Excerpts from 2011 Isaac Asimov Memorial Debate
American Museum of Natural History

Hosted by Neil deGrasse Tyson

Panel discussion including S. James Gates, Jr., Professor of Physics, University of Maryland

http://www.amnh.org/explore/amnh.tv/%28watch%29/isaac-asimov-memorial-debate/2011-isaac-asimov-memorial-debate

Transcript beginning at 01:01:33

NdGT: So where has this pursuit taken you [Dr. S. James Gates, Jr.], where have you landed?

A: [Prof. Gates:] Oh my god. Why would you ask that?

NdGT: I'm asking you that here and now. It's New York City, it's March 7 [2011] … Where have you landed?

A: Well, partly it's taken me to these strange images that are behind your head right now.

These are pictures of equations. I've been for the last 15 years trying to answer the kinds of questions that my colleagues here have been raising. And what I've come to understand is that there are these incredible pictures that contain all of the information of a set of equations that are related to string theory. And it's even more bizarre than that, because when you then try to understand these pictures you find out that buried in them are computer codes just like the type that you find in a browser when you go to surf the web.

And so I'm left with the puzzle of trying to figure out whether I live in The Matrix or not.

NdGT: Wait – you're blowing my mind at this moment. So, you're saying – are you saying your attempt to understand the fundamental operations of nature leads you to a set of equations that are indistinguishable from the equations that drive search engines and browsers …

A: Yes.

NdGT: … on our computers?

A: That is correct. So …

NdGT: Wait wait. I have to just be silent for a minute here. So you're saying as you dig deeper, you find computer code writ in the fabric of the cosmos.

A: Into the equations that we want to use to describe the cosmos, yes.

NdGT: Computer code.

A: Computer code. Strings of bits of 1's and 0's.

NdGT: It's not just … sort of resembles computer code, you're saying it *is* computer code.

A: It's not even just is computer code, it's a special *kind* of computer code that was invented by a scientist named Claude Shannon in the 1940s. That's what we find buried very deeply inside the equations that occur in string theory, and in general in systems that we say are super-

symetric.

NdGT: Ok. Time to go home, I think. I mean ... where are we going to go after …. So, are you saying we are all just … there is some entity that programmed the universe; and we're just expressions of their code ...

A: Well, I didn't say that ...

NdGT: … like The Matrix? That's what you said ….

A: Some of those codes are showing on the screen behind you right now. They don't look like codes, but these pictures, which we call "Adinkras," are graphical representations of sets of equations that are based on codes.

So this is, in fact, to answer your question more directly, I have in my life come to a very strange place because I never expected that the movie "The Matrix" might be an accurate representation of the place in which I live.

Transcript beginning at 1:34:16

Q: [from audience:] This is towards Dr. [James] Gates. I'm curious about your theory, you say there's computer code in these equations. Now, computer code is generally just instructions for a processor; and I'm curious as to what the instructions you're findings are; and if you're not sure, what's to say that it's actually computer code? I mean, theoretically the number pi has all the data that's ever existed.

A: Well, we say that they're computer code …

NDT: You mean the digits in pi …

Q: Yes.

A: We say that they're computer code, first of all, because the structure of the equations is such that they dictate that there are certain things that are actually strings of 1's and 0's. That's – now that's just digital data. But it's not just random 1's and 0's. As I mentioned earlier …

Let me talk about something that you probably do every day, but – I don't know if you're a computer scientist or not – but most of us …

NDT: Sounds like that kind of fluency.

A: Ok, well, most of us sit at our computer screens and we type on the keyboards, and we then send these – if we're using a browser – we're sending strings of 1's and 0's elsewhere. But on the other hand, in the transmission process, there's always some fluctuation. So a 0 that you type here, because of static in the line might be read as a 1 at the other end and vice versa. So, in fact, when you sit and type at the keyboard, your computer's doing something behind your back. Namely, it throws in a bunch of extra 1's and 0's, which – and these things are called "error correcting codes" – so that the computer at the other end can look at the whole collection of what you typed plus what was sent and figure out if there were bits that were being flipped back and forth. And that's how you get accurate transmission of digital data.

Among the codes that are used for this purpose are a special class of codes that are called "block linear self-dual error correcting codes." They were first, in fact, the Shannon extended check sum code is an example of one of these things.

These are the codes that we find buried in the equations – not just any code, but these self-dual error correcting block codes. It is quite remarkable for anyone that I've talked to. We have no idea what these things are doing there.

Q: Do you have any literature out?

A: I'm sorry?

Q: Do you have any literature out that …

A: I can give you technical references that almost nobody in the world can understand.

NDT: But you … I thought you had a popular-level article on this?

A: Thank you, yes, actually in … so … this past June the British journal Physics World asked me to write a popular-level description of what we've found. So in the June [2010] edition of Physics World – it's published in London – the cover story is called "Symbols of Power," and it's about these weird symbols that have been showing behind us – we call these things "Adinkras" – so that for a popular-level description, yes, we've written that. But other than this one popular-level description, it's all technical gobbledygook. And that's a technical term, by the way.

NDT: [Laughing] Gobbledygook.

Q: Thank you.