Define Information Before You Talk About It: Egnor Interviews Marks

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Announcer:

Has anyone ever given you some useless information? What does it even mean for information to be meaningful? This week, we flip the script on to Mind Matters News as guest host Dr. Michael Egnor interviews our own Robert J. Marks about information, the creative limits on artificial intelligence, and why evolutionary algorithms aren't the magic bullet they're often presented to be. enjoy.

Michael Egnor:

This is Dr. Michael Egnor. And it is my privilege to have as my guest, Dr. Robert Marks. Dr. Marks is the Distinguished Professor of electrical engineering and computer engineering. And he is the director of the Bradley Center. Dr. Marks it's a privilege to have you with us today.

Robert J. Marks:

It's good to be with you, Michael, it's interesting to be on the side that's being interviewed. So this is going to be a new experience for me on Mind Matters.

Michael Egnor:

There'll be a little bit of reciprocity.

Robert J. Marks:

Turnabout is fair play, as they say.

Michael Egnor:

That's right. So we'd like to discuss today information. And I know that information is a topic that you have a strong professional interest and a great deal of professional expertise. Probably the best way to start is to ask what is information?

Robert J. Marks:

That's a profound question. It turns out that before talking about information, you really have to define it. And there's some interesting questions that reveal the ambiguity of defining information. For example, if I burn a book to ashes, and scatter the ashes around have I destroyed information. Does it make any difference if there's another copy of the book. If I take a picture, everybody knows the pictures on your cell phones require so many megabytes of storage, am I creating information? So these are kind of questions the answers of which depends on your definition of information.

Robert J. Marks:

On another hand, if I'm given a page that has Japanese text on it, and I don't read Japanese, which I don't. Does it have less information to me than it does to somebody that has a native reading ability of

Japanese. Claude Shannon recognize this, he recognized that there was different definitions, at least in academia, in the mathematical sense, if you will, of information. And he said, this is a quote of Claude Shannon, "It seems to me that we all define information as we choose. And depending on what field we are working in, we will choose different definitions. My own model of information theory was framed precisely to work with the problem of communication."

Robert J. Marks:

Claude Shannon, of course, was the guy that wrote the 1948 paper, which defined information. It was the first paper to use the word bit, a contraction for binary digit. And he laid the foundation for the communication networks that we use today on our cell phone. He was an extraordinary man. And the work that he did in founding Shannon information has had more profound effects on our lives than say, for example, the works of Einstein. He was just really a brilliant guy that worked for Bell Labs.

Robert J. Marks:

So to answer your question, what is the definition of information, one has to go to the different models of information that there are. There is the Shannon model of information. And Shannon modeled information as bits and was interested in how we used information to communicate. There's also something called Kolmogorov information. And Kolmogorov was a Russian scientist and his information was founded by three people Kolmogorov, Chaitin, and Solomonoff. And Kolmogorov got his name associated with it, because of the Matthew principle. He who has shall be given to. Because Kolmogorov at the time was the most famous of these mathematicians.

Robert J. Marks:

But it has to do with structure and the description length of an object. Then there's the physical definition, a great physicist named Rolf Landauer said all information is physical. Now I would argue with that I think that all information is physical if you constrain yourself to the physics definition. And this is in total contrast to the founder of cybernetics, Norbert Wiener, one of the great names. Norbert Wiener, it's a great name. He is famous for saying information is information. It's neither matter nor energy. We can think of, for example, information written on a book on the printed page. That's information that's etched on matter.

Robert J. Marks:

But we also know that information can be etched on energy in terms of the cell phone signals that you receive. And so it's not matter nor energy, but both can be places where you can place and represent information. And then the fourth, the three so far, Shannon information, Kolmogorov information, physical information. And the fourth is specified complexity. Specifically algorithmic specified complexity.

Robert J. Marks:

The models of information that I have just shared with, you don't really measure meaning, the purpose of specified complexity and specifically, the mathematics of algorithmic specified complexity is a way to measure the meaning in bits of an object. And so that's what information is. Then again, it depends on the field that you're talking about. And typically, when people talk about information, they don't take the time to define information and that needs to be done.

Michael Egnor:

If you consider the information that is put into a system by an intelligent agency. Is that one of those particular kinds of information? Or could that be any kind of information?

Robert J. Marks:

Well, yes, it does turn out that one of the one of the challenges with naturalistic processes is that they cannot be creative. And therefore, if you see the act of something, which is creative, creation, for example, it requires external information to be infused in the process in order to guide whatever it is that's being designed to its final design. For example, in biology information is there everywhere. Shannon information is there. Kolmogorov information is there, because the description of the human body would take volumes to write down. Specified complexity, algorithmic specified, complexity is also there. Because the body and what it does has a lot of meanings.

Robert J. Marks:

So I think in all cases, the relevance to biology is really significant. One of the interesting things about biology and this is fascinating, and it shows again, the genius of our creation. Is that one of the things about information that Shannon showed is that if you had a digital representation, then you could communicate exactly. Continuous or analog computing or processes is not... It degrades. And if you took a photocopy of a picture of your mother and took a photocopy of a photocopy and a photocopy of the photocopy of the photocopy, et cetera. In about 10 or 12 generations, your photocopy would look nothing like the original copy.

Robert J. Marks:

One of the beautiful things about all of creation is that it uses DNA, which is digital. And we know we can take a digital image of your mother and send it to your wife who sends it to her sister who sends it to her son. And each one of these pictures is exactly the same, there is no degradation. So there is a beauty-

Michael Egnor:

That's fascinating.

Robert J. Marks:

Yeah, there's a beauty in the fact that our reproduction is guided by a digital process. This is the reason for example, we no longer use VHS tape, which was an analog or a continuous process. Why we went to DVDs and ultimately digital streaming. And it's the same reason we don't longer use cassettes, we went to CDs and ultimately to streaming music on Spotify, which is all done digitally. So it's a wonderful testimony to biological design that we are fundamentally digital in terms of our reproduction.

Michael Egnor:

Wow. Sometimes when it's difficult to define or understand a concept, it's helpful to imagine its absence. What would characterize a system that had minimal information in it?

Robert J. Marks:

Well, this dates back to the 18th century, and a mathematician named Jacob Bernoulli, who came up with the idea of Bernoulli's principle of insufficient reason. And his concept was that if we know nothing, if we have no information, no a priori information about anything, the best that we can do is assume that everything is going to be uniformly distributed. It's a very useful principle. But in terms of absent information, if everything that followed Bernoulli principle, we would just be dust kind of spread around. Mathematically Bernoulli's principle is exactly the same as maximum entropy. And we know that maximum entropy is what spreads the gas around the room. So if there was no organization, if there was no informational structure, that's where we would go, according to Bernoulli and to thermodynamics.

Michael Egnor:

What fascinates me I believe, is not only that, living things, quite obviously containing enormous amounts of information, but even just the ordinary laws of nature, manifest information and manifest an intelligent cause. That I think you can see information in snowflakes and the laws of physics, all sorts of things.

Robert J. Marks:

Yes, exactly. In fact, one of the interesting things is that things with high Shannon, or even Kolmogorov information happen all the time. We know, for example, that the generation of a single snowflake, as you mentioned, requires a lot of information in terms of either bits or description length of Kolmogorov.

Robert J. Marks:

And so the question is is that meaningful. We're getting back to the idea of missing meaningful information. And the idea is no, because we know that it snows all the time. So these improbable high informatic things happen all the time. I think a more interesting question is to ask what is the meaning of two identical snowflakes. Then all of a sudden, you get into the idea of meaning, two identical snowflakes has a greater meaning than a single observation of a single snowflake?

Michael Egnor:

How does biological information differ from information in nonliving things?

Robert J. Marks:

I think, I don't know if it does. I think that the information... Now if we just talk about the functioning biology, talking about things in your field is a little bit outside of my wheelhouse. About talking about the mind and things of that sort. I do believe that after recent study that the mind is very different from the physical part of the brain. So there's information that occurs external to the brain. But I think in terms of just the physical, materialistic definition, that most of the information can be used to measure what is in the biological entity. We can talk about, however, creativity and where the idea of creativity comes from, which is the creation of information. And that is outside of naturalistic or information processes.

Michael Egnor:

Thomas Aquinas, following Aristotle, defined living things as things that strive for their own perfection. And he felt that was what distinguished living things from nonliving things. A rock doesn't everyday wake up in the morning and try to be a better rock. Whereas living things to a greater or lesser degrees of success, try to make themselves better at what they do. They eat, they rest, they interact with nature, they do things to make themselves even better examples of what they are. And it would seem to me that might relate to the difference between information in non-living and living things. That the information in living things is directed to ends. It's directed to purposes that you don't see in nonliving things in the same way.

Robert J. Marks:

I would definitely agree with that it. It does turn out that in order to do the improvement that you're talking about, there needs to be a, if you will, a degree of creativity in doing that. In other words, the entity has to have creativity. This is one of the things that we argue a lot about in artificial intelligence. Will artificial intelligence ever be creative? And I maintain, I feel it's almost like a mantra now, but artificial intelligence will never be creative, it will never understand. And currently it has no common sense. So these are materialistic attributes that are beyond the capability of artificial intelligence, which certainly can be applied to the human mind.

Michael Egnor:

Sure. I mean, I've always thought of artificial intelligence as just a representation of human intelligence. And that, in the sense the term artificial intelligence is an oxymoron. If it's artificial, it's not intelligence. And it's so intelligence must be human. And all the intelligence that's in computers and computer programs and machines, is all human intelligence that is represented in those devices.

Robert J. Marks:

It is. In fact, what you mentioned is exactly the test that Selmer Bringsjord, he's a professor at Rensselaer used in his test for whether or not artificial intelligence would be creative. His test was that does the computer program do something which is outside the explanation or the intent of the programmer? And there has been thus far no artificial intelligence that has done this.

Robert J. Marks:

Now we have surprising results from artificial intelligence. I would say that the AlphaGo that beat Lee Sedol in the Asian game of Go, the most difficult board game of all, at one point it did the surprising move, and everybody went, "Oh, that's incredible. This was creative." No, that was not creativity. AlphaGo was trained to play go. And that's exactly what AlphaGo did. It was playing go, better than human beings. But we see this all the time. Computers play chess better than I can. I think it was Emo Philips. He says, "Yes, computers can beat me at the game of chess, but I have yet to lose a match in kickboxing." So there will still be, there will still be things that humans are better at. I always loved that joke.

Michael Egnor:

So what specifically is the relevance of information to biology? And why is information so interesting when it's applied to a study of living things?

Robert J. Marks:

Well, I think one of the things is that it's beyond the explanation of materialism. We hear a lot of thoughts today about Ray Kurzweil's singularity. This is where AI writes better AI that writes better AI and pretty soon, the AI it is claimed is going to have the intelligence equivalent to that of a human being.

Robert J. Marks:

Well, of course, if we have AI writing better AI, that is beyond the original intent of the computer programmer, then we have creativity don't we. And creativity is beyond the ability of artificial intelligence. So Ray Kurzweil's idea isn't going to work. There's also the thought that someday we will have something which is called artificial general intelligence, which will be intelligence at the human level, including things like creativity, understanding and sentience. And this will be achieved someday.

Robert J. Marks:

And no this all requires creativity in terms of the computer program, and that will never happen. I have a colleague, Roman Yampolskiy, he's at the University of Louisville. And all this talk about artificial general intelligence, he posted a post on social media on April Fool's Day in 2016. Let me read it to you. Roman is quite a character.

Robert J. Marks:

He said, "Google just announced major layoffs of programmers future software development and updates will be done mostly via recursive self improvement by evolving deep neural networks." In other words, he said that this AGI had been achieved. And this allowed everybody to be laid off at Google because they weren't needed anymore.

Robert J. Marks:

And it was a great joke. But one of the interesting things he said on his social media, he got a bunch of likes. But also interestingly, a few requests from journalists came in and they said they would like to talk to him about this wonderful developing story. So to non-experts, the joke was not obvious. But I think to anybody that does artificial intelligence, it was obviously an incredible joke. And I think it's humor that illustrates this idea that no, we're never going to have the sort of computer generating software that generates better and better AI. Isn't going to happen.

Michael Egnor:

Right. There's a computer scientist, California named Judah Pearl, who I find to be a fascinating guy. And he's, over the past several decades, really pioneered in the field of causal analysis. Which is the ability to ascribe quantitatively using mathematics, causal inferences in processes, which historically has been very hard to do. Statistical analyses were able to infer correlation, but they weren't able to infer causation.

Michael Egnor:

And he is trying to figure out how to allow machines to make causal inference. Because to have machines that are worth using, that have any kind of what appears to be autonomy, the machine has to be able to infer cause. But of course, all that for cause is human intelligence is put into a machine. Very interesting aspect, I think, of information theory is the ability to infer causal relationships, as opposed to simple correlations.

Robert J. Marks:

Yeah, that's very interesting. Of course, the people that do word mining and natural language processing are big into things such as correlation. And correlation is easy to do it. Talking to my friend, Gary Smith, who is a professor of economics at Pomona College, he said this is very dangerous, it's going to be very dangerous in the area of data mining. He said because we're going to come up with inferences that have nothing to do with each other.

Robert J. Marks:

There's a great website called spurious correlations. And they just show how in big data, you can get correlations between totally unrelated causes. They have a graph. I'm trying to remember one of the exact ones, but they had a graph something as people who died strangled in their bedsheets versus the cheese consumption of Wisconsin and the curves lined right up. I mean, they were totally correlated. But clearly there was no causation there. And establish of causation thus far is going to have to require human intervention. Yes. So yeah, I agree with you.

Michael Egnor:

It's kind of interesting because the inference to causation seems to be leap beyond ordinary algorithmic statistical analysis of something. And it's a leap, I think that only human beings can make. And I think it's also a very big problem in science, especially medical research. That correlation is certainly not in itself conclusive evidence of causation. And there's all kinds of errors made in medical research. Because it's assumed that correlates imply cause which they don't necessarily.

Robert J. Marks:

And this is interesting, because most of the journals that accept papers based on statistics are only into the correlations. They require an R value of such and such, meaning that the data corresponds to a high degree of correlation. But the problem is, of course, is we do have these spurious correlations, and there is evidence of repeated correlations that are obviously true. If you smoke cigarettes, it's going to kill you. That's obvious. But for first time sort of situations, you're not really sure. And this has led to the conclusion of one researcher that up to 90% of the papers published in the literature that are based on statistics are flawed.

Michael Egnor:

I would tend to disagree. I think it's much higher than 90%. I think that's a real underestimate the number of papers that are garbage.

Robert J. Marks:

Michael, I was ready to argue with you. It turns out, okay.

Michael Egnor:

Yeah 90% is very conservative. Yeah.

Robert J. Marks:

Which is really amazing. And that's the reason that today, something... Coffee is good for you, coffee is bad for you. You hear all of these fleeting studies that are reported in the news as gospel, and it can have a terrible effect, it can make you paranoid. And so I try to ignore all of these anymore since Gary Smith pointed this out to me. It's really terrible.

Michael Egnor:

And I actually think that this is this notion of Pearl's, obviously that causation is a different inference from correlation. And that we need to develop a way of quantifying it and of applying it to machine learning is absolutely fascinating. And I really think that it's a uniquely human thing to understand causes. Machines can crunch numbers and do things that don't provide insight. But to get insight into what causes what I think requires a human being.

Robert J. Marks:

I think I agree with you, I can see, for example in natural word processing that one could look at an event which precedes another event. And if you saw that a number of times, you can infer that maybe one caused the other. But I wonder what the dangers are of doing something like that?

Michael Egnor:

Well, a good example, the smoking example that you used is that smokers frequently will have yellowing of their fingertips because they're holding cigarettes. And they also are predisposed to get cancer. And there's no question then that yellowing of your fingertips correlates with having lung cancer, but it doesn't mean that yellow fingertips give you lung cancer, or that they cause lung cancer. You have to get the causal arrows right. Yellow fingertips and lung cancer are both caused by a common factor which is smoking, but they don't cause each other.

Robert J. Marks:

I remember a similar story about the ice cream consumption and murder rate to New York City. That the ice cream rate would increase and then the murder rate would increase not realizing that they were both just related to the rise in temperature. And after people got tired of eating ice cream, they went out and killed each other. I guess is the bottom line.

Michael Egnor:

We actually what I was a resident in neurosurgery in Miami, I was there during the drug wars. And so we would get gunshot wounds to the head coming into the ER constantly. except they would always stop when it rained. And Miami has quite a bit of rain. So when we would have an hour or two of rain, the ER would just go completely quiet. Nobody would come in. And then the sun would come out and then people would shoot each other again. And it was fascinating, but people would shoot each other during rain.

Robert J. Marks:

So the causation would be that good weather causes people to kill each other.

Michael Egnor:

Yeah, or that there's something about being wet that protects you form gunshot wounds. Which is just kind of interesting. But so yeah, so the causation thing is a very subtle question. Dr. Jeffrey Shallot, who is a mathematician in Toronto, claims that Mount Rushmore doesn't have any more information than Mount Fuji. I'd like to ask my guest today Dr. Robert Marks to answer that question.

Robert J. Marks:

In terms of meaningful information I think it's obvious. Michael, they used to say that it doesn't take a brain surgeon to answer this or it doesn't take a rocket scientist. Well, it turns out you're a brain surgeon. And I've done work for NASA. And I got a NASA tech brief award. I guess that makes me a rocket scientist. So I think for both of us, the answer is obvious. Yeah. That Mount Rushmore contains more information than does Mount Fuji.

Robert J. Marks:

And it's clear from the context that this refers to meaningful information. There's more meaningful information on Mount Rushmore, there's Lincoln and Roosevelt and Washington. And yeah, what do we get with Mount Fuji? We just get a big chocolate gumdrop. So yeah, there's obviously more information on one than the other.

Michael Egnor:

And we had spoken in a previous podcast about different types of information. Can we say what type of information the additional information on Mount Rushmore is?

Robert J. Marks:

Yeah, this is an interesting question we can ask ourselves, for example... I'm going to give an explanation then dovetail into the answer. We can ask ourself the definition of two DVDs, both of which have the same storage capacity. One has the movie Braveheart. One has just random noise in it. And both of them take out the same amount of bytes.

Robert J. Marks:

Can we say that the DVD of Mel Gibson's Braveheart has more information than the noise? Yes, absolutely. If you talk about meaningful information, and as we talked about before, it depends on your definition of information. Certainly in the case of Shannon information, or possibly Kolmogorov information yeah, they're the same, but neither one of those measures meaning. And so one has to go to specified complexity, the mathematics of specified complexity, specifically algorithmic specified complexity.

Robert J. Marks:

And I'll give a little pitch here, in case people want to read more about it. It's in chapter seven, of the book that I co-authored with William Dembski and Winston Ewert, called introduction to evolutionary informatics. And the cool part about the book is that it references a lot more nerdy papers that have been published in archival prestigious journals and conferences. So you can read it there at kind of a lay person's level, or you can dig deeper and go into the papers.

Robert J. Marks:

So I believe that Dr. Shallot it was thinking about Shannon information in the sense that a DVD of Braveheart would contain the same information as a DVD of just random noise. So if you took a picture of Mount Rushmore, and you took a picture of Mount Fuji, and you stored them on your camera, both of them might have the same file size, if you will. And in that sense, they are identical. One of the problems that we talked about before is people throw around the idea of information without really defining it. So I hope that by defining it that we've made this clear. And I think clearly in the context of the statement about Mount Rushmore containing more information than Mount Fuji, that we're referring to meaningful information. I think that that's implicitly obvious.

Michael Egnor:

It's kind of interesting that Dr. Shallot was making the criticism. That he was saying that it wasn't clear that Mount Rushmore had more information than Mount Fuji. Using his blog, where he types letters and words that other people read. And there's no question that his blog contains more information than either a blank screen or just a screen with random typing. So even the very effort that he makes to deny that Mount Rushmore has more information than Mount Fuji is itself an example of something that has more information that something analogous to Mount Fuji.

Robert J. Marks:

That's a fascinating observation. So him making a statement is actually a self refuting argument.

Michael Egnor:

And if these guys didn't have self refuting arguments, they wouldn't have any arguments at all. Because everything they say is self refuting. So you've referred to specified complexity. And what is that?

Robert J. Marks:

Well, it's built on Kolmogorov. I'm going to get a little bit in the weeds here. But Kolmogorov complexity is based on the shortest description length you can have of an object. The reason I really like Kolmogorov information theory is that it is the link to the physical idea of information. We know what mass is, we know what energy is, but what is information, what's a physical link to information and I think that the description length is a good example.

Robert J. Marks:

To illustrate, imagine that we have a three dimensional printer, and we want to write a program. All three dimensional printers need programs in order to operate. We're going to write one print program that prints a bowling ball in three dimensions, then we're going to write another program which generates a detailed bust of Abraham Lincoln, down to the detail of the wart on his right cheek and his upper shaved lip.

Robert J. Marks:

I'm shaving my upper lip right now with my beard. And everybody says I look Amish. And I point to the fact that Abraham Lincoln shaved his upper lip. And so we would have to get Abraham Lincoln's shaved upper lip. And the question is, if we had the two programs, we had the bowling ball, and we had Abraham Lincoln, which program is going to be the longest. It's obviously the one of Abraham Lincoln, because with a bowling ball, you said, print a sphere and put three holes in it.

Robert J. Marks:

But with Lincoln, you would have to specify his lips, and the beard and the mole and his eyebrows and everything else, and it would be a much longer program. So therefore, Lincoln, the bust of Lincoln has more complexity than the bowling ball. And this is what Kolmogorov complexity measures in terms of information.

Robert J. Marks:

And the shorter the description length in terms of a computer program one has the longer the program is, the more Kolmogorov information it has. Now, the interesting part is that if you wrote a program to do a three dimensional bust of Lincoln and I wrote a program to do a three dimensional bust of Lincoln, one of our programs would be longer than the other one. So which one is the proper description length? Well, Kolmogorov complexity asked the question, well, there must be a shortest program somewhere that generates the bust of Lincoln, whatever the length of that shortest program is, is the Kolmogorov complexity of Lincoln. So this is Kolmogorov complexity, which is a component of specified complexity.

Michael Egnor:

If you have three different systems, you have a bowling ball, and you have a bust of Lincoln, and you have the atoms that would make up a bowling ball or a bus of Lincoln reduced to individual atoms and just distributed throughout the universe, just dust. Which has the most information.

Robert J. Marks:

Again, yes, we are talking about Kolmogorov information, which is description length. Description length, in terms of the computer program that were required to duplicate the object. So it is that computer program that I'm arguing will be longer for a 3D printer to print a bust of Lincoln than a bowling ball. Now, there is the open question that specified do you want to get as far as duplication. You want to get down to the atom? I would say probably not. You're just interested in the surface of the bust of Lincoln and the surface of the bowling ball.

Michael Egnor:

But wouldn't something with maximal entropy to have more of that kind of information that a bust of Lincoln?

Robert J. Marks:

Yes, and this is where the rub comes in. Let's have a bust of Lincoln versus say, a rock that we picked out in the driveway. Now this rock might have a bunch of dimples and indentations and it might have the same complexity that the bust of Lincoln does. But that's only one part of specified complexity. So complexity is one part of it. The other one is specification. Why do we recognize that there's more meaning and a bust of Lincoln than there is in a rock that you pick out of your driveway, even though the computer programs that generate them are of the same length?

Robert J. Marks:

It is that in terms of context, in terms of experience, the bust of Lincoln is more meaningful. And this can be folded into the idea of Kolmogorov complexity in order to come up with this idea of algorithmic specified complexity. The idea of algorithmic specified complexity uses the idea of conditional Kolmogorov complexity. And the idea here is that you bring into the interpretation of the meaning your experience.

Robert J. Marks:

And so this would answer the question that I asked and answered on the first podcast. Or I guess I asked it. About the text in Japanese that I can't read, versus the text in Japanese that a Japanese person could read, that was fluent in Japanese. Well, for them, it would have more information, because they had the context to interpret it. So specified complexity has two components, it does have to have the complexity. And then it does have to have the specification. Those two things combined give the overall measure of algorithmic specified complexity, which measures the meaning of an object.

Michael Egnor:

From the standpoint of information theory how does a bust of Lincoln, our statue of Lincoln differ from Lincoln?

Robert J. Marks:

Oh, well, I think they're two different total worlds. For the bust of Lincoln we're just only interested in the outside, the external surface, were not really interested in what goes inside. I believe we're constrained with whatever the physics of the 3D printer is, if we're printed on a 3D printer, and whatever it fills it in with it fills it in with. We're only interested in the external. So that was the intent of my example.

Michael Egnor:

The thing is that... And then it's certainly true, but I kind of like to take the observer out of it, meaning to say that let's not consider so much what we're interested in, but rather, what the actual differences are. How does the statue of Lincoln... And let's say that you made the statue in such a way that it you also had a statue of Lincoln's internal organs. You tried to make it as detailed as you could. How would the most detailed statue that you could imagine, differ from Lincoln himself, information theory-wise.

Robert J. Marks:

Well, I think that in terms of meaning, Shannon information, Kolmogorov information, physical information, where people talk about Landauer said all information is physical, which is true if you go there. None of those address, meaning. The only way to address meaning of which I am aware in information theory is to place it into context. Into something which is meaningful. And that context must come through experience.

Robert J. Marks:

In order to read that thing in Japanese, you have to have the experience of having learned Japanese. I can show you a picture. And you might say oh, I see a couple of women and I and a boy there and I look at the picture and I say Michael, "That's a picture of my family. This is my son Jeremiah and Joshua and my daughter Marilee and my wife, Monica." And so that picture is going to have more information than it would fruit for somebody that has never met my family.

Robert J. Marks:

So in that sense, it is all based on context. I'm not sure for example, how an alien would come down, say a bulbous blob, sort of alien with no form and look at the bust of Lincoln and think that it had any meaning. It would have to have the context of knowing what humans look like. And if it had no idea what humans looked like it would just sit there and flub it slips and said, "This is just like a moon rock."

Michael Egnor:

As I mentioned in the past, I'm fascinated by the traditional Thomistic and scholastic definition of living things. And that is that they are things that strive to perfect themselves. And what Thomas Aquinas meant by that is that there are purposes built into nature, final causes what he called teleology broadly. And those purposes, provide goals for things in nature, that things in nature tend to change in the direction of those goals.

Michael Egnor:

But what is unique about living things is that they act of their own accord to achieve their goals. Whereas nonliving things are acted upon, but don't act of their own accord. An example would be, no matter how detailed a statue of Lincoln you make, the statue wouldn't be trying to make itself a better statue of Lincoln.

Michael Egnor:

Whereas Lincoln tried to make himself a better man every day. What made Lincoln alive was that he was always trying to be a better Lincoln. Better in terms of more fully realized or perfectly himself. As we all do, there's always a striving in living things. And there's no striving inanimate things. Statues don't try to become better statues. They can only be made better by something external, but they don't try it themselves.

Robert J. Marks:

Yeah, this is interesting, because this gets back to the idea of algorithms and the idea that everything naturalistically must occur in an algorithmic sort of sense. So if you have a bust of Lincoln that you want to print, you're generating a computer program that follows a type of algorithm. What you are describing is this intent to better yourself is non-algorithmic I would maintain that it is beyond the scope of naturalism, beyond the scope of information theory to capture, at least as I know it right now.

Michael Egnor:

The other connection that I think is absolutely fascinating here and the connection was drawn by the Scholastic philosophers, is that there is a remarkable analog to this idea of things in nature, and particularly living things, striving to perfect themselves, striving towards a goal. And that is intentionality, which is a technical philosophical term that refers to the fact that all thoughts are directed at things.

Michael Egnor:

Every thought you could have is about something. If you think about it, you can't really think anything that isn't about something. When we say I'm thinking about every thought has has something it points to. And the implication there that the Scholastic philosophers drew, was that the tendency in nature for things to go to ends, to go to goals, and particularly the tendency of living things to perfect themselves is the kind of thing that has to have a mind behind it.

Michael Egnor:

That is there's there's no striving unless there's a more profound organizing mind that creates the striving. And so, the ancient philosophers connected the idea of intentionality in the human mind to the idea of teleology and final cause in nature. And that was one of the reasons that was, for example, was Aquinas's fifth way of demonstrating the existence of God.

Robert J. Marks:

Well, let me ask you a question. We're all familiar with robots and robotic mice, finding their selves a path through a maze, for example, in order to get food, for example. And this again, is a robot. Wouldn't these robots be attempting to... I guess robots don't eat food, but they get some sort of reward at the end, a teleological award, of course. But wouldn't these robots be designed to improve themselves by getting better and better?

Michael Egnor:

Oh, they are sure. But the design is externally imposed on them. There's no inherent tendency. That if you take a robot, and you just plop it down in the middle of a desert, and watch it for a while, if it does do things, it won't do them for long. That is that robots are conglomerates of silicon and copper, steel, and things like that. And you can leave silicon and copper and steel out in your backyard or on your desktop for as long as you want. And it will never do anything that even remotely resembles a robot. The only way that silicone, copper and steel become robots is if a human being assembles them, and programs and makes them do it.

Robert J. Marks:

So their intentionality is external.

Michael Egnor:

Yes, yes.

Robert J. Marks:

Okay.

Michael Egnor:

And that external teleology, or external intentionality, is what characterizes inanimate objects. They can't make themselves better in any way unless some intelligent agent comes along and pushes them, and makes them do it. Whereas an intelligent agent can make itself better without being pushed. Or I should say, not even intelligent, a living thing makes itself better. Bacteria make themselves better. And they're not intelligent in any sense that we think of intelligence. But bacteria make themselves better. But grains of sand, that are the same size as a bacterium don't make themselves better.

Robert J. Marks:

What this reminds me of in computer science and artificial intelligence is the bias that is placed into artificial intelligence. There are some people that would hope that artificial intelligence, for example, could filter out hate news. No, it's not going to be able to filter out hate news without having a bias from the programmer of what is hate news.

Robert J. Marks:

And it is, I think, a firmly established fact through computer science theory, like the no free lunch theorem, that you cannot build a computer science without an intention, without a bias. And that computer programs without bias are like ice cubes without cold. You just can't have them. So we would expect intentionality in computer programs and artificial intelligence to always be programmed in by the computer programs. That's a good point.

Michael Egnor:

And what terrifies me about artificial intelligence, and I don't think one can overstate this danger, is that artificial intelligence has two properties that make it particularly deadly in human civilization. One is concealment. That is that even though every purpose, every single purpose in artificial intelligence is human, it all comes from humans it's concealed. We don't really understand it. We don't understand Google's algorithms.

Michael Egnor:

There may even be a situation where Google doesn't understand Google's algorithms. But all of it comes from the people who run Google. So the concealment is very dangerous. We don't know what these programs are doing to our culture. And it may be that no one knows, but they are doing things. And the second problem, which is an enormous problem is one that Rene Girard, who's a French philosopher, wrote about extensively, and that is the concept of mimetic contagion. Gerard felt that-

Robert J. Marks:

Say those words again, I didn't get it. Mimetic? I feel like I'm doing the interview now.

Michael Egnor:

That's okay.

Robert J. Marks:

Mimetic contagion. What does it mean?

Michael Egnor:

Mimetic contagion. Gerard was a literary theorist who was also a philosopher, and I think, one of the most brilliant men of the past couple centuries, he was a brilliant man. And he felt that what made us human was our desire to imitate. That we are imitating animals, and no other animal imitates anywhere near the way we do. And we imitate particularly other humans desires. That is that, for example, advertisers notice that if they show a popular quarterback drinking a certain brand of soda, other people will want to go out and buy that same soda. But that's kind of an odd thing. Like, why would we imitate what that guy wants.

Robert J. Marks:

Because the guy looks happy, and we want to be happy.

Michael Egnor:

Right. And Gerard developed this remarkable system of sociology and anthropology, based on this idea that humans are inveterate imitators, and they imitate desires. And he said that one of the most dangerous things that happens in human culture is what he called mimetic contagion. And what that is, is it's a contagion of imitation, I imitate you imitate me, my neighbor imitates me who imitate you, and then you imitate my neighbor, and then that this whole thing just becomes an explosion of imitation. Which also can lead to jealousy, to violence.

Michael Egnor:

For example, if I imitate your love for your wife, that's a real problem. If I imitate your desire for coffee, that's not such a big deal. But when you start imitating other people's possessions, other people's significant others, then you have war. And so one of the problems with artificial intelligence is that it allows us to imitate others, without even knowing what we're doing. And it allows it to happen at the speed of light, and simultaneously all over the world.

Michael Egnor:

That is that I can imitate a guy in China, at exactly the same moment that everybody else in the world imitates the same guy. And it takes zero seconds to do it. And that's never happened before. Humanity has never had that kind of interconnectedness. And that mimetic contagion, according to Gerard is lethal to mankind. I mean we will destroy ourselves. And so I see the concealment of meaning in AI, that is that every fragment of meaning in AI is from human beings. None of it is from machine. But we don't see it that way. We don't even understand it very well.

Michael Egnor:

And it can happen like kerosene with a match. It can happen at incredible velocity and incredible ferocity. And these are incredibly dangerous things that we're dealing with it. Frankly, I think that some of our political crisis in this country right now is because of that. It's because of the bias inherent in our information that we're getting, and the enormous potential for imitation for mimetic contagion.

Robert J. Marks:

I just watched a Netflix documentary called the Social Dilemma, which talked about the impact of social media and Google and all of the mining, the data mining that is done by these big networks that correspond to the concealed information that you talked about. And you're right, it's chilling. One of the things that they mentioned is that there's only two industries that refer to their customers as users. And that is social media and drug dealing.

Michael Egnor:

Yeah, sure.

Robert J. Marks:

And so the impact that was made really makes me want to quit social media altogether. But I tell you, it's addicting.

Michael Egnor:

Absolutely. Absolutely.

Robert J. Marks:

So one has to do partial withdrawal. Maybe I need to go into a 12 step program or something.

Michael Egnor:

And the problem is that they know it's addicting. And I think probably one of the reasons that it's addicting is that they've made it addictive.

Robert J. Marks:

Oh, yes, absolutely.

Michael Egnor:

And we don't even understand it. And frankly, they may not even fully understand it. That is, it's incredibly dangerous stuff. Incredibly dangerous. It also has potential for good. But wow, the danger that we're facing is I don't think we comprehend what this means.

Robert J. Marks:

So concealment. The thing that bothers me about AI mostly is its unintended consequences. Certainly in social media, there's unintended consequences. But if you look at things like self-driving cars that kill pedestrians, and there's lots of pushback against the military using autonomous AI, because it might not do something that it's supposed to do. And I think these are real concerns. And they boiled down to, if you are going to develop AI, you better make sure that the AI does what you intended to do. So that's another one I would add to the chilling aspects. I do like your idea of concealment. Also, I think that is frightening.

Michael Egnor:

What concerns me a great deal is, first of all, the widespread belief among people who engineer AI, that AI has the potential to become conscious or to have its own intentions.

Robert J. Marks:

And it's surprisingly widespread.

Michael Egnor:

Oh yeah, frankly, they all believe it, practically. And it's a collective insanity. I mean, nobody in their right mind actually thinks that a machine can think. The belief that a machine can think, is along the lines of thinking that your television set is trying to communicate with you. The people who made the television program are communicating with you through the television set. But the television set isn't trying to do anything. It's just a piece of metal.

Michael Egnor:

And these AI engineers are smart enough to know that. But they don't seem to. And two things scare me. Number one, that the people who are designing AI aren't smart enough to figure that out. And number two, that maybe they have figured that out, and they're using it in ways that they're not being honest about. And both of those concepts are terrifying.

Robert J. Marks:

Yes, I do think that some of these testimonies about control of the masses, before Congress are going to historically be revealed to be similar to the testimony of tobacco executives about the effects of cigarettes.

Michael Egnor:

Absolutely.

Robert J. Marks:

They know what they're doing, and it's going to come out somewhere.

Michael Egnor:

Right. And I think the primary motives have been to monetize it. Obviously, they want to make money. And frankly, I think that will always be the motive. I think they're just trying to be trillionaires instead of just billionaires. But the thing is that there are certain cultural and social structures that can be built that make it more lucrative. And that's very concerning.

Michael Egnor:

That is that there are certain cultural contexts like having us feel that constantly acquiring new things, is what will make us happy, as opposed, for example, to praying to God. But praying to God doesn't make the money. But buying new cars does. So they push the buying cars. It's pretty scary stuff. Many evolutionary biologists claim that all of the information present in living things got there by natural selection of randomly assorted variation. Is that true? It's very clear that living things contain a lot of information. Is it possible for the Darwinian process of random heritable mutation and natural selection to generate all that information in biology or even any of it?

Robert J. Marks:

Well, my background is not in biology, but it is in computer science and computer engineering. And one of the things we do is do artificial intelligence. And I think maybe your question translated to artificial intelligence is, can anything happen in artificial intelligence from totally random, unguided mutations and processes to allow for something to happen? And the answer is absolutely not. We did a lot of work.

Robert J. Marks:

We meaning Winston Ewert and William Dembski, a lot of work on analyzing programs that were purported to generate information. And this was something that excited the people with the advent of the computer, they said evolution is such a slow process. It's going to take us years and years in the laboratory to do anything. But if we have a computer, we can take these Darwin algorithms and we can simulate them on a computer in show that indeed it works. And so people try that. And there were people jumping up and down and saying, "Yes, we have proven Darwinian evolution."

Robert J. Marks:

There was a problem, though, with their simulations. Number one is that all of the simulations were guided to be successful. And they were random. They were stochastic, you have the three steps of evolution, you had the random mutation, you had the killing off of the weak and the survival of the fittest. And then you had the repopulation. The key in those three steps is survival of the fittest, how do you determine what the survival of the fittest is. In order to do that, you have to have something called a fitness function or an objective function.

Robert J. Marks:

That needs to be imposed by the programmer, the programmer is telling you how the organism can better itself. And that is necessary in order to perform evolution on the computer. The work that we did, which is summarized at a lay level in our book, and I'll give a plug here, Introduction to Evolutionary Informatics. And let me say it again, Introduction to Evolutionary Informatics. In that book, we looked at a number of computer programs that purported to perform Darwinian evolution.

Robert J. Marks:

And our report in the book is aimed at a high level, at a general consumption level. And they are based on publications in prestigious journals and conferences. And those are referenced there for people that want to dig in further. But we showed that in all cases, that yes, it was required, and that there's mathematics behind it. The mathematics is based on something which was called the no free lunch theorem. Which was popularized in the IEEE transactions on evolutionary computing in 1997, where Wolpert Macready showed something which astonished the area of genetic programming and evolutionary programming.

Robert J. Marks:

Their conclusion and their mathematical proof was, if you have no idea about the direction that you're going, you're never going to get there. And so it basically says that in accomplishing a goal, that one search algorithm is as good on average as another one. And this astonished the computer science field, especially those in evolutionary computing, but it caught on. And we took this up, and it's covered in the Introduction to Evolutionary Informatics book, for example.

Robert J. Marks:

And we showed not only was this true, but we could measure the degree to which people infused information into the search process. So we could measure in bits, the amount of information that a search process, the programmer put into a computer program in order to get it to succeed. And these programs were random. And so how do you say random things can succeed? Well, if you think about a pinball machine, that pinball bounces around the different bumpers, but it eventually falls, it goes through the flippers and goes down the little hole behind the flippers, eventually, it's a random process, but it always has the same sort of result.

Robert J. Marks:

And one of them that we took on the biggest one, because it was part of the Dover trial was a program called Avida, A-V-I-D-A. And Avida purported to perform evolutionary algorithms. But it was chock full of added information. Now the metric that we derived in order to measure the degree of information which was put into a algorithm in order for it to succeed is something called active information. This is something which can be measured in bits.

Robert J. Marks:

And we were able to measure the amount of active information being put into Avida and it was a lot. We also took on another algorithm called EV, which purported to show Darwinian evolution and showed it was chock full of active information. I don't think the people that wrote the program did this intentionally and tried to hide it. I think rather, they were numbed by familiarity, that they were just so used to these Darwinian processes that they put them in there without thinking at all.

Michael Egnor:

It was seen me but from from what you're describing of this, that the idea that there's information put into these programs is pretty obvious. I mean, I think it's fascinating that you can measure it, that you quantify it. But the these programs are all elegant computational tools. And of course, there's information being put in. How could experts like these Darwinists not see that? I mean that's really blind. That's quite amazing.

Robert J. Marks:

I have this old theory of the difference between scientists and engineers. I'm an engineer. Scientists often come up with good theories. And they like these theories, and they're vetted, and they're placed up on a throne. And they're kind of worshiped like a queen and protected like a queen. Whereas engineers make the Queen come down from the throne and scrub the floor. And if she doesn't scrub the floor, we fire her.

Robert J. Marks:

And I think that that's probably the case here. Now, why did these people do this. I heard an old story. And this is well circulated. So people might have heard about this before, but I call it the dead man syndrome. And it illustrates the challenges of being in a silo of belief, a silo of ideology that you can't see out of. The story of the dead man syndrome is that a man enters a psychiatrist's office and says, "Doc..." He was really sad, by the way, says, "Doc, I'm dead." And he started sobbing, he went over and sat down and put his head down and started to cry.

Robert J. Marks:

And the psychiatrist was just astonished. He said, "Well, come on, you're not dead, you're walking, you're talking and dead. People don't do that." He guy says, "Yeah, I know. It's astonishing, isn't it that I can walk and talk but doc I'm dead." So the psychiatrists thought of a way that he could make an explanation to the man and convince the man that he wasn't dead. So he had a diabetic finger prick thing, and he asked the guy do dead men bleed.

Robert J. Marks:

And the patient said, "Why no dead men don't bleed." He said, "Here, give me your finger." And so he pricked his finger and the guy started to bleed, a little puddle of red blood came up, and the guy's eyes got big. And he looked at the doctor and looked at the puddle, looked at the doctor, he said, "Doc, this is incredible. You're right, and I'm wrong, dead men do bleed."

Robert J. Marks:

So the point of that story is if you're so ensconced in an ideology, that you are going to be pounding square pegs into round holes, in order to defend that silo of ideology. And I think we point a finger at a Darwinists for doing that. But I think everybody has to be concerned about placing themselves in a silo of belief, and allow themselves open to other explanations, and go where the evidence leads us.

Robert J. Marks:

I mean, this is what the scientists say. Go where the evidence leads us. And the evidence in terms of Darwinian evolution is especially as implemented and simulated by a computer, is that no, it simply doesn't work, not unless it's guided, not unless there's a teleological forcing function there. You have to figure out what is good, you have to figure out what that survival of the fittest is. And that is typically a place where active information is placed into the algorithm. And yes, it can be measured in bits, in many cases. And that's pretty good. And I think we're very proud of being able to do that.

Michael Egnor:

I was myself sort of raised in a Darwinist atmosphere. And I believed it. I really believe that Darwin explained how living things came to have adaptations. I thought Darwin explained how man came to be.

And it was really the Intelligent Design movement that helped me to see how wrong that is, What nonsense that is.

Michael Egnor:

And I still frankly, every time I look at this issue, it leaves me flabbergasted that Darwinists could really believe the stuff they believe. And they really are in a silo. But goodness gracious, the silo has very thick, strong walls. These people can't get themselves out of it. So I point out also that whereas you mentioned that, certainly the goals to which evolutionary change tend have to be specified. That you don't get anywhere unless you specify goals.

Michael Egnor:

But even randomness requires information and intelligence. Because there's an old Aristotelian adage, that chance, or accidents only occur, as conjunctions of designed two things. That is that they're conjunctions that you didn't intend, but they depend upon a milieu of design to happen. If you didn't have the milieu of design, the randomness would even have any meaning.

Michael Egnor:

A good example is a car accident. So you're going through an intersection, some other guy goes through the intersection and you collide. Well, that's an accident. Nobody intended the collision. But everything else in that event is designed. The automobiles you're driving are designed. Both you and the other guy were intending to go somewhere. The stoplight that one person ignored was designed. The road was designed. So randomness has to happen on a framework of design. So design even shows up in randomness, as well as goals, purposes.

Robert J. Marks:

Well, exactly the against. I would add to this by making the statement that there are deterministic aspects of randomness. And this is a difficult concept to explain. But examples are obvious. If you flip a coin a million times about 50% of the time, it will come up heads if it's a fair coin. And that is a deterministic output of the randomness.

Robert J. Marks:

So imagine setting up an evolutionary computing program where you have a specific outcome in mind, and you performed this operation a million times, well, it's going to converge to that output, just like the coin flip converges to a 50% success rate. And this forming, this putting together of the stochastic framework in order for this to happen is what the people in evolutionary computing do.

Michael Egnor:

An example, kind of what Aristotle meant by saying that randomness or chance, depends critically on purpose is that if I set out to design a random number generator, I would need to go to school for a decade, to learn computer engineering, to learn electronics, to learn all of that, to design a random number generator. So at the tail end of this thing would come out random numbers, but there's nothing in the least bit random about the effort that it takes to reach that point. A random number generator is not itself a random thing. It's a highly designed thing.

Robert J. Marks:

Well, it's a highly designed thing. And I would also argue that all random numbers generated by computers are themselves deterministic, believe it or not. In fact, they refer to them as pseudo random number generators. And there's a little algorithm that spits out numbers that look random, but underneath them all, they're not random. In fact, I have a student right now, that is looking at training a neural network to forecast random numbers.

Robert J. Marks:

Because if these random numbers are being generated by a deterministic algorithm, then we should be able to discover what this deterministic algorithm is. Is there a way that we can game that system and literally figure out what the next random number is. In fact, the only place in the world that randomness exists is in quantum collapse. And that's the only place that there's true randomness.

Robert J. Marks:

One of the big problems that I see, we talked about the critics living in silos is that I read their works all the time. The critics, however, I don't think read our works. I get into arguments, we talked about Dr. Shallot, for example. I think he just had in mind this idea concerning Mount Rushmore and Mount Fuji, that they had different amounts of information. He had his head stuck in the silo of Shannon information theory, and not understanding the context of what was going on.

Robert J. Marks:

If he had gotten a copy of my book, or read some of the articles that we have generated, then he would understand what was exactly meant by this. I have also gotten into a challenge with a great gentleman, Randy Isaac, from the American scientific affiliation. I think he's a former IBM guy with a physics background. And I couldn't shake him off the idea that all information was not physical, he kept going back to the physical definition of information, and I couldn't shake him out of that silo.

Robert J. Marks:

He said, Well, Rolf Landauer, one of the great physicists said that all information is physical. And that's not true. That's one of the many definitions that we can have of information. So I wish before they made critical comments concerning our work, that they literally read it and became familiar with it so that their comments would be useful.

Robert J. Marks:

By the way, I should mention that many times I have engaged with opponents of our work. And they have been right, I can think of at least two occasions where they found a mistake in our reasoning. Now, it didn't detract at all from the main thrust of our conclusions. But they were right. And if you look at our papers, at the end, we will have an acknowledgement to these people that did read our work and made critical, well-civilized interchanges with us. We acknowledge their contributions, and we appreciate it. And of course, that back and forth is always, always important, as long as it's done in a civilized way as opposed to a pugilistic way, which we see a lot of.

Michael Egnor:

Well, that's one of the great tragedies in this is that, as I found when I began reading, intelligent design literature, is that the questions that intelligent design scientists raise and the points they make are very, very profound, important points. And a great deal more progress could be made in biology and in intelligent design and evolution if the people are that Darwinian side, would simply engage with honesty, with integrity, with a genuine desire to learn. Because they have things they could teach us. These people are very smart people, but they come at intelligent design as an enemy, instead of as a tool for a better understanding evolution. And it's a real shame.

Robert J. Marks:

Exactly, I remember in the Science Rising, the film that you occurred and there was a film clip of a guy that made a profound statement. He says science and academia that exist in these silos have already decided that science has already decided in a materialistic naturalistic framework and that all our job is to fill in the details. Walter Bradley made a great observation. He was being deposed by an ACLU attorney.

Robert J. Marks:

And they asked first of all, if he was a Darwinist... Well, they actually asked if he was a Christian, trying to appeal to the genetic fallacy of discrediting him. He says yes. And they said, "How can you be objective and looking at these things and be a Christian at the same time?" And Bradley's comment was, I think, ingenious. He said, "Look," he says, "I'm not the one of the silo, it's you that are in the silo. I can accept naturalistic things happening. I see materialistic consequences all the time. I don't prescribe to it as a philosophy. But I also have a broader perspective, because there's many things that I can bring into conclusions that are outside of your narrow silo. It's not me that's in the narrow silo, it's you." And the ACLU attorney immediately switched directions in his questions. It's just a brilliant comeback. And I think it's very apropos.

Michael Egnor:

One of the first intelligent design theorists that I read was Philip Johnson, who passed away recently. And I owe him a tremendous debt, because he opened that insight to me. And a point he made that, for me was sort of the cornerstone of by coming to understand better, I think the controversy between the Darwinian viewpoint and the ID viewpoint, is he said that Darwinism isn't really much of a scientific theory. It's a philosophy. It's a metaphysical system. And it kind of dresses up as a scientific theory. But it really is a philosophical system for attempting to explain biology on purely materialistic terms. And we should address it that way. It's a philosophical problem, it's not a scientific problem.

Robert J. Marks:

Well, I don't think anybody that has looked into the mathematics of Darwinism, as is covered in our book, I'll plug it again, Introduction to Evolutionary Informatics, can ever come to the conclusion that Darwinian evolution works without some sort of guidance. If it did happen, there needs to be a great amount of external guidance in that process, there needs to be lots and lots of active information in the process to make it work. It can't be done just through a random process.

Michael Egnor:

One thing that fascinates me about it theory is trying to understand ID theory in light of more classical metaphysical systems. So, for example, Thomism or Aristotelianism or Platonism, and so on. And it's very interesting that Aristotle said that, in order to understand any process in nature, you really need to know four causes of that process. You need to know the material cause, what matter the thing is made of. The formal cause, which is sort of the principle that gives it structure and dictates what it does, what it's doing. The efficient cause, which is the cause that actually gets it going, that actually starts it off. And the final cause, which is sort of the goal to which the change is tending.

Michael Egnor:

And he said that the final cause is the most important cause. In fact he called it the cause of causes. In a sense that he saw nature, not as be pushed a lot like you would hit billiard balls and push them, but as being drawn along, as being pulled towards goals. And I think that dovetails very beautifully with the ID point. That you don't get evolutionary change, unless you have goals. Unless you have something in nature that sort of pulls the change in certain direction. And that's exactly what Aristotle said. That change is meaningless unless there's a goal.

Robert J. Marks:

Now, I think that some physicists recognize this, and some biologists recognize this. And I think it's also true of physics that the universe... Well, why are we here? Why is the universe so perfect? Or why are our bodies so complex? And they refer to the idea cosmologically is the anthropic principle. And I suspect there is an anthropic principle for biology, which says that we are here we are complex. And, of course, it had to happen, because if it didn't, we wouldn't be here to notice it. That strikes me as kind of ridiculous. What is your sense?

Michael Egnor:

Yeah, I think the... I see the principle that they're talking about here as just kind of another way of talking about teleology and talking about purposes in nature. There's an example that has been given to sort of refute... One of the ways that people have made this argument have tried to downplay the idea of purpose is they've said that, well, if the universe didn't have these particular characteristics, we wouldn't be here to note it. So that it's no surprise that the universe seems to be made for us. Because if it weren't made for us, then we wouldn't even be here to know it.

Michael Egnor:

So that means that it could still be by chance, that there doesn't have to be a purpose. And I think that's faulty reasoning. And the example people have given is imagine that you are facing a firing squad, and they put the blindfold on you. And the firing squad has got like 12 marksmen and they're standing like six feet away from you. And they say fire, you hear the gunfire. But you're still alive. They missed.

Michael Egnor:

And they take off the blindfold. And the first question you would ask is, "What happened? Why did you miss? How did this happen?" And to answer that, and say, "Well, it was just chance. If it wasn't because of that, then you wouldn't be alive here to ask the question." But that doesn't mean it's not a valid question. It's a perfectly valid question to ask, Why are things the way they are? Even if your continued existence depends on it. It doesn't mean that the question goes away.

Robert J. Marks:

Well in fact, if I was in that firing squad situation, I wouldn't just shrug my shoulders and say, "Well I'm here. So it must have happened." I would spend a lot of time investigating what the heck happened. I would be very interested.

Michael Egnor:

Maybe you got 12 friends on the firing squad. The fix is in somehow. And when you look at the universe, and you look at the existence of life, the existence of human beings, the fix is in. And just because our existence depends on the fix, doesn't mean that the fix isn't worth understanding. The fix is still there and it's fascinating. And of course, people who are traditionally religious Christians and Jews and Muslims and people who have thought about this a lot, may well have some insight into the nature of that fix.

Robert J. Marks:

Yeah, I think that the anthropic principle, be it for cosmology or for human biology consists of the guy at the firing squad, just shrugging his shoulders and walking away. So, well it happened.

Michael Egnor:

Right. Right, which is crazy. Which is crazy. Which is a deliberate effort to not understand what happened. And that's, to me, what comes through again and again, when I look at Darwinian arguments. Is that it boils down to a deliberate effort to not understand. Well, Dr. Marks, thank you very much for joining us. It's absolutely fascinating. And thanks again, to all our listeners for listening to Mind Matters News. And please listen to us again in the future.

Announcer:

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