might well make you conclude that Life is therefore not such an improbable thing to arise. Indeed you may well have read articles about how organic molecules have already been found on comets, or on a moon of Saturn which also has an interior of liquid water, or other such speculation.

Then there was that famous experiment in 1953 when a scientist zapped a vat of organic compounds with an electrical jolt, and amino acids—the basic building blocks of protein and, thus, life—spontaneously formed. Surely a few more such jolts in a primordial ocean on a primordial Earth, and life would have taken off. And if it happened so easily here, then surely it might also be taking place on what to our terrestrially blinkered eyes seem to be alien worlds.

Well, again, not so fast.

Because it is certainly undeniably true that life did arise here, and after a long drawn out process produced us. And we have been able to make remarkable progress in reverse engineering it all and have so far determined that at its most basic form 'life' is nothing more or less than a series of oxidizing chemical reactions. But the more that we understand how intricate and precise that chain of reactions has to be, the more it is apparent that the conditions so required make the origination of any sort of life anywhere else much less probable, not more so.

Not to mention that that experiment back in 1953 was in fact meaningless.

But before we get into all that, let's go back and think about probability and statistics a little bit more.

Now you may well be aware of the old saying that if you had a million monkeys typing away for a million years, sooner or later one of them would come up with the Encyclopedia Britannica. Sounds plausible enough, doesn't it? And it's a great image to think of: An almost infinitely humongous office full of monkeys mindlessly but determinedly tapping away.

But how really probable is that saying?

So: Imagine a basic typewriter keyboard which contained all 26 letters, a period, a comma, a 0 and 1 (so that numbers could be expressed at least in a binary way), a quotation mark, and a space bar. A total of 32 keys in all. Now let's just posit the words “ENCYCLOPEDIA BRITANNICA” (all in caps, because, remember, no lower case is available). And imagine a single monkey randomly typing along trying to recreate this. 1 out of 32 times he would type the "". Then 1 out of 32 of those times he would type an 'E' after that. So on average he would type a '“E' 1 out of 32x32 times, or once every 1024 times. Let's round that down to 1 in 1000. And—remembering our scientific notation—now that’s 1 in 10^3 times that he would do this.

So how many random attempts would be needed before we had a four character string ('“ENC')? That would be 1 in 1000 times 1 in 1000, or 1 in 1,000,000, or 10^6. (Remember that we *add* the exponents.) Six characters ('“ENCYC') would require 10^9, and so on. But 10^9 is a *billion*, and it is really mind boggling to think that it would take a billion keystrokes by that monkey just to get those specific six characters in a row.

But it gets worse. For let's imagine that our monkey is gamely hitting a key once a second, each and every second, day in and day out for a year. There are about 30,000,000 ($3x10^7$) seconds in a year, which is a whole lot if you are trying to count them. But it would take our monkey over thirty years to hit those billion strokes needed to, on average, come up with just those first six characters.

Okay. Let's have the monkey be slaving away ever since the Big Bang some 14 billion ($1.4x10^{10}$) years ago. That's approximately $4x10^{17}$ seconds since time began. If that's not enough keystrokes, let's imagine him wailing away at the incomprehensible speed of a million times a second. This brings it up to $4x10^{23}$ microseconds since time began.

Now let's not just imagine a million monkeys doing this, but a *trillion* monkeys. That's a million times a million. All typing a *million times a second* ever since the Universe was first created.

And the odds are still overwhelmingly against any one of them coming up with just the 25 character sequence “ENCYCLOPEDIA BRITANNICA" even once!

And I’ll let you think about that for a moment.

Now it is somewhat ironic that in the present day West, just as it was in the Soviet Union, the physical science which is by far the most unconsciously influenced by the all encompassing ‘political’ ideology which informs our thought is biology. For instance, even though he was in all other respects a mainstream evolutionary biologist, the famous science essayist Stephen Jay Gould was honest enough to point out that the theoretical framework of Darwin's 'Origin of Species', published in 1859, was remarkably similar to what was then seen as the most intellectually progressive of economic/political ideas. Namely the 'survival of the fittest' free market liberal utilitarianism of, you guessed it, John Stuart Mill and Jeremy Bentham.

Now being a true believer in secular humanism, Gould concluded that this was all just a lucky coincidence. Although by now it should go without saying that one should always be deeply suspicious of any new 'science' that serves to completely confirm one's preexisting ideological beliefs. Even (and especially) if this involves knowledge which is now accepted to be as real to us as evolution.

Because the 18th Century's ideological (and totally unsubstantiated) belief that Selfishness is *the* organizing principle of human behavior can not so coincidentally also be seen to permeate just about every aspect of modern biology and evolutionary theory. As in the best selling book 'The Selfish Gene'. Or the belief that the real and only ultimate purpose of every living organism is nothing more nor less than passing on its genome to succeeding generations. And that thus the only traits which make any evolutionary sense are those that promote the Self.

Thus when confronted with something like altruism—the plain fact that certain creatures, though primarily humans, behave in ways that not only don't advance their own selfish cause (for example by anonymously giving charity to strangers), or even wreck their own selfish cause (for example by dying in battle)—evolutionary biologists twist themselves into all sorts of knots trying to explain how what's really going on is some counter-intuitive, complicated Selfishness all along.

How much easier and more scientific to go back to the beginning, Occam Razor style, and admit that maybe Selfishness is *not* the organizing principle of everything.

But, as we have seen from the beginning of this podcast, that is not how the mind works.

And what is truly bizarre in all this is that one of the most basic fundamental facts of biology is that every eukaryotic organism (which is basically everything more complex than a bacterium, from a paramecium to a pine tree to a panda) ultimately reproduces through the process of sexuality. (Even amoebas end up having sex at some point.) Which means that the only way new generations ultimately

arise is if each living individual 'willingly' gives up half of its genome. So that on the face of it one would think that the overwhelming evidence which sexual biology actually provides for us is *against* Selfishness.

Not to mention the plain fact that half of all such sexual existence above the bacterial level is *female*. And (although the details vary) a huge portion of a female's life energy is not used for herself but rather for the propagation and care of her offspring. So that, again, one would think that Self*less*ness would be the better way to describe the existential feminine condition.

Now you might respond that it is silly and anthropomorphic to suggest that Life is all about altruism and surrender. But isn't it just as anthropomorphic to suggest that Life is selfish? Isn't Life just being Life? And wouldn't we all be a lot better off not applying any specific human motivation, let alone 18th Century ideological convictions, to the mysterious phenomenon of Life? After all, even many physicists who wouldn't ever see any sort of divine presence in the cosmos still admit to being overcome by the wonder and the strangeness and the sheer improbability of it all. Why can't biologists do the same?

But instead it seems that certain present day biologists go out of their way (and certainly away from their field of expertise) in order to re-fight the atheistic arguments of 250 years ago. Which is why, just as it was with Voltaire or Bentham, it is rare to see flashes of wonder or enthusiasm in their writing. And which is why it is also therefore no great surprise that popular biology should always seem to stress that the origin, complexity or diversity of life is no big deal whatsoever. Simple organic molecules get zapped in that primordial ocean and become amino acids. Amino acids bump around together and form polypeptides. Polypeptides bump around and form proteins. Meanwhile nucleotides bump around and form simple RNA, which codes for various proteins, and which also by the bye spontaneously replicates. RNA bumps around and forms much more complex DNA. And, voila, here we are. No need to look for God or Mystery anywhere. It's all your basic garden variety organic chemistry, as modified and shepherded by Natural Selection.

Ah, Natural Selection. That survival of the fittest process which determines which mutations end up making an organism better adapted to its environment, and which mutations just end up making organisms end.

Except that it's not at all clear that, just as Newtonian physics didn't work at the atomic level, and that therefore quantum mechanics had to be developed, so too Natural Selection is really not all that good an answer to the beginnings of life. Because if the odds of things bumping together to form

more complex things are on the order of, say, 1 in 10^{10}, then it's all but a certainty that it will happen. But if the odds are instead something like 1 in 10^{30} or 1 in 10^{40} or 1 in 10^{50} then we're back to those typing monkeys. Because remember that there have only been 10^{23} *micro*seconds since time began. So that it doesn't matter then how many molecules you have. It's just not going to have the time to happen.

And the interesting thing here is that for most of these bumping scenarios in reality no one really has a clue as to what the real probabilities are. Now a cynic might say that this is because it's well known that most biologists are math averse to begin with. And a conspiracy theorist might suggest that it's because biologists, being true believers in their ideology, intuitively suspect that they're not going to like the answer. But the true reason no doubt has to do with how difficult it is to determine probabilities when you have no good idea of what the initial parameters really were.

Because forget about figuring out how life might arise on a moon of Saturn. The truth is that we still don't have the foggiest idea of how life arose on Earth.

Remember those lightning bolts zapping the primordial organic soup? Couldn't have happened. Period. Because the energy requirements needed for those initial chemical reactions to occur means that not only would the original oceans have needed to consist of a 10,000 times higher concentration of organic molecules than is possible, but lightning bolts would have had to hit this soup *every three seconds* for thousands upon thousands of years.

Then there is the hypothesis that life first developed in hydrothermal vents, which are basically those volcanic outpourings deep below the ocean's surface which have been discovered comparatively recently, and which are totally a function of tectonic plates moving about. But besides not knowing how those plates moved about in the early Earth, it also is impossible—given that we now know what specific chemical reactions would have to have been involved—that the extremely hot and unstable temperatures in those vents could have provided a plausible environment.

I could go on and on, but I trust that you're starting to see the basic problem: The more that we know about how life works on the microscopic level, the fiendishly more complicated it becomes, and the less likely it is that it could have arisen simply from things bumping around.

Because, just as another for instance, consider proteins. In regular life we think of 'protein' as something which we need to have in our diet in order to build strong muscles, etc. But proteins are actually the literal building blocks of life. Virtually all of the work of a cell is done by a vast variety of them, each of which is a chain of up to 20 different amino acids (think of the 26 letters in the alphabet)

strung together to form 'words' several hundred 'letters' long (the largest known protein is 27,000 amino acids in length), and each of which is folded into a profoundly unique three dimensional shape. This three dimensional requirement takes complexity to an almost insane level. So that when you recall the difficulty our monkeys had just coming up with that 25 character title “ENCYCLOPEDIA BRITANNICA”, what do you think the odds are that proteins would have coalesced just by randomly bumping around? Especially when, just as a randomly generated strings of letters is nothing but meaningless garbage, all proteins have to actually meaningfully work. They have to perform some function. Which—to make it all weirder—usually makes no sense in itself. But only in a complex partnership with other proteins.

It all gets mind numbingly complex all too quickly. And the biologist's response that the whole point of RNA's (and later DNA's) existence is to encode the information to make all those interacting proteins simply avoids the chicken-and-egg question of where the original proteins came from for the RNA to evolve from those nucleotides and encode.

Not to mention that nobody has a clue as to how nucleotides first developed.

Now, as with the fine tuning of the Universe, I am in no way suggesting that this almost absurd level of complexity means that some Old Testament Jehovah must have magically created life. What I am saying though is that, just as quantum physics is not 'rational' when viewed through the lens of 18th Century thinking, so too the origin and meaning of life might require a far more subtle and expansive imagination than that which was going on when people were wearing all those wigs and snorting all that snuff.

Which also takes us back to that suggestion that there is an excellent chance that, for all of our success in figuring things out, we just might never be smart enough or conscious enough to ever figure it *all* out. Always keep in mind the fish and the calculus. And at the very least that it would seem to be wise to always have the humility to accept that just maybe perhaps we are not the ultimate crown of creation.

For the sake of argument, however, let's say that everything that I just talked about in the last section is wrong. That it is in fact relatively easy for polypeptide chains to form and for RNA to organize itself, whether in a primordial ocean or on a moon of Saturn, the atmosphere of Venus, or any and all of those exoplanets which are being discovered.

Still the overwhelming consensus among biologists who know the nuts and bolts about energy requirements, etc., is that in the vast, vast majority of situations the furthest that life could ever evolve is to be somewhat similar to a form of what is termed the *prokyrotic*, or very simple single cell bacterial state. And how big are bacteria? In general they are less than one millionth of an inch long. Or to put it another way, a typical ounce of dirt has over a billion bacteria in it.

And why would life get stuck there at that microscopic size? It has to do with bioenergetics, the chemical equations which actually create the energy which keeps life moving and make it 'alive' in the first place. Because what 'life' really comes down to is an incredibly complicated set of reactions (yet another example of the bizarre improbability of everything) which end up pushing single hydrogen protons across a (cell) membrane wall. And while those reactions at the molecular level produce a surprising amount of energy, there's only so much total energy available. Namely the amount that will support something around the size of a bacterium.

So what happens if you want to power up something like one of the smallest complex cells—say, a red blood cell—which is about 10 times the diameter of a bacterium? Well, surface area is the square of a diameter, so you would end up with 100 times as much cell wall with which to conduct those proton pumping chemical reactions. But the volume of such a cell would be the *cube* of the diameter, or 1000 times that of the bacterium. Which means that there is no way that enough energy could be produced to keep such a cell alive. Which means that a whole new sort of mechanism would have to evolve in order for that to happen.

Well, such a mechanism did indeed evolve. Which is why today we have red blood cells, nerve cells, amoebas and other protozoa, molds, fungi, plants, and animals, from worms to dust mites to men. In other words, virtually everything that in everyday terms we think of as life are what biologists call *eukaryotic,* or complex cells.

Because besides being much larger than bacteria, these cells are orders of magnitude more complex than the more primitive versions. Bacteria are more or less simple sacs of undifferentiated protoplasm. But complex cells have nuclei where their DNA is stored. They have multiple cell walls. They reproduce sexually. Death is pretty much programmed into their life. Most importantly, they have mitochondria, which are specialized areas which greatly magnify the proton pumping energy transfers which that extra size requires.

And here's the thing: Because all of these cells—from fungus to us—share so many basic characteristics, it necessarily means that they all share one single common ancestor. Just exactly one.

What's more, there is absolutely no evidence of there ever existing a biological 'missing link' in between those comparatively simple bacteria and the super-complex eukaryotes. Which means that the jump to complex cell had to have happened exactly once, and in one particular cell, in the entire four billion years of evolution upon this planet.

Think about it. By now it is pretty much agreed that, no matter how it happened, life-like processes started soon after the Earth was formed a little over four billion years ago. Bacteria—and archaea, which look and act the same as bacteria, but have a different genetic makeup—came along pretty quickly. Some time afterward these organisms 'discovered' photosynthesis. And then for about two billion years everything just sat there. Literally. A giant, endless thin mat of teeny tiny single simple cells soaking up the sun and reproducing in their peculiarly bacterial deathless way.

Picture those countless quadrillions of cells lying there for millions upon hundreds of millions of years. And then one day—no one knows when, how, or why—a particular archaeon found itself inside of a particular bacterium. And for some unknown reason they were able to co-exist, and even reproduce. And for some unknown other reason the two quickly co-evolved, so that the particular archaeon became a mitochondrion, that part of the cell wich churns out energy. And the particular bacterium evolved into a nucleus. And as a result the new complex eukaryotic cell could become much larger, more energetic, and much more, uh, complex than those more primitive prokaryotic ones had been.

Again: What with all those zillions and zillions of cells, and millions and millions and millions of years, this endosymbiosis happened exactly one time. Biologists know this because all complex cells, from fungus to whale, share far too much of the exact same traits and genes for it to be otherwise.

This doesn't mean, however, that biologists like to publicize this fact. This is because, first, this one off event had absolutely nothing to do with the 'natural selection' of things bumping into other things, or of random mutations sometimes producing better products.. No, it was just a total fluke.

But the larger issue is that this story flies against the 'naturalistic' narrative that life is obvious and common throughout the Universe. With the implication that we humans are nothing special. Because the reality is that the odds against a eukaryotic cell forming are so overwhelming that, even if every other planet out there was absolutely covered with microorganisms, it is almost a mathematical certainty that nothing would have ever developed beyond that stage.

The reality is that we are indeed stupendously, ridiculously special.

But it doesn't end there. Because for the next billion years or so after complex cells happened, *they* just basically sat there.

Well, complex cells did figure out how to eat other creatures, starting with all those previously pacifist photosynthesizing bacteria which had been comfortably lounging around for the previous two billion sunny years. And being simple cells, of course, there wasn't much that the bacteria could do about it.

Then about 580 million years ago the first baby steps of multicellular evolution were taken. Ancestral forms of (probably) sponges and corals appear in the fossil record, although most of the 'animals' of this Edicaran period were very strange, and may not even have been true animals per se. At any rate, they all died out for some unknown reason around 540 million years ago anyway.

Of course, *why* multicellular creatures would ever develop in the first place is another poser which is usually glided over by biologists. After all, once a cell wall has evolved (probably from oily fats) and those chemical reactions and attendant proton pumping take place across it, one can see why and how single cells could exist. But the whole idea of cells differentiating into brain cells, muscle cells, etc., and all of them forming into a precise arrangement and then being totally coordinated towards a common goal requires a level of complexity and informational genetic code which is orders of magnitude greater than that required for a single cell, even a single complex cell.

And if you do think that it is somehow a logical biological progression for multicellular life to exist, then I suggest that you turn the question around and ask yourself: If it is so logical, then why didn't complex cells do it for the first billion years of their existence?

Not to mention the additional philosophical question as to why, if all life is indeed selfish, would hundreds, then millions, then trillions of previously selfish cells all 'voluntarily' band together for the sake of the whole?

Nonetheless, shortly after all those Edicarian creatures died off, multicellular animal life exploded out of nowhere. Within almost a geological instant, famously called the Cambrian Explosion, all (and more) of the modern animal phyla (upwards of over 30), from jellyfish to various worms to arthropods to vertebrates, branched out from nothing more spectacular than a simple sponge. From being tiny, microscopic, and with extremely simple differentiation, animals cascaded upward and outward in size and complexity, becoming as big as a millimeter, then a couple of inches, then a couple of feet. And virtually all of our basic body parts—eyes, intestines, ways to move around, ways to get

food in the mouth, and the nervous systems and brains to co-ordinate all of this—came out of nowhere and were pretty much in place in those few million years.

And at the same time, for the first time in the four billion year old history of the Earth, things started to get really nasty. Animals started really discovering how to eat each other. A defensive/offensive arms race then commenced and soon spun out of control, with all the shells, spines, claws, tentacles, sharp teeth and evasive behaviors that have continued up to the present day.

Then, after that incredibly brief Cambrian Explosion, not much has happened since. Sure, new species continued to differentiate. But no really new phyla have developed. No really new ways to organize a physical body. It's all bilateral (and other forms of) symmetry. Mouths and guts and appendages to move about with. All the basic forms and functions of animal life happened in a virtual instant. And the rest is just details.

In response to this uncomfortable fact most biologists simply wave the magic wand of Natural Selection, even though the whole original idea behind natural selection was that evolution simply could not happen that quickly. A little more than a century ago, when the reality of the Cambrian Explosion was first established, they tried to explain the discrepancy by suggesting that we just hadn't found the proper Pre-Cambrian fossils yet. Now they say that a few million years is actually plenty of time for all that evolution to take place, so that no 'explosion' ever really happened. Once again the implication is basically: Keep moving folks. Nothing strange is going on around here.

The problem with this approach is that it is still almost impossible to explain away the uniqueness of that Cambrian moment. After all, there have been many mass extinctions of life since then. You are no doubt aware of that asteroid that killed off the dinosaurs 70 million years ago. But other events, such as at the end of the Permian period about 250 million years, were even more destructive, with 96% of all marine species dying off. Yet in all these events the new species which replaced the old were relatively similar. At no time, even with an essentially empty palette for Nature to work with, did Nature come up with anything strikingly new or different. No new phyla. No new categories, such as 'plant' or 'animal'. Why an explosion only once?

Moreover, if there were indeed some 'trigger' which was responsible for the Cambrian Explosion to occur, nobody has yet figured out what it could have been. Increased oxygenation of our atmosphere has been proposed. So has been the ending of a long glacial period in which the Earth had turned into a giant iceball. So has been a hypothetical chance development of a new gene which would facilitate multicellular complexity.

Unfortunately, however, none of these hypotheses is more than just that. A hypothesis

And thus we are left with another remarkably improbable reality and mystery.

Now my point in all this is not to present myself as some sort of authority in biology or evolution. And I am somewhat aware of the counter-arguments which biologists make in order to support their world view.

But it should be clear by now that anyone pretending at this point in the game that somehow we 'know' how life came about, or that evolution was some smooth unremarkable process, is doing nothing more than blowing smoke. And my contention is that the reason that they are blowing that smoke is that their preexisting ideology, not science, is causing them to believe in the smoke that they are blowing.

Because, again, it is of course a certainty that life did in fact arise. It is of course a certainty that complex, eukaryotic cells popped up at some point. It is also a certainty that the Cambrian Explosion occurred and that multicellular life developed. But I submit that the deeper questions of why, and especially how, these critical junctions of evolution came about have still not been remotely explained in a satisfactory way.

And the larger issue for my thesis is that it is a virtual certainty that all of these incredibly important major events did not happen through simple, easily replicable processes. Whatever environment was necessary for those first chemical reactions and proto-cellular membranes to simultaneously occur and to continue uninterrupted for a relatively long time, it was no doubt extremely rare, if not unique. That endosymbiosis which was necessary for the first complex cell to develop was absurdly improbable. Whatever trigger it was that caused the Cambrian Explosion, it could have just as likely not have happened.

So, putting aside all those other constraints of astronomy and physics and geology, and considering that complex cells basically did nothing for the first billion years of their existence, it is thoroughly believable that this state of affairs could have well continued for the next half a billion years, and that the Earth of today would still contain a thin mat of algae and protozoa lazily feeding on all those bacteria. Given that the first complex cell was an utter fluke, it is even more believable that the Earth of today would still only have the even thinner mat of photosynthesizing bacteria that it had for its first two billion years. And, given all those initial constraints, it is extremely likely that the Earth of today would be just as lifeless as Venus, Mars, or the Moon.

And this is without even taking into account all the weird twists and turns (such as the killing off of the dinosaurs by that asteroid) which set the stage for us mammals and humans to come about.

Just with what he have discussed, though, I would hope that you the listener will conclude that, even if there is no God, even if there is no Plan—actually, *especially* if there is no God or Plan—what we have here in the mere fact of our present Earthly existence is well beyond being overwhelmingly strange.

In light of which I would suggest yet again that more than a little humility might be in order. And it also might behoove us to proceed as slowly and as carefully as possible.

Instead of running around like small children playing with loaded guns.

Because it just might turn out that those biologists who are toeing the ideological party line, who are working so hard to interpret science so as to conform to simplistic 18th Century ideas of the primacy of selfishness, are thereby setting us up so as to possibly kill off the apex creatures of all those billions of years of evolution.

Namely us.

And that would be ironic now, wouldn't it?

Anyway, I'm sorry that I'm going to have to be leaving behind these weighty questions about the existence of the Universe and the existence of Life. Because, no matter how fascinating these questions are, the goal of this podcast is to try to figure out the true parameters of human nature and of the human condition.

So next episode we're going to start in on one of humanity's most unique assets: Namely, our intelligence.

Although, of course, that is for next episode. For this episode I would once again like to thank you so much for so far having listened.