An Economic Genius Talks About Gaming AI

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Speaker 1:

Is artificial intelligence setting up a demotion for the human race? Our guest and Discovery Institute Co-Founder, George Gilder, sure doesn't think so. This week, we revisit our discussion with George Gilder on a variety of topics and AI, as well as his book titled Gaming AI: Why AI Can't Think But Can Transform Jobs. Now, here's your host of Mind Matters News, Robert J. Marks.

Robert J. Marks:

Greetings. AI is really good at winning games, but how does this and AI's other accomplishments translate to applications in the real world? When will be reduced to practice? Our guest today to talk about this is George Gilder. And George really needs no introduction. He's a friend of movers and shakers, from presidents to business luminaries and politicians. And George Gilder's economic and business prophecies have famously been fulfilled again and again. And he is the co-founder with Bruce Chapman of the Discovery Institute, and of course, the Bradley Center for Natural and Artificial Intelligence as an arm of Discovery Institute.

Robert J. Marks:

George Gilder has penned a new monograph for the Bradley Center entitled Gaming Intelligence: Why AI Can't Think But Can Transform Jobs. The monograph is available, like everything else in the world, from amazon.com, in print form and in Kindle. George, welcome. Thank you for spending time with us.

George Gilder:

Great to be here, Bob. You're quoted in it. You're the same Bob Marks, so imparts great wisdom about the limitations of AI in the pages of this monograph.

Robert J. Marks:

That's right. I noticed that, and I wasn't going to talk about that because that would be flying my own colors. But thank you for mentioning that. Thank you for flying my colors.

George Gilder:

Okay.

Robert J. Marks:

So really appreciate. You begin your monograph with the following statement. I'm going to quote here. "Artificial intelligence has become this epoch's prime battleground in technology, philosophy, and even religion. At stake is the agenda of a new demotion of the human race." We'll unpack this a little bit as we go along, but how in general do you see AI as a new demotion of the human race? This is pretty serious prose.

George Gilder:

Well, it declares that the human mind is just a machine that can be simulated by computer algorithms. And so just as it was believed that the great geocentric model of the universe was replaced by the

Copernican view that had the sun the center of the universe, thus demoting the human endeavor from being the center of everything to becoming a mere planet of a larger body. And ever since then, science has been further demoting the earth to a fringe planet in one of multiple parallel universes that are often assumed, without any grounding or persuasive evidence.

George Gilder:

So this is machine learning and AI, artificial intelligence, are believed to be headed for a singularity, as my friend Ray Kurzweil calls it, in which machines will be able to outperform human minds in every contingency and application. And human beings really will become unnecessary. And indeed, the vision is that these machines will become so powerful that they can replicate and advance themselves so that they will project their intelligence and technology through the universe, and ultimately colonize the whole universe in a way that mere human beings, with our biological, carbon-based bodies never could accomplish. So it is a way of diminishing the human mind to some material phenomenon that can be reduplicated readily by a machine and then constantly exceeded by machines.

Robert J. Marks:

You have a phrase for this in your book. You call it materialist superstition. I really like the combination on those two words. And that's really what you're talking about. And you also refer to something called the AI movement, which adopts this material superstition. How widespread is this AI movement? What is the AI movement?

George Gilder:

Well, from China to the United States. But oddly, even though AI is advancing just as fast in China, if not faster than in the United States, there's less inclination in China to regard it as a threat or as some channel to usurping the human brain. So it really is a specialty of the American academic science, this materialist superstition. I call it the flat universe theory, which is just as delusional as the flat earth theory. The flat universe theory says there's nothing out there but physics and chemistry. And that is the materialist superstition, the belief that there's nothing there except physics and chemistry.

Robert J. Marks:

So yeah, this is very interesting, especially since China is notably atheistic, and therefore materialistic. And they're sinking, I believe, the figure I heard was $30 billion into development of artificial intelligence. And yet, you say that this movement isn't as dominant there as it is here. That's really interesting.

George Gilder:

Yeah. I think they're just more practical at using these machines to enhance human capabilities. And that's really what AI does. I mean, recently, the Deep Mind division of Google, which is their really most sophisticated AI division, although there's AI all over Google. But Deep Mind has recently mastered protein folding.

Robert J. Marks:

Yes.

George Gilder:

And that is a major achievement. It's the sort of last frontier of the biotech revolution, or one of the latest frontiers of the biotech revolution. We discovered DNA and the coding that translates directly into proteins by a very complex process from a DNA code to the ribosome to the 22 amino acids in a protein. But until you can actually fold the protein in the complex way that proteins plectics are manifested, you can't really create a protein that works. So this breakthrough by machine learning and AI is very impressive. And if you have a process that's deterministic, and can be expressed in symbols, then that AI and machine learning has awesome capabilities. And they've achieved a goal that humans with their much slower algorithmic processes, humans have inductive capabilities, and imaginative capabilities, and moral capabilities, and century integration, and all kinds of mental capabilities that are really absent in AI.

George Gilder:

But AI, if you got the problem structured, and it's deterministic, and the inputs can be rendered mathematically, can do billions or even trillions of parallel operations a second, and thus achieve absolutely amazing acceleration of human capabilities. But no matter how fast they compute, there's no trigger point where they suddenly become a mind.

Robert J. Marks:

Yes, absolutely. One of the things, Alpha Fold, they have algorithms that predict the structure of a protein based on its genetic make up. I'm really not an expert in protein folding, but one of the quotes that I found from Deep Mind's CEO, I think his name is Demis Hassabis.

George Gilder:

That's right.

Robert J. Marks:

He said, "It's still a long way to go before we can say we've solved protein folding in any meaningful way." So they've made lots of progress, but they still have a long way to go, I guess, towards the final solution is what I understand.

George Gilder:

I guess that's true. However, they did solve for I think 38 out of 43 of the protein folding problems that they confronted were solved by the Deep Mind process. And the best human contribution, I think, was 6 or 7 out of 43 problems. These are just rough recollections. But I think they did figure out the folds for those particular molecules, but of course there's infinite possible molecules. So to solve 43 may not be ... It's a promising start certainly. And it is something that machine learning achieved that human learning processes couldn't because of the conditions that I describe. It's a deterministic problem. The data can be expressed in a symbol language, a code, and it can benefit from the vast acceleration that computational silicon can achieve.

Robert J. Marks:

This is quite an accomplishment. There was an effort at the University of Washington 20 years ago called Fold It, where they farmed out computational resources. So if you weren't using your computer at 2:00 AM in the morning, you let Fold It use it. And then they had some graphics. And then they decided to turn it into a game, and it turned out that people, that is their customers, played the game and were able to solve the Fold It problem where the algorithm was unable to do it. But that was 20 years ago. So

we've made quite an advance since then. And the other thing that strikes me is folding protein is kind of like a game, right? That's what Deep Mind does well.

George Gilder:

That's right. I mean, you see, I began this subject really by going back to Leslie Park in Britain during the Second World War, when Alan Turing and IJ Good were key figures in solving all the German codes, and thus making an absolutely vital contribution to the victory in the Second World War by endowing the British military intelligence with the capability of interpreting all the German codes. It was an amazing feat. And the computers were called the Colossus.

Robert J. Marks:

Yes.

George Gilder:

And that, I think, was the first great feat of artificial intelligence. I mean, humans, no matter how many together, could not do essentially real-time breaking of encryption in war time codes. And yet this machine that Turing and his team programmed could do this. And I'd learned that Turing and Good used to practice for their programming challenges by playing the game of Go.

Robert J. Marks:

Really?

George Gilder:

They also played Chess. And Turing taught Good the game of Go. And so Go is regarded as an ultimate intellectual challenge, both in China and Japan. It really has a tremendous mystique in Asia. And what precipitated that giant Chinese AI program, 30 billion and more that you've cited, is when the Deep Mind program beat the Lee Sedol, who was the world champion in Go. And now, to this day, people who say AI is going to usurp human brains, and it's going to take over the world, and is going to replicate and advance and take over the universe in a singularity for the entire cosmos, people who believe that continue to cite the victory in Go and the victory in Chess and the victory in these games. But games are identified by the fact that the symbol systems and the actual objects, the maps and the territories as it were, are the same thing.

Robert J. Marks:

Yes.

George Gilder:

But we all know that maps, no matter how refined the digital map, it differs inexorably from the actual territory. And it takes human beings' interpretance, as Charles Sanders Peirce wrote many years ago, to mediate between the map and the territory. And it's symbols and objects. There's no intrinsic identity between symbols and objects. And if it's a game, the real essence of it is the symbol and the object is the same thing. In Go, you have these two little stones, and you move them across a board with hundreds of points on it. And the symbols and the objects are the same so that if you can program the computer to conduct these Go games at billions of cycles a second, they can obviously outperform any human being.

George Gilder:

But that's because there's no difference between the symbol and the object. But the rest of the world, where we live, we have symbols, we have mathematical languages, we have computer codes, we have a vast array of symbol systems which allow us to interpret reality. But the symbols are never the same as the reality. They're labels. They got to be applied by human minds to reality. As CS Peirce put it, they need an interpretant between the symbol and the object. And he contended on this basis that reality is not binary as computer languages are. Reality is triadic. It's three way. Symbols, objects, plus interpretants. And this is the flaw of materialist superstitions, always visions based on games, successes in games, extrapolated to successes in reduplicating human intellectual capabilities.

Robert J. Marks:

We were talking last time about the AI movement. In your book, and I like this, you list six assumptions of the AI movement. Now, these are not necessarily false. They're applicable sometimes. But I wanted to visit three of them. The first one was the modeling assumption. And we basically covered this, I think in the first podcast. I don't know if you want to add anything, but it is the assumption that a computer can deterministically model a brain. Now, I mention that some of these were false and some of these were true, sometimes and not, but this one looks to be one that is patently false. Would you agree?

George Gilder:

I do. I started with Godel's Proof. The whole computer industry seems to have forgotten the foundations of their science. Godel really proved the incompleteness of all logical systems through imagining a kind of software system that embodied logical propositions from Boolean concepts. And he proved, using this software system that he conceived, it really was a software system, what we would call today a software system. He proved that all logical systems, including mathematics, and arithmetic, and Boolean algebra, philosophical logic, whatever it is, they're all dependent on propositions beyond themselves that can't be reduced to the system itself.

George Gilder:

Alan Turing, who was the giant of computer science, along with John von Neumann, who really was propelled into computer science by Godel, and made Godel famous. Godel was an unknown, 21-year-old, very nervous nerd at the time. And von Neumann made him famous. But Turing really is the giant. And Turing took Godel's Proof and applied it to computer science. He really created, in his universal Turing machine, which is the fundamental architecture of a computer to this day. And he showed that no computer system can work without an outside interpretant, essentially. Turing called it an oracle. And that's where we get Oracle computer. Turing said that every computer system has to have an oracle to interpret the world to it, and it's a repetition of Charles Peirce's insight that logic is triadic, and Godel's insight that every logical scheme requires axioms outside itself, relies on axioms outside itself that can't be generated by the program.

George Gilder:

So this is all basic computer science, really the history of how computers were invented. And John von Neumann and Kurt Godel became Einstein's greatest friend. And they walked famously every day to Woodrow Wilson Center at Princeton, discussing these baffling issues. And all this completely applies to artificial intelligence. They need oracles. They need outside axioms. The machines can learn if the data is structured in a form that the machines can read. And so once again, you need a human mind.

Robert J. Marks:

Yeah. You mentioned also ... Godel, by the way, I've plowed through his theorem. But it's most easily understood by looking at the work of Turing, and later Gregory Chaitin, who is a guy that you mention.

George Gilder:

Yeah, Gregory Chaitin the great. He's another great figure who really invented algorithmic information theory with Kolmogorov.

Robert J. Marks:

Yeah.

George Gilder:

And they, once again, proved it again, that this is a great tradition in computer science that many of the actual engineers building computers have almost forgotten.

Robert J. Marks:

Now, I don't know, I think that most of the computer scientists know about Godel, hopefully, and they definitely know about Turing and the Turing halting problem, and the great things that Turing did. Are they living in a state of delusion by simply ignoring these facts and going ahead with their silly assumptions about what can be done in the future?

George Gilder:

Yeah, because they uphold the materialist superstition. It's their great religious faith that somehow, if they make the computer go fast enough, it'll reach some kind of trigger point, where Godel, and Turing, and all the great figures in superlogical aporias disappear. It's kind of a faith in a magic moment in the materialist superstition. It's the religion of atheists.

Robert J. Marks:

Very good. The other ... We were going through the different ... You made six statements about assumptions of the AI movement. And we started with the modeling assumption. The second one was the big data assumption, that the bigger the data set, the better. There's no diminishing returns as data set gets larger and larger. Why is this an assumption? I don't think this is true. I think you're going to get into problems. But what's your take on why this is a problem, why this is an assumption of the AI movement?

George Gilder:

Well the AI movement explicitly believes that part of this process of AI achieving a singularity is that it has so much data that the data essentially becomes consonant with the world, sufficient to completely and in detail model the world and the universe. And it's the assumption that the more data you have, the smarter this AI is going to grow. And I think that assumption is just wrong. All the data has to be structured, it has to be presented to the machine. It all comes a crapper because of the basic problem of symbols and objects that I spoke of before.

George Gilder:

Symbols and objects aren't the same. And the relationship between the symbols and the objects is not fixed. It changes. You have a cat as a definition. And the boundary conditions for cats, where do they become bobcats? Where do they become lions? Where does the cat realm begin and end? Cartoon cats, it's just AI began with the promise of telling cats from dogs. And they can sort of do that now. This was the other ... AI is now conducted on what are called neural networks, which leads to some of the delusional ideas that now we've broken beyond the Turin machine, and we're now creating neural machines that somehow simulate human brains.

Robert J. Marks:

This hype has been around for a long time. I'm old enough to have lived through other so-called AI revolutions. And I don't know, the hype is just repeating. People don't understand history, which is a point you make in your monograph.

George Gilder:

And also in my other book, Life After Google is my current book that also addresses a lot of these subjects from a different point of view.

Robert J. Marks:

Okay, great. We will make, by the way, in the podcast notes, we will make links to George's book. The fourth area of the assumptions of the AI movement, the third one I want to talk about is the ergodicity assumption. I got to tell you, George, I love the term ergodicity. I think that nerds are familiar with the concept of ergodicity from studying things like time series and stochastic processes. But applying it to AI was really, I think it was just spot-on. It identifies a limitation. And I think I told you, my email, that we are working here at Baylor University with a PhD student now trying to quantify the concept of ergodicity for artificial intelligence. Unpack ergodicity for us a little bit.

George Gilder:

Well, it means that the same inputs the same outputs for each process, roughly. I mean, there are lots of refinements of the concept, but that, in essence, is what it says. And if the relationship between inputs and outputs changes frequently, as the real world shows, then your AI system will be wrong a lot of the time. It's right for one relationship of inputs and outputs, but it can't overcome the ergodicity problem that inputs and outputs in the real world are continually evolving and changing and transmuting.

Robert J. Marks:

It's very clear there's lots of things out there that are not non-ergotic. One is probably forecasting the market from tick data. I had a friend, Jack Marshall, who was a professor of financial engineering that was approached all the time by people that says, "I have beat the market by artificial intelligence." And of course, doing so would have required ergodicity. Jack said he didn't even have to look at the program or the results. He simply asked the person who made the claim what kind of they drove. And if their program had indeed worked, they would be driving a very nice car, but most of these were poor students that had never reduced it to practice. So I think that's the classic non-ergotic process, or one of them, is attempting to apply AI to tick data from the market in order to forecast it.

George Gilder:

You can calculate various probabilities, and using probabilities does result in very massive, fast, parallel processing, you can trade the market very successfully, as one of the chapters of my book, Life After

Google. And not to just ... But one of the chapters tells the story of Renaissance, which is the most successful investment fund in the world, and really in history. And they accomplished this, something like 40% or more growth for 20 years, profits for 20 years. And they did accomplish it by using computers to very rapidly trade in the market. And what they were doing was essentially front running.

George Gilder:

They would gauge what participants in the market were doing. And before they could complete their trades, the computer would accomplish the trade, thus they'd front run and scored tremendous, earth-shaking, historic gains. And I believe this kind of computation should not be legal in stock markets.

Robert J. Marks:

Really?

George Gilder:

Yeah. I don't think ... I mean, if front running isn't legal for humans, it shouldn't be legal for computers. And it's using the speed of computation to game the markets, just as AI tries to game all these other dimensions of reality, like driving a car. It's also trying to game the markets. And the fact that they can conduct thousands of transactions while a human being is just reaching for the keyboard means that they can out-trade human beings. And I don't think that's a legitimate technique. It has nothing to do with investment.

George Gilder:

I mean, now half of all the trades are determined by computers, or more than half the trades in the stock market are determined by computers. And they're fast trades. And they don't have anything to do with investment. There's no knowledge about specific technologies and companies and competitive environments and future possibilities. It's all just identifying trading patterns before they happen. And I don't think that's an abuse of artificial intelligence.

Robert J. Marks:

That's fascinating. Jack Marshall, the person I talked to you before, was not a believer in forecasting the market. I can understand short-term forecasting.

George Gilder:

Yeah, it's all very short term. It's thousands of transactions a second or a minute or whatever. I mean, it's something far beyond what any human trader can dream of accomplishing. So the calculation was that they could do four months of transactions in a second. So they're not legitimate players in the market. They're outperforming humans simply by the speed of operations.

Robert J. Marks:

I've heard that some trading companies have laid fiber between them and the market in order to get faster transactions to get a heads up on these sort of trades that you're talking about.

George Gilder:

Isn't it absurd?

Robert J. Marks:

Well, that is absurd.

George Gilder:

This has nothing to do with investment.

Robert J. Marks:

No, no.

George Gilder:

Investment is learning. It's the growth of knowledge. Wealth is knowledge. Growth is learning. It's registered in all the learning curves that are the most thoroughly documented phenomenon in economics.

Robert J. Marks:

Yes.

George Gilder:

And these computers are just learning about transitory patterns in the froth of trading. That has nothing to do with the learning processes that propel capitalist investment.

Robert J. Marks:

Jack Marshall said he used tick data to forecast futures. And I said, "Jack, I thought you said you didn't believe in that?" He says, "Well, in this case, it worked." He said, "Everybody else in the futures market was using tick data, and these indicators like stochastics, and trendlines, and things of that sort." And he said, "Everybody was using. My job was just figuring out a little bit earlier than the other people what exactly they were going to buy and sell."

George Gilder:

Front running.

Robert J. Marks:

Yeah, that is an early example of front running I guess. But that was before the computers. Didn't this front running cause the flash crash that we saw a few years ago?

George Gilder:

It's believed to have, yeah. I mean, it causes a lot of volatility in the market. And I believe the cause of it is what I call the outsider trading scandal. Because the SEC regulates inside trading, and prosecutors like Preet Bharara in New York very aggressively prosecute insider trades of any sort, that poor woman got sent to jail for two years for some phone call where she-

Robert J. Marks:

Oh, jeez.

George Gilder:

What was her name? Famous Martha Stewart.

Robert J. Marks:

Oh yes, yes.

George Gilder:

But Preet Bharara has never indicted a computer. So the result is that now half of all trades are computation, and you got these all these exchange traded funds, which are ETFs, which are all computer contrivances. And none of them contribute any information valuable to a long term investment process. They're all just gaming the market like AI games Go or Chess by performing, projecting moves, millions of times a second.

Robert J. Marks:

I never thought of that. The market is kind of like a big chess game, trying to anticipate moves.

George Gilder:

Not if people are actually investing for long-term gains. I don't think short-term trading is investment. They claim it affords liquidity, but there's plenty of liquidity.

Robert J. Marks:

You say there is reason to believe that AI is currently enjoying an Indian summer. First of all, I would question the political correctness of Indian summer, and second, why do you believe that we are on the verge of an Indian summer in artificial intelligence?

George Gilder:

Well, I just think the dreams that AI is cruising toward a singularity, where it will essentially usurp human minds, and then transcend the capabilities of human minds is delusional. And so today, everybody's talking about AI. And part of the mystique is the idea that AI and machine learning, where machines learn to recognize patterns without having the patterns fully specified ahead of time so that the machine can actually learn a subject by identifying repetitive patterns in it. This process, at some point, will allow the machine to design new machines, replicate themselves, and then design ever better machines that ultimately acquire an intelligence that can be projected off into the universe and can populate the universe with machine mind.

George Gilder:

And that this dream, it's sort of a religion of the nerds. It's the materialist superstition, belief in a flat universe where there's nothing but material and the laws of chemistry and physics. This idea that ultimately, human beings can retire to beaches on a guaranteed annual income while maybe Brin and Page of Google and the other AI entrepreneurs fly off to nearby planets with Elon Musk in a winner takes all universe. This is sort of the dream of AI. And it's all going to come a crapper. AI can't do any of that stuff.

George Gilder:

It can do jobs that human beings define. It can perform with tremendous speed and efficiency. But it doesn't begin to threaten human minds, to usurp human minds. It can amplify and extend human minds, and relieve human minds of rote work that is really below human capabilities. But it doesn't pose any kind of threat to human minds, or even jobs for that matter.

Robert J. Marks:

You call super intelligence, which I believe requires creativity, and I think that we both agree that AI and computers can't be creative. You have to have a software that creates better software, that creates better software, and that creativity is beyond the capability of artificial intelligence. You call super intelligence the rapture of the nerds is one of the quotes that I really enjoyed.

George Gilder:

Oh good. Thank you.

Robert J. Marks:

Yeah. You, as I recalled, are neighbors with one of these proponents of AI, Ray Kurzweil.

George Gilder:

Yeah, Ray, if you look closely at Ray's statements, they're becoming increasingly modest.

Robert J. Marks:

Are they? Okay.

George Gilder:

Yeah. The singularity is coming, but the singularity won't really displace human beings. We'll become better. He understands that the idea of usurping human beings isn't a very popular vision, or a very good business plan for Google, where he now works as chief of engineering. So I'm just saying that I detect a certain moderation in Ray since he first pronounced the singularity.

Robert J. Marks:

There's been, in my perception, a decrease in talking about artificial general intelligence. You mention Ray Kurzweil, but I also see that from Deep Mind. A few years ago, that was just a really hot topic. But now, it's been diminished. We don't hear much talk about AGI anymore.

George Gilder:

That's because AI is application specific, essentially. It can be assigned to specific applications, governed by specific symbol systems, with specific levels of ergodicity and assumptions that, given inputs, will always produce the same outputs, determinist expectations. It's a computer system. And all computers are ultimately application specific.

Robert J. Marks:

What's going to be the future of computing technology? That's covered quite a bit in book about Google.

George Gilder:

Yeah, Life After Google.

Robert J. Marks:

Yes.

George Gilder:

I like to ... It will end up serving human minds, as computers always do. And I like to compare ... I started doing connectome studies. And I started reading about the connectome of the human brain, that's all dendrites, and axons, and neurons, and synapses in the human brain, all the various components as they might be called of this miraculous human brain from which somehow mind is emerging by some means that people don't yet fully understand at all. They scarcely can model a brain of a worm or a fly, so they really are still rather far short of the mind of a man.

George Gilder:

So the connectome, there have been a whole series of books about the human brain and its connectome. And it was familiar to me because I previously had for decades been studying the internet and the connectome of the internet. And if you take the whole global internet, until a couple years ago, it took to map all the connections in the global internet, it took about a zettabyte. That is 10 to the 21st power. And the total memory capacity of the entire internet was measured in zettabytes. And thus, I was fascinated to discover in these books on the connectome, and there's one from MIT, and there's a number of them that are cited in my monograph.

George Gilder:

And it turns out how big do you think the connectome of one human mind is. It's about a zettabyte. In other words, one human brain is about as densely and complexly connected as the entire global internet. But one human brain functions on 12 to 14 watts of energy. Well, the global internet takes gigawatts of energy, billions of watts. So ultimately, people just don't really understand mind very well. And so when they talk about mind being a machine, they just don't understand it. They don't understand human beings created in the image of their creator, to be creative and conscious. And all these visions just are absent from the AI model. So the singularity is achieved not by a giant advance of technology, but by a delusional diminution of the human mind to a binary machine.

Robert J. Marks:

Interesting. You said enthusiasts for connectome studies must face Stretton's Paradox of connectome knowledge. I tried to google Stretton's Paradox, but couldn't find it. What is Stretton's Paradox?

George Gilder:

This is Tony Stretton, who worked with the major biological laboratory at Cambridge in Britain, and then came to Wisconsin, where he's been a professor of biology for decades, and did the first full connectome of a nematode worm. And he started out thinking this was going to be a simple job to really define all the connections in the brain of a tiny worm, which is the smallest entity that's believed to have a full discrete brain. And he said the more he learned about the brain of a nematode, the less he felt he knew. He was in the newtonian, this could be called Newton's Paradox, that the more he learned, the less he knew. And oceans of reality lay still far beyond his reach and beyond his can.

Robert J. Marks:

So the connectome doesn't suffice for the explanation of what's going on totally, I guess?

George Gilder:

Yeah, oh yeah. Once you got the connectome, once you get this connectome of the human brain, you still don't know how it works.

Robert J. Marks:

Right.

George Gilder:

Well once you have a complete connectome for the internet, you probably know how it works pretty well, because it's mostly binary computer processes, concatenated around the world. And if you can really map them in detail, you pretty much have the definition the schematic for the entire global internet. But you define the connectome of a mind, and it's still eludes you.

Robert J. Marks:

So just because a human brain has a zettabyte in terms of its connectome, it still doesn't come close to explaining everything.

George Gilder:

Yeah. And so ultimately, computers work to the extent that they serve human minds. And that's always been the way they work. Turing's oracle, he said that no computer can function without an oracle that's independent of the computer itself. And Godel applied this principle first to all logical systems. They're all dependent on axioms that can't be reduced to the systems themselves, whether they're mathematics or algebra or computer algorithms or whatever they are. They still can't be complete. It's called Godel's Incompleteness Theorem. And Godel and Einstein used to discuss this as they walked through the streets of Princeton for years. They were best friends and at the Woodrow Wilson Institute of Advanced Studies, or whatever it was called.

Robert J. Marks:

I understand that Einstein went with Godel when he got sworn in for US citizenship, which is pretty cool. I guess they were really good friends.

George Gilder:

Yeah, yeah. I forgot that Einstein testified for Godel to get ... Yeah.

Robert J. Marks:

Yes. Yes. Okay, a little different topic. We've talked about artificial general intelligence being reduced on the spectrum in discussion.

George Gilder:

And the reason for that is Turing defined that also. Because Turing said the Turing machine, which is a computational machine, a computer, could do anything any other machine mind could accomplish, presuming infinite tape, infinite printers ink, infinite possibilities. And of course, that's a pretty severe

condition. The defenders of the ultimate singularity think you go down to Fry's Computer in Silicon Valley and buy various infinite tapes and infinite memory systems and everything.

Robert J. Marks:

That'd cost too much.

George Gilder:

But they cost quite a lot.

Robert J. Marks:

You mentioned Turing's buddy, Jack Good. And I learned from your monograph that, again, he was a colleague of Alan Turing. But he first voiced the idea of a singularity in 1965. He called it an ultra-intelligent machine. Was he the first, do you believe, to talk about this idea of an intelligence explosion?

George Gilder:

This goes all the way back to Babbage and Ada Lovelace. And it's all the people building computational machines always imagined that in some way they were reaching toward simulation of a human mind. It's really been a dream of computation, virtually from its origins. And so lots of people through history have speculated on if you can build a calculating machine that can add and subtract numbers, can't you imagine in some future era it'll be possible to create a gigantic calculating machine that can simulate a human mind. And now we're here, and we are producing these giant binary calculators and imagining that they can simulate, or in a singularity, reproduce the human mind. And once again, they're failing. But the more they fail, the more they uphold the ultimate goal. It's the religion of the nerds, the rapture of the nerds as I call it.

Robert J. Marks:

Rapture of the nerds. I love that. There's a bunch of stuff I'd like to talk about. Some of it's a little bit disjoint. Let's talk about blockchain. Blockchain of course is the engine behind bitcoin. And a few years ago, a few years ago blockchains were supposed to be everywhere. But I haven't heard about them much in the news. What's happened to blockchains. You talked about blockchains a lot in your book, Life After Google.

George Gilder:

Well blockchain, for one thing, the Chinese government, under Xi Jinping, Chinese communist government has adopted blockchain as a core technology for the future of China.

Robert J. Marks:

Really?

George Gilder:

And has launched a blockchain platform for the entire Chinese economy, and a new digital yuan currency that's affiliated with their blockchain platform, their national blockchain network. And while American congressman and senators are panicked by the idea that Facebook might launch Libra on the blockchain and somehow undermine the venerable dollar, the Chinese are cruising on to adopt blockchain. And I believe that we're headed towards some kind of monetary crisis where bitcoin will

have its day. Although, bitcoin has real limitations that make it difficult to become a currency. So there's still room for generating a currency that actually can expand with the global economy rather than be capped, like bitcoin, at a absolute limit of 21 million units.

Robert J. Marks:

So that's a limitation, right?

George Gilder:

That's a limitation.

Robert J. Marks:

I see. Okay.

George Gilder:

That renders it inherently a deflationary currency, and that's a mistake. So bitcoin has its flaws. But nonetheless, blockchain is a crucial new distributed architecture for the internet and for the global economy. And unlike the current internet architecture that's hacked 8 billion times a year now. The more we spend on internet security, the less secure the internet becomes. It's eminently hackable. And world money, currency trading is $6.7 trillion a day.

Robert J. Marks:

Whoa.

George Gilder:

And that's 70 times all world trade in goods and services, 70 times, and still it's up 30% in the last three years while we have a trade war, and trade actually diminishes by some measures. So certainly its growth has halted. And so blockchain still has a critical role in the future of technology. It can provide the basis for distributed internet architecture rather than this porous pyramid we now have where all the data and money and power rises to the top where it's controlled by a few Leviathan social networks and search engines and whatever, and where it can be hacked.

George Gilder:

You know where it is. You know where the important information is. It's at the top of the pyramid. Blockchain provides a model where the information's distributed across all the nodes in the network through a mathematical process called hashing. And it means that unless you control the whole network, you can't change anything that's on the blockchain. And so it is both an answer to this hacking of internet security, and the hacking of global money by central banks and politicians.

Robert J. Marks:

Do they literally hack the encryption? That's impossible. That's not possible is it?

George Gilder:

No. No, the central banks, they just hack the currency. They just manipulate it and multiply it and divide it and use it as a magic wand for political causes rather than a measuring stick for value, which is what money should be and what real money is. Money is really based on what remains scarce when

everything else is abundant, and that is time. Time is what money really is. Money translates time, which governs every economic transaction at an enterprise. Money translates time fungibly into the economy.

George Gilder:

So blockchains are really useful for any kind of computational process or transactional process that needs a ground state, needs a secure ground state that can't be manipulated. So blockchains are going to be very useful in the future, and they actually are. Blockchain advances come almost daily, and the China East breakthrough is just amazing. So the blockchain is real. In my book, Life After Google, it became for awhile a second bestseller in China. And it got the award last year as the best social science book in China, published in China. So that's why I've been in China so much over the last year, chasing Life After Google. And they really adopted its message. I don't know whether they will ... It'll probably be a somewhat porous blockchain, with back doors for the communist potentates.

George Gilder:

But blockchain is pretty hard to manipulate, so there's going to be a struggle in China to define the limits of the blockchain and how it functions. And it's going to be very interesting to watch because it does give you identity, and a lot of people think that facial recognition is a threat to identity. I want to be recognized when I go out to the airport or whatever rather than being treated like a terrorist as the TSA has to do, treat everybody as a terrorist, if they can actually identify you, as the new Clear system in a lot of the airports now do. And they're trying to make advances which use face recognition. And it's great to have your Apple iPhone that can see you and recognize your face and let you in immediately rather than have you have to recall which unmemorable password, complex number password you happen to adopt for any particular app.

George Gilder:

And so I like face recognition. And I just think we're making some mistakes in the understanding of new technology that derive from our belief in a singularity, this idea that somehow technology threatens the human mind, threatens human jobs, threatens human uniqueness. That belief is really crippling our technology because it makes people fearful. And actually, technology is good. It creates jobs always. Technology never destroys jobs, at least in a free economy, it generates the capital to create new work. People don't get hired because they're unproductive. AI and other such technologies make people more productive, and thus more employable, and provide better jobs, safer jobs, and more creative jobs. And so my whole theme is this is AI is a hopeful, wonderful, new amplifier of human work and employment, not a threat to human uniqueness or capabilities.

Robert J. Marks:

I agree. Yes. If it's done right. There'll be problems, but I think those can be mitigated.

George Gilder:

Yeah. Yeah.

Robert J. Marks:

I wanted to ask you about bitcoin, back to bitcoin. You're familiar with Dread Pirate Roberts and his website on the dark web for selling drugs. He used bitcoin and he escaped detection for a long time. That was one of the things about bitcoin which was attractive is everybody can be anonymous. I like the idea because I don't know if I want my government, or anybody else, knowing what transactions I make.

But what's the privacy sort of issue? I also read that in South Korea, that a dark web website in kiddie porn was broken, and it was because of the visibility of bitcoin. Are there new laws put into effect to make the ownership of bitcoin more visible and more accessible to say governments?

George Gilder:

No. It's just bitcoin, it's transparent. Bitcoin is more transparent than cash is. It's as Dread Pirate Roberts discovered. I mean bitcoin is an immutable database, and every transaction, deep into the past, is mathematically present in every future transaction. So this is an effect of both the incredibly efficient mathematical procedures of hashes, as they're called, where you represent a large body of data with a 36 byte hash, and also not only the hashing, but the fantastic advancement of memory technology, which is memory and storage technology, which has allowed you to have a simulacrum of all the transactions in a system on every node in the system. And that's an amazing technological advance. But it means they're all there, and you have the public key, and you have the private key connected to it, and ultimately, you can track down any criminal who used bitcoin. It's just a new form of cash that actually is more transparent and traceable than cash is.

Robert J. Marks:

Well, they had a hard time getting the Dread Pirate Roberts. They got him in a sting according to the book. I don't know how reliable the book is but.

George Gilder:

I read the book. I know the family. And supposedly, he just made a terrible mistake in dealing with these hit men. And it was really an evil blunder. And he's paying the price. His parents claim that he hardly knew about it, and that's possible. You don't know. But in any case, they got him as soon as they wanted to. For awhile, it was the most successful sort of database and online market on the internet. And it took awhile before the police decided to crack down on it.

Robert J. Marks:

That was just a fascinating story.

George Gilder:

Yeah, it is a fascinating story. And one of the cops got corrupted.

Robert J. Marks:

Oh, yes.

George Gilder:

So he's in jail too. The cop that actually broke it got tempted and tried to steal some bitcoins and he's in jail too. I mean, it was really a carnival of police powers. But it's this anarchist impulse, where all forms of drugs and illegal behaviors and everything can be concealed with this new currency, whether it's Monero or Zcash or whatever it is. But all of them ultimately can be traced and broken down. Ultimately, the people, it's the people you're going to get. And you can find them. And if you find them, you can question them, and you can find out what they've been doing.

Robert J. Marks:

Bitcoin works because of encryption. And let's go to the next topic, which is quantum computing, which threatens to expose and make classical encryption obsolete. What's your take on quantum computing? It seems to me that it's been a glacial progress in the technology.

George Gilder:

I think quantum computing is rather like AI in that it moves the actual problem outside the computational process and gives the illusion that it solved the problem. But it's really just pushed the problem to IO, input output. And quantum computing is analog computing. That's what it is. It's changing the primitives of the computation to quantum elements, which are presumably the substance of all matter in the universe. And I consider ... But still, you got to translate the symbols in the world, which in turn have to be translated from the objects in the world, into these cubits, which are quantum entities.

George Gilder:

And then from there, once you've defined all these connections and structured the data, then the problem is essentially solved by the process of defining it and inputting it into the computer. And I think a wonderful physicist at MIT named Seth Lloyd has written about this a lot. He believes the whole universe is a quantum computer, which from some point of view you could say. And so God is really a quantum computer, and you're essentially praying when you use the quantum computer. It's sort of a new rapture of the nerds.

George Gilder:

But quantum computing, again, is a very special purpose machine, extremely special purpose, because everything has to be exactly structured right for it. And so you may be able to build it, build one that can break one form of encryption. But then you just change the ... There are all sorts of ways to circumvent this threat that quantum computing supposedly poses to bitcoin and other such encryption based technologies in the cryptocosm. If it really became robust and good, you could use it to encrypt too.

Robert J. Marks:

Yeah, that's my point. I think that once we get quantum computing, and if it works well, we can also do quantum encryption. Which quantum computing can't decode, so that's the next step. So yeah, that's fascinating stuff. One of the things that I heard you talk about, and I know you're an early proponent of it, is carbon computing. The idea is really compelling, because the computational part of human beings is definitely carbon based. But we haven't gone there, have we? We're still in silicon. What's going on in carbon computing and what do you see as the future of it?

George Gilder:

Well silicon is popular because it's simple and because it yields these very rapid computations with binary systems, on/off codes, ones and zeros. And ones and zeros can be manipulated at fabulous speeds. And that's why the whole computing revolution happened, because you could really manipulate symbols at a tremendous speed. But the cost of this is the symbol's got to be translated into objects. Well, carbon, since we're all carbon, and carbon is much more complex and affords many more degrees of freedom in materials, and carbon shapes, carbon nanotubes, we're beginning to make memories with carbon nanotubes and simulate behavior with carbon nanotubes, and filter with them.

George Gilder:

There are all kinds of carbon. And many of our screens now, computer screens, are carbon based now. And so carbon is gradually moving into the computational world, and in order to make any real, long-term advances in computation, I think rather than grasping for elusive quantum superpositions, you can actually simulate the brain of a fly in carbon. We still don't know how the fly eludes the swatter. And Carver Mead always says that understand the human brain, we don't even understand how a brain of a fly allows it to elude the swatter. It's too light to fly. The world is much more mysterious than the advocates of the singularity imagine.

Robert J. Marks:

Yes. We are fearfully and wonderfully made, as somebody said.

George Gilder:

That's right. That's right.

Robert J. Marks:

One of the stories I like to share was an old science fiction story about why humans, by necessity, must be carbon based. And that is because we breathe in oxygen and we exhale carbon dioxide. If we were made of silicon, we would breathe in oxygen and exhale silicon dioxide, which is a solid.

George Gilder:

That's good.

Robert J. Marks:

Yeah. So we would probably crushed by our own breath when we slept at night. So that's the reason that we are carbon based as opposed to silicon based.

George Gilder:

I'm convinced. That strikes me as intelligent in its design.

Robert J. Marks:

Oh, George Gilder, thank you. I've had a blast talking to you. Really appreciate your time and your contributions. I much appreciate it. We've been talking to George Gilder, whose fascinating monograph, Gaming Intelligence: Why AI Can't Think But Can Transform Jobs is available at amazon.com. And I recommend it highly. It's very readable, very understandable, and like a lot of George's work, is profound and just chock full of meaningful ideas. So until next time on mind matters news, be of good cheer.

Speaker 4:

This has been Mind Matters News, with your host, Robert J. Marks. Explore more at mindmatters.ai. That's mindmatters.ai. Mind Matters News is directed and edited by Austin Egbert. The opinions expressed on this program are solely those of the speakers.