Nate Hagens (00:00:02):

You're listening to The Great Simplification with Nate Hagens. That's me. On this show, we try to explore and simplify what's happening with energy, the economy, the environment, and our society. Together with scientists, experts, and leaders, this show is about understanding the bird's-eye view of how everything fits together, where we go from here, and what we can do about it as a society and as individuals.

(00:00:33):

This week's podcast is a second installment of a conversation with my friend Daniel Schmachtenberger. We intended this series to be a three-part series on bend versus break, but we got a little sidetracked with both interesting and, I hope, relevant and helpful tangents on energy, maximum power, animist religion, and the importance and relevance of hyper-agents or those human individuals who have outsized influence on our cultural direction. Daniel and I come to this with wildly different backgrounds, and we've kind of found each other on the internet and are learning from each other, exploring, and trying to figure out the path ahead and basically share our revelations and our thought process publicly because I think we need a lot more people engaged in these questions in this space at this time, I hope you enjoy this conversation. I certainly did. Here is part two with Daniel Schmachtenberger.

(00:02:02):

Okay, this is podcast number two with you of a three-part series at least, and what I'd like to do today is kind of merge our meta worldviews on how energy, materials, technology, money, human behavior, all aggregate into an explanatory systemic overview of the human condition, the human predicament as it pertains to all the risks that we're facing. You and I have been kind of playing verbal mental ping pong on this stuff for a couple years, and we have a huge overlap in how we see this stuff, and I'd like to kind of hone that overlap to converge on maybe a unified thing that we both agree on today. I will go back to the podcast missionary position of me interviewing you this time as opposed to last time, you interviewed me. But maybe, if it makes sense to you, I'll just give like a one-minute overview of what we covered on the first podcast on bend versus break, which was called energy blind.

(00:03:21):

The reason we did that as opposed to starting here is a lot of people are still naive about the relationship between energy and the human experience. We talked about

how important energy is in nature, how energy in biological systems is the currency of life, the same as human systems. We are massively supported by a hundred billion barrel of oil equivalents of fossil sunlight added to our systems every year. There's a big energy quality difference between so-called renewable energy, which is robust and viable, but can it power a 19-terawatt system in our current way is a big question. We talked about Jevons Paradox, which is the rebound effect, that new efficiency in technology help you save energy on a micro scale, but on a macro scale it ends up buying more stuff and having more surplus and we end up using more energy in aggregate. And we talked a little bit about the tenuousness of oil supplies, depletion, and things like that. So I hope everyone can go back and listen to that as a precursor to this.

(00:04:43):

So good afternoon to you. Where would you like to start this conversation, my friend?

Daniel Schmachtenberger (00:04:50):

Just that it's been a few months since we did that last one, and I'm really excited that we are finally getting to this. You and I had had a conversation offline where we explored some of the topics in more depth, and I think they're really interesting and useful frames, so I'm excited for us to get to dialogue through some of those things that we had discussed and then get to expand the topics.

(00:05:13):

When you and I spoke last time, I had got the good fortune of having you explain your models to me. I had read the superorganism paper and watched some talks, but I'd never actually read your book, and in prep for this time, not because I didn't think it'd be great just because of scheduling, I did get to read the book, and I just want to make sure that all of your readers that have not should go read his book because it's excellent. It's so well-structured. Nate has spent his career studying what is the world predicament and basically took the most important frames from the nature of how humans understand stuff and how we kind of get understanding wrong to human motivation, to evolutionary perspective, to energy, infrastructure, and like that and just kind of put it in these chunks, very well-chunked, but summaries of stuff that each would be a book, and so it's like, whatever, a hundred books summarized in a nice sequence. So I just wanted to acknowledge like fucking brilliant book. That was so well done. I was so happy reading it last night.

(00:06:15):

You know, what I think you and I both kind of came to independently was the awareness that there are many different potential catastrophic risks, meaning different escalation pathways to the end of this world systems viability that even though they look really different, whether we're talking about resource shortages that lead to war, that lead to kind of large-scale war or breakdowns of supply chains or planetary boundaries directly and ecological tipping points, that there are some things that all of those have in common, and if you try to treat the Amazon hydrological pump here, the dead zone here, the soil depletion here, the species extinction here, the nuclear escalation here, the AI risk here, and the biorisk arms race here as separate issues, you're going to fail because they're actually all unsolvable without solving the underlying kind of generative dynamics that give rise to them, and each year we keep getting more of them as a more new tech, and the new tech increases the kind of destructive capacity, both unintentionally through externalities and intentionally through conflict theory war.

(00:07:26):

So we keep getting more total catastrophic risks, higher probabilities on them, more interconnections and cascades between them, so it's impossible to keep managing the front of that. So it's like, "Fuck, what is underlying those?" which ends up looking like diagnosing what about civilization is kind of self-terminating. It's a little bit like the difference between the kind of traditional allopathic medical approach and the anti-aging work, right? The traditional medical work is like, "Okay, well, maybe we can keep you from dying from heart disease, but at most by a year because your cancer, your Alzheimer's, and your diabetes are immediately following because you're aging and you're aging poorly for a bunch of underlying systemic reasons that the homeodynamics of your body aren't working that well." So whichever system gives out first doesn't make that much difference. So if you want to do more than by a year, you have to look at can we age better comprehensively, which will affect all the systems, so what are the underlying dynamics. So the kind of anti-aging work is thinking at a much more fundamental way about pathology in general and pathogenesis in general rather than specific applications, and it's very much like we're doing that for this world system. And just to close that, you did it in a particular way that I really appreciated that was very overlapping but a little different than the metaphors I used, and I think

that's why we got along, and I think getting to show the mappings between those is insightful, so that's what I'm hoping we do today.

Nate Hagens (00:08:46):

Yeah, excellent. Thank you for your kind words on the book. As far as aging, we're part of a system, and that's what I've tried to do, that's what you're trying to do, is explain how the system functions together. As far as anti-aging, if everyone lived to be 150, a wider boundary perspective on that is we would have some more massive ecological problems as well, so it depends where you draw the boundaries on this stuff.

(00:09:17):

Okay. So yes, I have described the system as we self-organize as families, small businesses, corporations, nation-states to optimize surplus, but it's not really surplus. It's financial representations of surplus, and that's tethered to energy, tethered to carbon, and that this system is out of control as a superorganism. A superorganism, it's not really a physical entity, it's just the behavioral dynamic of 8 billion of us roughly just pursuing these cultural objectives, and it's no longer in anyone's control. There's no politician or billionaire that is actually steering it. So that's kind of the dynamic that I've come up with, is that we have outsourced the planning of our system to the financial market, and that momentum worldwide of making decisions to keep that optimized suppresses any other paths of wisdom or constraint that might be totally viable and makes sense. There's just no fertile soil for those to germinate in. So I would like to get your unpacking, using your language and your work, on that dynamic and how you see that.

Daniel Schmachtenberger (00:10:46):

I mean, you already summarized so much stuff in your book, and if I was to summarize that in like the few concepts that give, if someone had to hold a very minimum set that I might offer would be that the financial system has an embedded growth obligation. It has to keep growing or this particular system breaks, and it has to keep growing at a percentage of the previous years so you have a compounding interest, which means you have an exponential curve.

(00:11:17):

So there is an exponential embedded growth obligation on finance, but finance is bound to the real world and you can't exponentially grow the extraction in the real

world. Specifically, you can't keep mining stuff on renewable and turning it into pollution and trash, and you can't keep having the energy that it takes to move all those atoms or the bits around indefinitely, and that specifically, the combination of the Jevons Paradox and the coupling of money and energy, which... I'll say the Garrett Relation, but Nate will say what's wrong with the Garrett Relation. I'm only saying it vaguely as the idea that there's a coupling between global GDP and energy that is an important coupling to understand. And roughly, that coupling is, anything that makes money is probably moving atoms around in physical space or moving bits around but that requires energy to do. So kind of across all industries, some will boom, some will bust, but they're all going to take energy, so there's some rough correlation between total money and total energy use.

Nate Hagens (00:12:21):

It's pretty clear what you mean when you say moving atoms around. That would be materials. But what do you mean when you're moving bits around, just to be clear?

Daniel Schmachtenberger (00:12:30):

Computation still takes energy. And so even when we're talking about capital associated with digital goods and services, it's still energy-dependent. It obviously takes energy moving atoms around to make the computational substrate. You got to do a lot of mining and you got to do a lot of fabrication to make the computer chips, the servers, the satellites, and whatever, and then the computational systems require energy, so the movement to digital doesn't get us off the need for energy.

Nate Hagens (00:12:58):

Right. Well, so what you're saying is the cloud is not virtual, and approximately 18% of our electricity today goes towards the servers, the gadgets, the wiring, and everything, like the cloud is definitely not virtual.

Daniel Schmachtenberger (00:13:16):

Cloud has a physical substrate layer that it depends upon that has real physics and energy dynamics associated. So we can, of course, get into the way that maybe digital goods have a slightly better efficiency in terms of how much energy they take per dollar than the physical goods, but then this is why the Jevons Paradox is so fundamental, is ultimately the dollars are seeking returns anywhere, and they'll seek

the highest returns possible, but they'll seek any returns, too. There will be a power law distribution on return. So if I can get a 1000x return, of course I'll get it, but if I can get a 3% return, large amounts of capital will do that.

(00:13:53):

So when you get increases in efficiency, you just get a cheaper industrial input, a cheaper market input, which means that a lot of things that weren't profitable now become profitable, so the surface area of profitability expands. And this Jevons Paradox is like everybody who's focused on environmental issues needs to kind of take this very seriously, which is, you increase efficiency of, say here, energy production, now you have cheaper energy. Energy is one of the key inputs to every industry. Cheaper input means a whole bunch of non-profitable areas become profitable and the market expands.

(00:14:28):

And so that efficiency doesn't buy you the thing that you wanted to have, so the embedded growth obligation still holds. And so you're like, "Okay." So because of that, we still get this coupling between dollars and energy. Dollars are on an exponential growth curve up. That means energy has to be on an exponential growth curve up. You can't do exponential extraction of energy forever. And we're already on a diminishing return on hydrocarbons, meaning hydrocarbons in to hydrocarbons out, the energy return on energy investments in diminishing return, and yet it has to keep up with a very verticalizing part of the exponential curve on finances.

(00:15:06):

There's a problem there, right? And you can only quantitatively ease and subsidize that thing for so long. There's like a fundamental problem there, and so, of course, the answer is just renewables. Well, great, we'll meet all of that energy need with renewables, except right now the energy return on energy of investment of the renewables means you got to use way more oil to get the non-oil producing stuff, and the curves still just don't work in the current way we're looking at it. So there's just some very deep reckoning in the relationship between the embedded growth obligation in finance and the physical limits of the real world atomically and energetically and the relationship between those. There's a heap of complexity from there, but that simple summary kind of gives you the exponential growth of the metabolism of the superorganism as Nate has argued it, which I think is fucking

insightful, and then we want to kind of take that as the base input with whatever Nate's about to say and then play from there.

Nate Hagens (00:16:00):

I agree with everything you just said.

Daniel Schmachtenberger (00:16:01):

That's because I was just recapping what you say.

Nate Hagens (00:16:05):

Oh, well, that's why then, naturally.

(00:16:09):

So one thing that we didn't get to in the first conversation that you indirectly referenced here, and I want to unpack it a little bit, is how money comes into existence and how that relates to GDP growth and future expectations. So money does not come into existence the way that's taught in economic textbooks. We do not make a loan from existing capital. 95% of our money comes into existence from commercial banks making a loan, and when they make the loan, they create the money.

(00:16:47):

So if you're a bank and you have $10 million on your books in assets and liabilities and you, Daniel, come in and have this great nootropics business idea and they say, "You're a great guy. We are in good standing with the Federal Reserve. We're going to give you a million dollars for your business," at that moment, your account went up by a million dollars. The IOU asset on the bank account went up by a million dollars. You can spend that million on anything you want, presumably a business. In the bank is equal. Now they have 11 million in assets and 11 million in liabilities, but the same amount of coal, oil, copper, water, Amazon forests existed on the planet that did 10 minutes earlier. We created more financial claims just based on the recent productivity of you, and our country, and our world as a reference. There was no biophysical reference at all.

(00:17:53):

The other thing that's important to note is when that million dollars was created, the interest was not. So that's the underlying embedded growth obligation, is we create money with no tether to natural resources, but when you have to pay that million

dollars back to the bank over every year, you're going to have to pay 5% interest as well, so you need to grow to do that. Now, debt doesn't have to be a bad thing if you take a loan from a bank if the productivity of your results are higher than the debt. But what ends up happening now as a world, not as individuals, we are doubling our debt every eight to nine years as a world and we're only doubling our GDP, which is the income stream required to pay back that debt every 25 years or so, and that's before energy declines. You know, peak oil. It's like you were saying, declining marginal returns to hydrocarbons.

(00:19:04):

So this is a real problem. So money isn't created out of thin air. That's going too far, because there is productive capacity, capital, industry, technology, and knowledge, but there is no recognition that all the financial claims in the world, be they stocks, or bonds, or pensions, or retirement fund, when they are cashed in, they have to be cashed in on something that will require energy and materials to convert, and that is just a fundamental disconnect in macroeconomics. The Bank of England wrote a great little paper, Modern Money Creation, that debunks how it's written in the economic textbooks. So I just wanted to add that bit in there.

(00:19:55):

The other thing I wanted to say is, all governments and institutions, at least ostensibly, in the world expect 2 1/2 to 3% growth into the future. That is like the standard expectation out 50 years. So given the tether of energy and GDP, which is around 0.99 to 1 globally, and given the tether of materials to GDP, which is pretty much one for one, you refer to that as atoms. So the link between atoms and GDP growth is pretty much one for one. We've grown our material footprint 2.8% a year since the year 1900. So given that, if we grow at 3% a year, in order to maintain and service the financial claims that we're adding all the time, we will double the amount of energy and materials used on the world in the next 25 to 30 years, and we'll double it again after that. That is a serious problem that more people need to think about, because I don't think the next doubling is going to happen, and so how do we respond as a culture to that? So that was my pin in your summary.

Daniel Schmachtenberger (00:21:17):

Yes. You know, the thing that we're saying right now is hopefully adding a little bit of clarity to a really basic intuition. It's like the most basic hippie shit that gets said in

the kind of renewable de-growth world. You can't run a exponential economy on a finite planet forever. It's like everybody's kind of heard that if you paid any attention in environmentalism. Because a financial economy and a materials economy can't be totally decoupled, right? And of course, people get excited about, "No, no, you can decouple them because the digital universe doesn't have to require the materials economy, or services don't have to require the materials economy, and we can do more thinking stuff." Well, kind of. But as we were already mentioning about the cloud and like that, the digital economy, the services economy still require materials economy, and the growth of them still requires growth there, and even if you get some increases in efficiencies, which is awesome, you get those increases in efficiencies, those increases in efficiency also grow the total material economy in a pure market system because the market system is going to take returns wherever it can get them.

Nate Hagens (00:22:20):

Yes, with a caveat, globally, because there are countries that are decoupling materially, not absolutely decoupling, but they're relatively coupling, like our country. We are producing more GDP while using not less energy but less than one for one, and we've been doing that for a while. But you look at the average American consumes 57 barrel of oil equivalents of coal, oil, and natural gas, three main fossil fuels per year, but we consume another 17 barrel of oil equivalence in stuff we buy from China and Bangladesh, et cetera, because we've outsourced our means of production overseas. So globally, what you just said is correct, but there are countries who can material decouple, but I do not believe that the whole world can material decouple.

Daniel Schmachtenberger (00:23:14):

Yeah, to just restate what you said in another way, individual country metrics on things that involve global supply chains are just always gibberish. They're basically always some kind of greenwashing gibberish, and I think we got into this last time, but in case we didn't, I'll recap quickly. It's very easy to export your shitty thing somewhere else and then import. Like I can import stuff from a country that has slave labor. I don't have slave labor. I can have a very good Gini coefficient in my country, but my country depends upon stuff that depends upon slave labor. So what does my Gini coefficient really mean? It just means that the really fucked-up Gini coefficient, I externalized somewhere else. And so to me, that's just called cooking the books.

Nate Hagens (00:23:57):

It means your Gini coefficient has narrow boundaries.

Daniel Schmachtenberger (00:23:58):

Yeah. So whether it's my Gini coefficient or my joules-to-dollars ratio, if I'm externalizing the shitty metric somewhere else but it's still on a closed biosphere, and what we're talking about is limits of the biosphere, all we're doing is cooking the books, right? Like this is just basically bad accounting.

Nate Hagens (00:24:18):

And cooking the planet. India just announced today they're coal consumption is up 29%.

Daniel Schmachtenberger (00:24:26):

I'm not laughing at cooking the planet. I'm laughing at the pun that just naturally emerged there. But yes.

Nate Hagens (00:24:31):

Well, it's horribly tragic. Crying is probably more appropriate than laughing. But in order to maintain the increased air conditioning because of the massive heat in India and Pakistan, they have to burn more coal. So that is a positive feedback that is just, it's profound.

Daniel Schmachtenberger (00:24:58):

Yeah. I first came across this, there's an Indian man who explained the situation to me in a particular way that I hadn't thought about quite like this before. He said, "Look, climate change is not going to hit the world evenly to begin with. It's going to hit certain areas much worse. The places that have air conditioners, good aquifers with running water, and those types of things are obviously going to do better. The places where you have high population multiplied by high population density and that are already in hot areas, the extreme weather events are going to hit a lot worse." So he's like, "India is really going to get screwed well before Europe and the US are, but it's because Europe and the US have air conditioners that they built with," and his number was something like $50 trillion of extraction during British rule of resources, US, I mean current equivalence from India.

(00:25:59):

And to be able to build that, which was both the use of all the hydrocarbons that got us to this climate change position plus also what protects them from it, but what also keeps them from having the resources to be able to deal with it themselves and then say, "Pull yourself up by your bootstraps to another country," and that put him into a kind of like eco-terrorist point of view of like, "What choice other than taking the West out do we have? Is this not a genocide of negligence?" And it's like, "Fuck, that's not a invalid perspective," right? Genocide of negligence is a thing we can actually look at.

(00:26:35):

And a lot of people, when they think about climate change, think about like systemic Venus-ification of the planet, but well before you get to systemic Venus-ification, which might never happen depending upon the model, getting the 50 Celsius heat waves over the next few years in places like India, Bangladesh, and Pakistan that have high populations with high population densities, with low groundwater, with low food resources that can lead to crop failures, then you get resource wars, and those resource wars can scale to global wars. Does a war over resource in northern India turn into a cleaving on Hindu-Muslim lines? Does that become an India-Pakistan war? There's a lot of places where things like this come, and so this is, again, a global issue. You can't take it as a local issue even if you were sociopathic and only cared about your country. These things escalate to global issues very quickly. And the timeline on stuff like that-

Nate Hagens (00:27:30):

Totally, totally agree.

Daniel Schmachtenberger (00:27:31):

... could be this year, could be next year. We can't guarantee because it's a complex system where you can't forecast well, but it doesn't take Venus-ification timelines for those things to occur.

Nate Hagens (00:27:42):

No, and the only thing I would add there is, even wider boundaries, is the genocide of the oceans and the complex self-aware life in the oceans, where 93% of the heat generated so far has been absorbed by the oceans because they can absorb it, but

there, too, is a limit. So, I think, personally, climate change is the largest risk for our species in civilization by two orders of magnitude. Having said that, I don't think it's in the top 10 in the next 10 years of the various risks that we face. So, just to come out of the closet on that, I care the most about future ecosystems, other species, long after I won't be on this planet. But I think we have, in your language, the governance, and regulation, and the inner beating heart of the superorganism. That is where we have to work and come up with solutions because there's lots of other things, the financial recalibration, the nuclear war risks, a lot of the other things you talk about, CRISPR, and AI, and polarization and all that.

Daniel Schmachtenberger (00:29:04):

Just to continue on your tangent for a moment and then we get back. You were mentioning caring about the complex life in the oceans and obviously the rest of the non-human life that we have been genociding or displacing. This is why our mutual friend, Aza Raskin, who co-founded the Center for Humane Technology has taken a good chunk of his time off to do the Earth Species Project. And I just want to mention it because, whether it succeeds in its goal really soon or not, just even thinking about it is very interesting and cool. They're using AI's most cutting edge… I mean, Google's AI cutting edge translation software to translate between languages, to try to translate animal languages, with the idea that, if we could actually listen to the whales and what they had to say and the dolphins and understand the depth of their sentience, it might be a wake-up call. And yeah, I think that's a cool project.

Nate Hagens (00:29:55):

But if they succeed in translating other species' languages and figuring out how bonobos or starlings or whales talk to each other, my biggest worry there is that humans, en masse, will just shrug and say no big deal. Where my core belief here is we need a new sacred, standard religion and economic growth for everyone have been our goals, our aspirations. And at the end of the day, my belief is the sacredness of the natural world that we inhabit and share with 10 million other species, that is what really matters, at the end of the day. But now, we're getting way off tangent from our stated goal today.

Daniel Schmachtenberger (00:30:44):

Actually, this is about to tie us right back into where we're going through another tangent, but I see the loop back, so indulge me.

Nate Hagens (00:30:50):

Okay.

Daniel Schmachtenberger (00:30:52):

Your concern is that even recognizing the much greater consciousness, sentience of other species that we can't currently talk to wouldn't change because the change in values isn't going to change behavior in an economic system that is incenting behavior in a direction that follows this embedded growth obligation to convert the entire natural world into currency. So, obviously values can influence our behavior, economics can influence our behavior.

(00:31:20):

The other key thing is that technology directly influences our behavior. And there's a coupling between these. We've talked about the way Marvin Harris models these three, in terms of civilizations being made of infrastructure, social structure and superstructure. The social structure is the social agreement field, the law of governance in particular and the institutions that mediate how do we do our social agreements.

(00:31:44):

The infrastructure is the tech stack that that rides on, the modes of production, agriculture, energy, waste management, all that kind of stuff. And the superstructure is the, what is the definition of the good life? What are our ethics? What is the basis of the jurisprudence of law? And so, that could be religion, nationalism, all those types of things. And so, different social theorists will argue which of these is most fundamental. I would argue that these three are co-informing. We can show causal loops where each one can inform the others. A lot of what we're...

(00:32:19):

Obviously, the goal that Aza has is, can we make a play in superstructure? Can we make a play in the understanding in human values that would have us somehow bind our economic incentive on our use of technology? And the economics and the technology are related because, obviously, you can't Venusify the planet with Stone Age tech. You can't blow the planet up with Stone Age tech. All of our catastrophic

risks are mediated by tech because otherwise we're not powerful enough to do shit at that scale. But obviously, our tech and the incentive structure to grow it, use it in particular ways, and the laws on binding those ways, the relationship of all of that goes together.

(00:32:59):

But just to give an example, because so many people… There's a paper we're writing with Consilience Project that'll be published by the time this comes out on why tech is not values neutral. A lot of people have this weird conception that technology is just values neutral. I can use a hammer to build a house for the homeless or I can use it as a weapon, but there's no value system embedded in the hammer. It's just the value system of the person that chooses to use it. And that would be the same with everything in our industrial supply chain. They either have that view or some people have the view that tech is fundamentally values positive. That's the general Hobbesian, Pinkeran, Gates-ian kind of view of the dialectic of progress, that tech only gets selected for and the market only upregulates it if it's solving some real problem that people want and they're willing to pay for. So, of course, it is inherently liberating humans from problems. It allows them to expand. And so, it's fundamentally net positive. Then, there are the Louis Mumfords and everyone who have critiqued why that's not true. And many people then can go in a Luddite direction of, no, tech actually messes up religions and societies and ecosystems. And so, tech is fundamentally net negative to our value systems.

(00:34:14):

We would argue in this paper, all three of those are naive. Tech is values affective. It affects it in a complex set of positive and negative ways. And very much in the same way that tech will produce some positive thing in the physical world but also externalize some negative things, it doesn't have one effect. It has a complex set of effects. And we need to factor the positive and negative externalities in addition to the thing it was supposed to do, and factor that into design. This is also true in the psychological space. I want to get into where I was going with that, but did you want to say something, Nate?

Nate Hagens (00:34:47):

I did. I want to add something and then ask you a question. You are saying that from a tech standpoint. I would say that we would not be able to Venusify the planet without fossil hydrocarbons, because my friend Steve Keen says that…

Daniel Schmachtenberger (00:35:07):

That's what I would call industrial tech.

Nate Hagens (00:35:10):

… a body… Well, a body without energy is a corpse. And technology without energy is a sculpture. And so, our cities without energy are a museum defacto. So, my question to you is, is energy values neutral?

Daniel Schmachtenberger (00:35:31):

No. And we'll get to that, but let me come back to the tech thing there. Obviously, without internal combustion engines, oil's not worth all that much. Obviously, without…

Nate Hagens (00:35:43):

True.

Daniel Schmachtenberger (00:35:44):

… electricity and an electrical grid, we fucking don't need all that. So basically, the energy is driving tech. Tech is also… Without oil drilling, which is tech, you don't get the oil, without oil refining, which is tech.

Nate Hagens (00:35:54):

Yeah. There's a positive feedback and there… In my Earth Day talk, I refer to it as the economic trinity, that information, energy and materials are bound, and that you need all three to go forward.

Daniel Schmachtenberger (00:36:10):

Yes. So, we're going to go into that, but let me finish this loop because it's where… It connects back to the binding of these and why… a good example of why tech's not values neutral and your other friends other than humans on the planet. So, tech allows us to exploit energy in different ways, like our ability to drill and refine oil and then use it to run tech that requires energy. And obviously, energy gives us the ability to

develop new techs and you get this positive feedback in that. And so, oil was this massive increase in our ability to use energy. Before that, the last massive increase, you might argue, was agriculture and the ability to make a huge amount more caloric surplus per acre with grains.

(00:36:57):

And with that particular one, obviously baskets were a part of it and a number of things, but the plow was a huge part of it because the plow... Moving from kind of the digging stick and to ox-drawn plow, the caloric surplus skyrocketed. And with it, obviously population did. And then, oil was the next big one and it was way bigger, right? But when we look at the plow, this is a classic example of kind of the way tech is not values neutral and related to values on animals. Following the plow... Many kind of historians have argued that following the plow, animism died everywhere. And animism was near universal before that. Most all of the kind of in-

Nate Hagens (00:37:36):

Wait, I didn't know that. What?

Daniel Schmachtenberger (00:37:38):

Most all of...

Nate Hagens (00:37:39):

The development of the plow for oxes, animist religions, fell out of... I did not know that.

Daniel Schmachtenberger (00:37:47):

I first came across this in Sex, Ecology, and Spirit by Wilber. And I've heard a number of... There's obviously the historians have deep detailed arguments on it, but I'll give the kind of general gist in argument is, that you can be a hunter and kill a buffalo while still being animistic. You can pray to the spirit of the buffalo. You can take no more buffalo than you need and use it all well. You can cry when you kill it and then say, "I'm eating you. We're going to get buried when we die and become grass that your great-grandchildren will eat. And we're part of this great cycle of life."

(00:38:20):

So, I can let an animal have a free and sovereign life and be a predator and be part of that and still kind of be animistic. But I can't yoke a buffalo. I can't breed it into an ox, yoke it, cut its testicles off, bind its horns, and beat it all day long, and be animistic and still respect the spirit of the buffalo. I have to say it's a dumb fucking ox. It's here for us, man's dominion over, and change the mimetics to do it. And so, the key insight here is that the plow... using the plow... The plow existing...

(00:38:55):

Actually wait, I want to construct this very specifically. The first part is that tech that is highly advantageous to use is obligate. You don't get to not use it and make it through history. And so, somebody else will use the plow. They'll grow their population because of the massive caloric increase. They'll make it through the famines. If we don't, then our tribe will get killed by them and or die in the famine. So, even if I don't want to, I have to. And if I don't, I don't make it through history. So, very adaptive tech is obligate. That's principle one. Principle two is that it codes a pattern of human behavior.

(00:39:32):

Now, rather than being a hunter-gatherer, I'm beating an ox all day, right? And I'm branding it and binding its nose and whatever else I have to do. Because it codes a pattern of human behavior, it codes a pattern of values in human psyche. And then, to do that in scale means it codes a culture. And so, animism was universal. In South America, North America, Africa, Europe, whatever, it was pretty universal. And animism died following the ox-driven plow almost everywhere because you can't be animistic and beat an animal all day long. And so, kind of some version of man man's dominion over type ideologies emerged following it. And so, to get that piece of tech, change the value systems from all life as sentient, we're not the web of life, we're merely a strand in it, whatever we do to the web, we do to ourselves, to man's dominion over, it's all here for us, that kind of thing, that was the result of a value system embedded in the technology itself, inexorably embedded, not based on how people used it, but embedded in it.

(00:40:36):

And then, some historians go on to argue that not only did the plow do that, regarding animism, it also went from where, previous to the plow societies... And David Graeber's new book adds a lot of nuance. I'm doing like a hundred thousand foot view... but that, whether women were gathering and men were hunting, or women were

doing horticulture and men were hunting, women could still provide half the food stuffs. Men had to do the plow cause women would miscarry. Men's up upper body strength mattered. So now, men provided the meat stuff and the vegetative stuff. Women moved in the house. As a result, you also moved from a distribution of male and female gods to mostly male gods.

(00:41:13):

So, the thing that is called patriarchy is often attributed as arising as a byproduct of the plow als, and the movement from all the food that gives life being male derived rather than female because, again, of the physicality involved in the nature of the plow. Then, of course, that gives you surplus. And before that, you didn't have surplus. You didn't have private property ownership. You had these different kinds of sharing systems. Now, with much more surplus, you could grow the population a lot faster. Now, you can got larger than Dunbar number kind of empires. Now, you got radical wealth inequality and class systems. So, we're like...

(00:41:48):

There are arguments about why that ended up requiring more formal institutionalization of marriage on larger scale, because now I own stuff that I could pass on to my kids when I died. So, I wanted more paternity certainty. So, everything from institutionalization of marriage, to views towards animals, to patriarchy versus matriarchy, to the formalization of economic to class systems, all as possible second, third order outputs, not in the physical world, but in the cultural world of a piece of tech. Now, we can go through similarly the way the printing press ended up giving rise to the Protestant revolution and democracy. And because without the printing press, you can't have everybody have a newspaper and have books. So, only a nobility has access. And we can go on and on and look at how each piece of tech, if you use it, encodes game theoretic power where those who use it will get ahead and those who don't will end up not making it through history. So, it's obligate. It codes behavior. As a result, it codes values and minds. As a result of doing that in scale, it codes cultures.

(00:42:50):

So, it's not just that we have to have values from something, like religion or whatever, to make us use tech well. It's that tech is directly creating our values also, so we have to design tech that in mind, not just how does this tech externalize costs in the physical world, meaning the mining byproduct and toxic tailings that come out of this mining technology and whatever, but how it externalizes things into the human

psychological cultural world. We're calling this kind of axiological design. How do you embed the axiology, the ethics into the tech design?

(00:43:26):

Now, we'll get into... That's an example of how infrastructure drives superstructure and also social structure. And Nate talks a lot about how the social structure, the economic growth, the embedded economic growth obligation, forces us to keep using more tech and energy and keeps forcing more and more fucked up superstructures that justify doing that, that are increasingly kind of nihilistic and et cetera. So, getting into how these interrelate is fascinating. And it's probably beyond the scope of this, because I want to get back to the nature of the superorganism, but you do have to recognize the feedback loops between all these and the superorganism.

(00:44:06):

So, I just... When you were mentioning people not caring about the complex life enough, I'm actually wanting to give that example of ways that actually resulted from the inexorabilities of the tech stack itself.

Nate Hagens (00:44:20):

First of all, that was beautiful. In the first part of that, where you were talking about the ox, I actually got emotional. I'd never heard that before. And embedded in what you were just describing is the core innards of the superorganism. And I asked you the wrong question before. I asked you if energy is values agnostic. And what I should have asked you is surplus values agnostic. Because when we started that transition in agriculture, it was to maximize surplus.

Daniel Schmachtenberger (00:44:56):

Surplus of energy. Right? It was calories...

Nate Hagens (00:44:57):

Now, of course, we're maximizing.

Daniel Schmachtenberger (00:44:59):

... largely, stored calories.

Nate Hagens (00:45:01):

True.

Daniel Schmachtenberger (00:45:01):

It was energy. I see agriculture as being the first… not the first. I see agriculture as being the second major spike in our ability to extract energy from the environment. I see fire being the first major spike, then agriculture, then oil, and then digital technologies that increase our ability to do all of that faster. And of course, there's a million sub refinements. So, it is surplus and its energy. They're both fair.

Nate Hagens (00:45:28):

And just to look ahead… And I don't know that I've said this on a podcast or in my life before, but fire, agriculture, oil and fossil hydrocarbons, and info and tech, those were the cans that we kept kicking to expand our reach. I don't think, physically, we have any more cans to kick. And the next can is in our minds. It's in how we get our evolutionary neurotransmitter cocktails of meaning and love and excitement and motivation and peace by using less resources. That's the only can left to kick, I think.

Daniel Schmachtenberger (00:46:17):

Look at the Jevons Paradox way back to agriculture, then we're going to move it forward. So, the Jevons Paradox on oil and kind of fossil energy makes perfect sense, which is when you get a increase in efficiency in the ability to make more oil or energy generation, you're going to use more energy because it opened up new market sectors. But you can see that that was also true for agriculture, and basically the generation of human calories as you grow the population.

(00:46:47):

If you get an increase in efficiency where you can get a lot more calories per acre or you can convert more acres to crop land, that increase in efficiency means you get more surplus, which means you grow your population faster and that thing keeps happening. So, there was a Jevons Paradox way back then, right? And…

Nate Hagens (00:47:03):

And a superorganism dynamic way back then too, because if you didn't do that, if you didn't clear the land, someone else would have and out competed you. So, all of a sudden, there was this imperative that hadn't existed before.

Daniel Schmachtenberger (00:47:16):

Yes. This is the... So now, do you want to go ahead and define the maximum power principle, and then we can tie those three concepts together?

Nate Hagens (00:47:24):

The maximum power principle is sometimes referred to as the fourth law of thermodynamics. And it is defined as organisms and ecosystems self organized so as to access an energy gradient. So, there's something also related called Kleiber's law, which shows that the metabolism or the energy burning of an animal, or an insect, or a whale, or anything in nature is related to their size, their body size, to the two-thirds power. So, the maximum power principle shows that organisms in nature self-organize to get more access to energy. But it's power, right?

(00:48:10):

It's not just access to this pool of energy. It's energy per unit time, which is defined as power. Now, in nature, other species only access energy that they use endosomatically, in their body. Humans use 2000 calories a day in our body. But in America, we use 200,000 calories a day exosomatically, outside of our body. So, we have a hundred to one exosomatic magic wand that we're waving around, on average. So, maximum power principle just means there's a tether between animal behavior and access to energy.

Daniel Schmachtenberger (00:48:55):

Yeah. Let me say it a different way that is a corollary of that, which gets to the obligate nature, which you were just starting to speak to, when I was saying before, if you don't use the plow, then your civilization is not going to make it through and define the world system relative to anybody else using it.

(00:49:13):

If you don't exploit the energy source, that doesn't mean nobody's going to exploit the energy source. Somebody's going to exploit the energy source. Whoever exploits the energy source, which includes the way that changes their culture and their memes to be able to justify doing the thing, that's the culture that's going to end up using that energy game theoretically and getting ahead, which also means the memes that correspond with that are the ones that get selected for.

Nate Hagens (00:49:36):

Right. So, we did briefly mention, in the first conversation, Alfred Latka wrote a paper a hundred years ago that access to energy was a core driver of evolutionary success, and that those animals that had access to energy had options that those who did not didn't have access to. So, access to energy was a core driver in our evolutionary past. And you're right. An energy resource would not long remain untapped in the wild.

Daniel Schmachtenberger (00:50:09):

It just maps an evolutionary theory to niche filling, the concept of niche filling. If there is any evolutionary niche that has some energy in it, some critters going to evolve to be able to access that energy. Now, the thing with humans, and as you point out the exosomatic capacity of humans, is there's a lot of environments that, with our tech, we can identify, have energy in them, that animals could not get the energy out of. And they couldn't do a lot to turn uranium ore into energy and we can. Right?

(00:50:40):

They couldn't get a whole lot of the energy out of fossil fuels and we can. They couldn't deplete all of the topsoil to turn it into grains, back to the earlier one. They also couldn't control fire to be able to burn shit and cook things that were unedible, and to cook edible things, or drive steam or whatever it was. So, in evolution, there is this kind of niche filling, but with our tool making, we're able to do that on crack, on a totally different version of that. But the maximum power principle... Okay, there's a chunk I want to do. Can you give me... The minimum chunk size will take a bit to construct these things.

Nate Hagens (00:51:15):

You have as large a chunk as you need, my friend.

Daniel Schmachtenberger (00:51:18):

So the Jevons Paradox says you get more efficiency. And rather than just use less stuff, you use that increased efficiency to do more stuff that is now... There's more things that have return possibilities than you had before. If you don't, because you're like, "Oh we can just live sufficiently now," somebody else will. And in general, that's the concept of a multipolar trap or a kind of...

Nate Hagens (00:51:44):

Can you give an example of the efficiency that you just said, just something in our regular lives?

Daniel Schmachtenberger (00:51:50):

Yeah. I mean, the example we gave of the plow is a perfect example. A plow will allow one man using a plow to produce... I don't know if it's 10 or a hundred times more calories than a guy who's just hunting, right? Because his ability, over the course of a year, to plant crops, grain crops, that have... and increasingly hybridized them, the grain calorie per acre per year relative to hunting or horticulture is just fucking uncomparable. So, that is an increase in efficiency.

(00:52:24):

So, we could just say, "Oh great. Now, we just don't need to work as many hours and use less land and be able to feed ourselves and do more art and spirituality," except we don't. We're like, "Great, let's work all of the hours and grow our population, or build bigger surpluses to be able to create systems of trade and exchange, to be able to do increased division of labor and more total specialization and complexity of our society so that it can beat another one in war because we have better weapons."

Nate Hagens (00:52:51):

So, there's two things that are happening there. One is all the 10 to 100 times extra surplus then has ripple effects in the economy that then there's more surplus to do more things. And the other thing is the other guy who's still the hunter has a choice to make, am I still going to hunt and get this low caloric output or am I too going to switch to this new technology, the plow?

Daniel Schmachtenberger (00:53:17):

So, our people, he might think, only took what we absolutely needed to live in harmony. And so, we wouldn't kill the pregnant buffalo. And we wouldn't kill the babies. And we wouldn't kill when the buffalo were too low and they had had a hard season. We actually decided to leave Buffalo alone even though they were great and only hunt deer, and because of this long term understanding of how to be part of a cycle of life. And when we took buffalo, we took just kind of what we needed. Now, if I

don't kill the buffalo, then these other guys have moved in who are just going to kill all the fucking buffalo they can. And they don't practice that thing.

(00:53:55):

If I don't kill it, it doesn't mean that it stays alive anymore. If I don't kill it, it just means that they do and that they will grow their population, and that not only will they grow their population, they'll now do division of labor, make better weapons, and then they'll come kill all of our people. So, me not killing it doesn't protect it anymore. I have the ability to kill it, but not the ability to protect it, therefore I actually should race.

Nate Hagens (00:54:18):

I know you're talking about buffalo and plows.

Daniel Schmachtenberger (00:54:20):

Everything.

Nate Hagens (00:54:21):

But you're talking about our modern fucked up culture as well and how we are living in the superorganism and we can't help but be part of the superorganism even though we understand that we don't like it.

Daniel Schmachtenberger (00:54:32):

I'm talking about…

Nate Hagens (00:54:34):

It's a compulsion.

Daniel Schmachtenberger (00:54:35):

So, this is… You and I have talked about this. I'll go ahead and formalize the concept because I want to bring the maximum power principle, Jevons Paradox, the superorganism, the inexorability all together to understand what this forcing function has been to understand how we make it not inexorable. How do we get out of it? Because the guy who doesn't want to kill the buffalo recognize…

(00:54:56):

If I just kind of finish that sentence, so it's probably obvious to everybody. If I don't kill the buffalo, the buffalo doesn't still live. The buffalo's going to get killed and fucked anyways. These other guys then are going to kill our people with their increased capacity. So, not only am I going to leave the buffalo. I have to hunt to kill it faster than the other guy to be able to grow our population in defense and whatever, because now, in the face of group in-group/out-group warfare of whatever kind, I kind of have to do that.

(00:55:23):

So now, there's a race to the bottom, because if anybody does the fucked up thing for the whole, but that provides a lot of game theoretic advantage for them in the near term, and they're going to use that game theoretic advantage in game theoretic ways, then everybody has to race to do that thing faster or they lose in the midterm. And they don't get to the long term sustainable thing that they're trying to do. We would call this a multipolar trap as the generalized case of it, of which there are a few examples. And they're the most intractable issues for society. And I would argue this is one of the deeper frames to understand what humanity has to solve. The multipolar trap, one example is a tragedy of the commons and we were just giving an example of a tragedy of the commons. It's also if I don't cut the tree down, the tree doesn't say somebody else cuts the tree down. The forest is all going to get destroyed anyways, but they're going to use that timber and the increased economic capacity to then also advance in a way that will fuck our people, whether it's direct warfare or economic warfare or whatever. So now we're in a race to cut the trees down the fastest or they're externalizing costs to the environment in the form of pollution or dumping or mining tailings or whatever it is. If I don't do it, it doesn't not happen. They're going to do it anyways. And then they're going to use that adaptive advantage to. So this is a thing where the inexorability of it happening anyways means that we have to race to not have anything we care about be fucked by other people doing it.

(00:56:47):

And of course, everybody thinks that, "If I don't, they will." So if you don't have the ability to make a system-wide agreement and enforce it, then you get those kinds of race to the bottom. So a tragedy of the commons is one example. We can bind these on small scales where you can create some agreement process and some enforcement process, but we need to have transparency of who violated the thing. And then in enforcement, we can actually enact and everybody agree. On very large scales, it's

really hard, which is why climate change is still a thing and which is why we have not got conservation of the oceans or the atmosphere or any kind of thing well is because if we tax carbon and China doesn't, and that messes up our GDP growth relative to theirs, and there's a great power competition for who controls the 21st century, then by us taxing carbon, we're still not preventing climate change. We're just agreeing to cede power of the world to a different power system that maybe for a lot of reasons we might not think is a good idea. So unless everybody can, nobody can, that kind of thing. So tragedy of the commons is one example.

(00:57:53):

An arms race is another. If they build nukes, we have to build nukes because otherwise, whoever doesn't have the nuke loses and nobody wants to give up the nukes because whoever gives up their last nuke first just is going to get fucked. Everybody's clear on that. And I'm not going to give up my last nuke because I'm pretty sure that if they say they're giving up their last nuke, they're lying. How do I know that in some deep secret underground military bunker, they don't have a nuke? So we're just not going to deproliferate. Now, it gets worse when you start to get very fast areas of new tech. I don't really want to live in a world with AI weapons, but I have to build AI weapons and I'm basically representing any advanced nation-state's thinking right now. We have to build AI weapons because they are.

(00:58:32):

So if China's going to be build AI weapons and the AI weapons are just obviously going to have supremacy, then the US and Russia and India and everybody has to race to do them. Well, why don't we just make an agreement that nobody does because we can't ensure that people are keeping the agreements because what are they doing in some deep underground military base? As a result, we need to either make the agreement and we defect on it knowing they're defecting, while pretending that we aren't defecting, spying on them and trying to lie to their spies. And that kind of thing happens. Or we just don't even bother making the fucking agreement. And then we are in an all-out race to build the most fucked up stuff that increases everybody's likelihood of dying from AI weapons.

(00:59:09):

Now, add this to bioweapons and on and on and on. So the arms race and the tragedy of the commons are two. There's a third one which is in the market. The kind of first mover advantage race to first mover on a market or race to scale on a market

that then externalizes everything other than the possible win potential. So there is a perverse game theory on paying attention to opportunity versus paying attention to risk. If I am going to develop some new technology like, let's say, some advanced genetic engineering technology like CRISPR, of course, there are some positive applications. Maybe I can try to do immuno-oncology and CRISPR oncogenes out and whatever. But of course, as I'm developing the capacity to do that cheaply, anybody can use it for any purpose like bioweapons or make more cancer. So one of the tricky things that happens in the world today is somebody develops a technology in a major corporation or say in academia.

(01:00:10):

They have an ethical review board, if it's in academia, to ensure they're doing some ethical purpose and there's oversight and there's all like that. But then they're developing the techniques and then they publish it. And they're publishing something that unlike nukes is not hard to build physically. I don't have to have cyclotrons and uranium enrichment, it's just now pretty simple technologically to make the AI thing or the synth bio thing or whatever. So I have an ethical purpose to develop the thing, but the knowledge by which I just developed and that I published and that I used the huge MIT funds or the Stanford funds or whatever it is, now anybody without those funds and ethical review boards has access to build that same thing for other purposes. And even if I'm going to go to market applications, I say, "No, my market application's good. I'm using it to do this thing."

(01:00:56):

Well, there's externalities that it might cause directly plus other people using that tech for fucked-up purposes. But if I think about the risk and say, "Oh, you know what, before we move forward on this, I'm really going to do a complex risk assessment of all the second and third-order effects of what this might do directly plus what putting the information out might enable others to do. And then if it's bad, we're not going to do it." And if it's bad but we find a way to mitigate it, then we'll do the mitigated version. So let's say I do that, somebody else in the market doesn't do that. They're just like, "Fuck it. There's an opportunity. I'm just going to sell the story that this opportunity's awesome. There's no downside risk. We did risk mitigation, but it was a total bullshit kind of version." They win the first-mover advantage. They get all the dollars, they have socialized the risk to the world. They have privatized the gain to themselves.

(01:01:45):

And as a result, the game theory and sense being focused on the opportunity and not the risk, whoever focuses on the risk just loses and has no power. So all of these, the market race which ends up being a race to the bottom externality-wise, the arms race, the tragedy of the commons, or examples of multipolar trap where anybody doing the thing that is fucked up for the whole in the long term but provides game theoretic advantage to them in the near term, ends up causing races in the wrong direction. Humanity has to solve for that thing categorically. There are ways, I believe, of solving for it categorically, and we can talk about what some of those are. And there are examples of where we've done it on local scales, we just haven't solved for it categorically. Now, this is directly related to the dynamics of the superorganism with it. You talk about it, it's directly related to the obligate nature of the plow, right? It's directly related to the maximum power principle. So I just wanted to construct a multipolar trap. We'll come back to that, but you wanted to say something?

Nate Hagens (01:02:42):

Yeah. Well, so what you're saying is the hunter versus the guy with the plow and the obligate nature and the Jevons Paradox rebound effect from the surplus generated by the plow. I've been writing about how that applies to our economic system and money and energy and CO2 absorption by the biosphere in the oceans. But you're adding another layer to it, which is saying the same dynamic applies to technology, especially exponentially soon-to-be AI-informed technology and spins off all these other mini superorganism volcanoes with X risk attached to them because we are optimizing for opportunity, not risk.

Daniel Schmachtenberger (01:03:37):

And there's a reason why it is intrinsically easier too. And this is worth noting. There's a reason why it's intrinsically cognitively easier, let alone game theoretically easier, pragmatically easier. I'm going to build tech to solve a problem. I have already defined that problem in a pretty specific way and I'll have one or a small number of metrics that are the success metric of the opportunity, the problem solve or the opportunity. So the plow is going to increase the calories of surplus that I can generate per person per year. That's the metric of success. It's pretty straightforward. And I can measure the plow versus the digging stick. I can measure one plow versus another. Later, I can measure a tractor versus a plow. And what I'm trying to optimize

for is how much total caloric surplus can be created per person or per acre or whatever it is, right?

(01:04:28):

So the upside is measured in one or a small number of known metrics. The risk is going to happen and it's a first-order effect, I'm directly causing that. The tech is built to do a first-order effect on one or a small number of known metrics. The tech is going to have second and third and fourth order effects on a very large number of as-of-yet unknown metrics which is where the harm is going to occur. So to do the risk reduction to prevent the externalities, I've got to think about not just what the results of using the plow to get calories out, but using that every season on topsoil erosion and what topsoil erosion then will do as a next order effect on the rivers because the roots aren't there anymore and what that'll do on the fisheries and what it does to human minds and what that will be. So now the externalities might be a million metrics with nth-order effects. So it's intrinsically easier to optimize for opportunity than it is to prevent against the risks.

Nate Hagens (01:05:31):

Well, we don't have the surplus to do the research even to optimize for all those risks. There's so many people right now that are concerned about global insect population. The estimate is we're losing one to 2% of insect biomass per year. How the hell do we test that? We can test little 10-acre plots here. We don't have the resources because that's not in our economic system.

Daniel Schmachtenberger (01:05:54):

It's not that we don't have the resources, it's that the multipolar trap doesn't orient those resources that way.

Nate Hagens (01:06:00):

Well, that's my question. All of the tech that is currently being built is in order to amass digital representations of surplus. And then this ties back to maximum power principle and evolution and ecology is that energy is going to be used and in nature. So where is this opportunity here that we are just naturally drawing down Earth's energy battery 10 million times faster than it was sequestered because we found it?

How could we not optimize for energy surplus, which is our biological tendency? Is that where you're going with what to do in the governance?

Daniel Schmachtenberger (01:06:47):

I have to get back to why we use all these exosomatic calories and other animals don't. To get into the nature of the biological tendency of humans, it is distinct. But I want to define the maximum power principle regarding markets. Obviously, we don't have pure market systems, there's regulation, but let me just try to define the idea in as close to a pure market-type thing as we can think about. So outside of regulation and enforcement. Return on investment of capital will be, any area that provides return of investment will be exploited. There is a search function and an exploit function and the market will search anywhere that capital can turn into more capital.

(01:07:38):

It will preference the higher returns, but there will still be some appetite for returns of any kind. So if I get positive returns, they're going to be exploited. And we can say that in terms of capital, but we can say it in terms of energy too and define the maximum power principle as wherever there are positive energy return on energy investment. So even if we start getting down to that it takes most of a barrel of oil to get a new barrel of oil. So long as I still get net oil out of the process, we're going to keep doing that thing if it is simply based on incentives, right?

Nate Hagens (01:08:17):

Because oil is so special, yes, but we wouldn't do the same for corn ethanol.

Daniel Schmachtenberger (01:08:23):

From an energy perspective, obviously, it takes some energy to get new energy. So long as I'm getting more energy out than the energy I'm putting in, it makes sense to do it. I'll always seek the maximum energy return on energy investment, but as the maximum decreases, I'll continue to do anything that gives me some energy return on energy investment. And that's also true with fiscal return on fiscal investment. And from a game theory point of view, any player, any agent in a game theoretic situation is going to try to maximize their returns on agency. I'm going to try to implement my capacity to act to get more capacity to act.

Nate Hagens (01:09:03):

So that's your optionality, in a way.

Daniel Schmachtenberger (01:09:06):

And it's actually very interesting, one of the other papers are writing right now, Consilience Project, on a theory of hyper agents and the idea that throughout history, it's pretty obvious that Genghis Khans and Alexander the Greats are different than most people. Something in their motivational structure, their psyche, their capacities, it's pretty different than most people and they have an outsized influence on what happens to the world.

Nate Hagens (01:09:33):

And 8% of men alive today have Genghis Khan's Y chromosome.

Daniel Schmachtenberger (01:09:36):

8 or 11 or whatever that number is. It's very interesting.

Nate Hagens (01:09:41):

Yes, something in that neighborhood.

Daniel Schmachtenberger (01:09:45):

Where we try to look at the patterns of what's happening in the world from a sociological perspective, from patterns of human psyche and behavior in general, we would argue that there is a tiny percentage of people at the top of a power law distribution who have an outsized effect on the world. And specifically, then they create the topologies that everybody else operates in. They create the incentive deterrent landscapes and cultures and stuff that then ends up making everybody else's values a lot what they are.

(01:10:15):

And these people are outside of the bell curves on most of the psychological things that we assess sociologically as humans. They are better at game theory, better at war, generally more sociopathic, highly more competitive, those types of things. And one good way to think of it is that they're good at maximizing returns on agency. So the hyper agent is someone who will implement agency to grow more agency. And a good hyper agent is someone who figures out how to do that at maximum scale.

Nate Hagens (01:10:49):

But is it exactly the same people-

Daniel Schmachtenberger (01:10:52):

Not exactly.

Nate Hagens (01:10:53):

... that are the richest people on the planet or not necessarily?

Daniel Schmachtenberger (01:10:55):

A major unit of agency, it's not the only one. So Kissinger had way more global influence than he had personal money. There was massive pools of money that he had indirect influence over. So, how much money do I personally own versus how much do I have in assets under management versus how much do I have in assets under indirect influence? So obviously, how much money does Xi Jinping have personally versus stewarding the GDP of China? It's not how much he has personally, it's how much total agency he has influence over. And there are different strategies for how to do that.

Nate Hagens (01:11:33):

So those people are optimizing agency and optionality and the money that they amass is an externality of that.

Daniel Schmachtenberger (01:11:43):

Money is a unit of agency and optionality. It's not the only unit, but it's a particularly interesting and important one. And it's why, obviously, before we had a financial system with a global reserve fiat currency type thing, the system emerged towards better and better optionality. The financial system emerged towards that. So when we were just talking about agriculture, the unit of currency might largely be just grains and being able to exchange grain for shoes or whatever it is. Or then we might just start getting into seashells or at a certain point, gold coins or something that is some kind of representation to mediate it a little bit easier. And then the movement from some kind of mediated barter with local currencies to being able to change the gold to paper units that are easier to then be able to get rid of the gold to then be able to have a global reserve currency. What that gives is increased...

(01:12:46):

And if you look at the current system with a global reserve currency with the OPEC backing, petrodollar backing whatever, you have the system of relatively high stability with maximum optionality. And it's usually hard to get both of those, things that are very stable, like the value of real estate or whatever is very low optionality. It takes me a long time to sell it. And the things that can move very fast, oftentimes, if I didn't have a global financial system made to do this, wouldn't have the same stability. So the systems is engineered to maximize total market movement. So if you think about, I think you and I talked about last time, the military concept of OODA loop, O-O-D-A, observe what's going on, orient to that to make sense of what to do, decide, and then act. And the fastest and most accurate OODA loop ends up winning in game theoretic scenarios.

(01:13:41):

In a situation where the world is changing rapidly, long-term planning is not as good as very fast ability to adapt and figure out what to do. So if I have a bunch of land and then all of a sudden the world changes where I need energy or steel or computation or a military, my ability to convert that land to those things takes a while. I got to sell that asset and find a way to sell it. So if I have a lot of currency, my currency gives me maximum speed, right? Maximum optionality to-

Nate Hagens (01:14:12):

It gives you more options, more flexibility.

Daniel Schmachtenberger (01:14:15):

So the thing everybody wants the most is the thing that has absolutely no intrinsic value, but the maximum optionality for every source of value. And yeah, of course, there's this perverse thing that says we will destroy sources of real value to get the optionality value.

Nate Hagens (01:14:32):

Because I want to have more options than the next guy.

Daniel Schmachtenberger (01:14:34):

And there's a multipolar trap, right? Because if I don't maximize my returns on agency because I value things, so I'm going to put money into protecting the forest and not turning the forest into lumber and then into capital. If I don't maximize my returns on agency and someone else does, they're going to end up either beating me in war or influencing the world more than me. So there's a multipolar trap between hyper agents to maximize returns on agency. And there's a rationalization that even if it's because I think I'm the most ethical hyper agent, I would be the best ruler, whatever it is, I'm still obligated to get the maximum power to be able to do that in what is considered an obligate game.

Nate Hagens (01:15:17):

So how many hyper agents are there on the planet today, roughly?

Daniel Schmachtenberger (01:15:20):

Lots and lots of people who want to do maximum returns on agency. There's plenty of people who are very power-oriented, they just aren't equally good at it. So there's plenty of people who are trying to climb the corporate ladder and they're in middle management and they are hyper agents and they're motivational complex. It's just how good at it they are is not that much. There's individual thugs who have nobody working under them who are trying to maximize their agency. So they might be a hyper agent motivationally, but their skill to do it is relatively low. So if we're talking about a tier one hyper agent, the highest capacity ones, they're not just motivated to do returns on agency, they know how to do it at scale, which requires being able to understand how to navigate things like finance, politics, technology, culture, human motivation, the things that can extend my agency in scaling dynamics. And depending upon how we define tier one, there's not that many.

Nate Hagens (01:16:19):

So contrast that to the superorganism, you have this small group of hyper agents that are maximizing optionality tethered to digital representations, dollars, linked to energy, and they're competing with each other for more agency. Is that the driver of the superorganism or is the superorganism driving them?

Daniel Schmachtenberger (01:16:47):

You're asking a bottom-up, top-down causation question in a system that is recursive. So there is a bottom-up dynamic, which is individual people are motivated to do stuff, but then that creates larger systems. And at this point, now global systems that then have their own embedded dynamics. The embedded growth obligation on capital is not any particular hyper agent, it's a global financial system because of interest if nothing else, and there's a lot more on top of that. But simply because of that structure has to have an exponential growth curve. And to stay bound to goods and services means you have to have an exponential growth of the materials economy, blah, blah, blah. But that system creates a top-down influence on all of the agents to do the bidding of that system.

(01:17:36):

So rather than people produce goods and services and then we figure out some way to index and then make an amount of currency, as you mentioned, making up the money out of, not thin air, but the contract is basically saying, "Let's put up the money to incent the growth of goods and services to keep up with it so it doesn't debase itself." But if you think about the money and incentive system, "So if I get money, I get the optionality for anything I want," that's pretty cool. That means that rather than have to figure out what somebody wants, you just get to give them this unit of choice-making, right? And the money's just like a unit of choice making for whatever the fuck you want. So now everybody wants the unit of choice-making. And the incentive of the decentralized system is for everybody to figure out how to do the best job at converting their own life force, both labor and creativity into currency, right?

(01:18:33):

That's the kind of market motivation. So it's my labor energy will get me a little bit, not all that much. My creativity multiplied by that might get me a whole lot more. So there is a both search algorithm, which is all the humans in the world, which was a smaller amount before, but 8 billion humans incentivized to figure out new and better ways to make stuff that will correlate to capital and then to exploit the fuck out of doing that. And as soon as somebody figures out a new thing that people hadn't figured out, now there's a race for others to try to exploit that space maximally. So somebody figures out early computation or whatever it is now, then everybody starts to race on that thing. Once that space gets flooded enough, it creates more incentive for search on new things. When somebody figures it out, then there's a race on that thing.

Nate Hagens (01:19:24):

I don't have a lot of money. I would like more money, but I'm not driven by it. I'm driven by discovery and friendship and conversations like this and doing meaningful things. So I'm optimizing for a broader portfolio of results than the optionality for money. Having said that, I would dearly like more money in the bank for a rainy day in case I get sick or something happens or I don't get funding, et cetera. But there is the capacity for humans to optimize things other than a single monetary representation of all our ancestral experience.

Daniel Schmachtenberger (01:20:10):

The scientists, philosophers, artists, spiritual teachers throughout history that we liked the most were mostly motivated, like you said. There was an intrinsic motivation that was not that much of an extrinsic motivation. The original theory of money partly was how do we mediate barter, partly was how do we incentivize people to do a bunch of shitty labor jobs that society needs that nobody's intrinsically motivated to do? So we need to extrinsically motivate them to do it because that is ultimately more efficient and kinder than the state forcing them to do it. The state could just take care of everybody's needs and then force them to do it, but we'll let the market force them instead of the state. So one of the core ideas of money was a system of extrinsic incentive because there's a bunch of shit that needs to get done that nobody really wants to do. But then of course, some people then take that extrinsic incentive and figure out how to just get very good at getting lots of it and not doing the labor stuff.

(01:21:05):

So interestingly, was Einstein money motivated? It does not seem so. It seems like he was very intrinsically motivated to figure out the universe as deeply as he could. Was that game theoretically, not just money, but agency game theoretically motivated at all? No, pretty much seems like a genuine curiosity, sacred even, impulse. Now, did his scientific insights give the basis for how to make the nuclear bomb? Totally. Was that his intention? No. Was the development of the bomb motivated by game theory? Totally. And it couldn't have done that without him doing that thing. So then the game theory ends up exploiting the non-game theory things. One could argue that Jesus didn't make a lot of Christians. Constantine made a lot of Christians. And I take this argument for the spirit of it rather than the literality because I don't know if anybody

knows the historicity of any of this well enough, but kind of standard narrative between Jesus and the third century.

(01:22:17):

There were just not that many Christians and a small amount of Christians getting thrown to lions and the Roman Empire and like that. Then we get a huge number of Christians when the Roman Empire goes from throwing Christians to lions being the Holy Roman Empire and the Crusades and spreading Christendom. So the Council of Nicaea, the creation of the Bible, the idea of spreading it by force or crusades, that wasn't Jesus. So it's not who made the concept, it's who identified the utility of it and was motivated to make it spread that was a hyper agent. So I would say Jesus and Einstein were both motivated by non-hyper agency-oriented things. And then Constantine and Eisenhower, or Eisenhower, and in that case, Hitler, were motivated to see, "How do we extract that and convert it to game theory?"

Nate Hagens (01:23:06):

So we need wider boundary hyper agents, but the system doesn't reward that. And most wider boundary hyper agents have very little power and optionality.

Daniel Schmachtenberger (01:23:17):

Hyper agent is getting returns on agency.

Nate Hagens (01:23:22):

There are wannabe hyper agents.

Daniel Schmachtenberger (01:23:23):

There are people that care about a lot of things.

Nate Hagens (01:23:28):

Yeah, I see.

Daniel Schmachtenberger (01:23:30):

When I was a kid and my mom was taking me to do activist stuff, we were going to Greenpeace protests and PETA in Cal Park and all these kinds of things, and I really cared, but I saw that everybody there really, really cared. They were willing to

self-sacrifice for other sentient beings they had never met, whether it was an animal in a factory farm or a whale that would get hurt or whatever. And I remember seeing that and then thinking about the industries they were up against and the tools of capital advantage, and political advantage, and technological and intellectual advantage that those industries had, relative to the tools of effectiveness these people were using, was handcuffing themselves to things and picket signs and like that. And it was just so clear they were going to keep losing. And the way I saw it at first was that that represented the kind of head-heart divide at the level of humanity, and that those things can't actually be divided. And then I realized one more step, I started thinking of it as like head-heart-will, something like that, those three.

(01:24:41):

There's, of course, lots of types of intelligence, lots of types of capacity, and we need to think about them all together. But if you just take those three as a beginning model, and you say, "Okay, solar plexus, will, agency, heart, kind of values, and mind, kind of strategic technological insight." And I started to see that any two out of the three together, and the world dies. Because it's not just single ones die, if you end up having a lot of agency and a lot of heart, a wide kind of heart, which is oriented to care about a lot of things inclusively, well, the activists had that, right? The activists had high agency. They were willing to work their asses off, risk themselves, get on Zambonis, handcuff themselves to things. So, a lot of agency, a lot of heart. Very poor strategic thinking about how to actually...

(01:25:36):

So, they had agency, but they didn't have the strategy to do hyperagency. And so, they would continue to lose. If you had wide inclusive values and you were smart, but you didn't have a huge amount of agency... I saw so many caring liberal intellectuals who had some thought about the problems in the world, they really cared, and they felt crushed and like they couldn't do anything. If you didn't have wide values, you had narrow values, but you had very high agency, and you had high strategic thinking, and your strategic thinking was in service of your agency, and your values were only optimizing for yourself, or your corporation, or your nation state, and you were willing to externalize harm elsewhere, you became a awesome hyper agent that ruled the world while externalizing lots of harm, and creating multipolar traps with other hyper agents to do so.

(01:26:22):

So, how to get all three of those together? Which would be the will, and strategic capacity, but with the wide inclusive values. I'm not trying to optimize for a narrow set of metrics, but very wide, inclusive of everything. I would say that is a minimum necessary requirement for people that can help turn the ship around. Now, that doesn't end the multipolar trap, that whatever values I care about that don't optimize my agency still seem like the game theoretically lose if I care about them, to the people that only do the agency returns. And so, one of the things that we have to get into is how to make that not lose. And that's one of the criteria of turning the superorganism thing around. I think there are answers to that and it's probably on our next podcast.

Nate Hagens (01:27:08):

Well, I was going to say, you and I know some of these hyper agents. And is one of the possibilities to change the values in this group to be wider, or wider values as you were saying, is that possible?

Daniel Schmachtenberger (01:27:26):

The question of do you try to increase the understanding of interconnectedness and the embodied values and commitments of the hyper agents? Do you try to increase the agency of the people who already have wider and deeper values? Any of those are possible paths. They're all hard. Human development is not a quick thing. And more fundamentally, we want to ask the question when, like when we were mentioning the way plows affected values at scale, is not just what do we try to do with individual people, but how would we make changes to society that would be developing people differently at scale? Now, of course you have this boot load question of, well, who's going to do that? Who is going to do that that was in this current system that isn't doing that, to try to make systems that incentivize different things long term?

Nate Hagens (01:28:25):

I think we are approaching a bend versus break moment, and we discussed that in the first conversation, where our financial claims on our physical reality are diverging, and that gap is getting wider, and it's unsustainable. So, when we have our third conversation, I would like to horizontally look at triage, transition, and long-term solutions for the human enterprise. And then vertically, globally, nationally, in communities, and as individuals. You have, off the record, and tangential to this

conversation, given me some excellent personal advice on how to cope and thrive during this time. I don't know if we want to fit that in the next macro podcast, but you're very good at that stuff. So, that's where I want to head to on what to do, because learning about the superorganism actually does something paradoxical. When you understand it, it actually makes you at least feel like you have less agency. People that understand the momentum of all this, it's kind of a shitty thing to discover because it feels like, "Oh, we can't just pass a climate law and everything is fixed," or, "Oh, we just can't have a law that has more equality, and that doesn't fix things." The problem is much more systemic and deeper than that.

Daniel Schmachtenberger (01:30:01):

It is certainly often the case that as people understand that the individual problems are not so easily solvable on their own, they're part of a deeper set of interconnected things, and there's this really tricky game theory of multipolar traps and incentives on opportunity and not risk. And that even if you try to regulate a thing, that the regulatory apparatus moves slower than the thing you're trying to regulate, and so it continues to wiggle out of the regulations. And as people start to understand all that, it can make them feel less agency, and a little bit overwhelmed and shitty.

(01:30:37):

And so, as you mentioned, talking about how to emotionally, psychologically hold that as valuable. But it doesn't have to make them feel less agency. It can make them feel more agency. And that's actually what I hope happens. That's the effect it has for me, and I'll explain why inside of me, because I think it can, for a lot of people if they hold it this way. I think there's a lot of people who care, but the problems seem intractable. There's a certain kind of nihilism they have because climate change seems like such a huge deal and almost impossible to solve. And then, so does species extinction, and so does nuclear risk. And it seems like there's a million problems, and then they learn about a new one, and a new one, and even if they started to feel like they got hope around some chunk of them, there's more. And there's a certain sense of impossibility in trying to deal with it all at that level, that when you start to get, "Oh, there are underlying system dynamics that all these are expressions of," it can start to feel more tractable.

(01:31:47):

Those problems are hard, but now that we're able to actually articulate that all the other problems are expressions of a set of system dynamics, now we at least know where to focus. Now possibly we've defined the problem well enough to be able to solve it. And in understanding a problem better, more solutions are to emerge. If I don't understand the problem well enough, I probably can't solve it at all. As I'm understanding it better, I might say, "Wow, that's a hard problem, but at least possible." So, I think we move from impossible to hard when we start to understand it better. And hard is better than impossible. And what I want is that it actually kind of cures the nihilism people have running of maybe this is fucking impossible, and creates a inspiration and upregulation with regard to the heart, of like "Hard, but possibly fucking tractable. This should get all my life energy. The fact that I don't know the answer instantly, nobody fucking knows. Einstein didn't know the answer to the questions he was asking, and no inventor knew the answer of how to make the invention they were thinking of."

(01:32:44):

There is some faith that the thing that you don't know exists that makes you do hard discovery work and stay with it. One of the other problems you talk about, kind of the dopaminergic nature of the superorganism, is that the delayed gratification to work on a problem for a long time that you don't know how to solve instantly is fucking critical. And so, one of the attributes of the people, in addition to these three things together, the agency, heart, mind, is part of the agency is the capacity to say, "I don't know the answer, but that doesn't mean I'm demotivated. The fact that I can even start to wrap my head around the problem more means that there is a possible path to answer, and I'm motivated to continue to explore that space until I have it, and then implement the best answers I have. And then when they fail, find out why they failed and not take it as a failure, but a learning." So, that psychology, I would say, is critical to being part of solutions.

Nate Hagens (01:33:41):

Thank you. That is helpful and it makes sense to me. One of my biggest challenges is, all along, I'm an expert on describing the constraints of our situation, less so of an expert on the solutions. Because they're not impossible, but they're hard, as you said. But I spend most of my time debunking people that say, "No, we can decouple energy from GDP," and, "No, renewables will be able to power a 19-terawatt society, we just

need to have the political will," or whatever. I spend most of my time on that instead of in the solutions space because, as you say, we have to understand the systemic nature of the problem in order to work on the real solutions.

Daniel Schmachtenberger (01:34:32):

One of the reasons you have the podcast is to help more people understand the design criteria, and the reason you're motivated to do that is not because you just like attention being on a podcast, but because more people understanding the criteria leads to more people's creativity working on solutions. And so, there is an implicit faith in your strategy-

Nate Hagens (01:34:50):

We need a lot more people involved.

Daniel Schmachtenberger (01:34:51):

... that collective intelligence, if it has the right input, can do something. Obviously that's why I'm talking with you here is the same kind of faith. We're actually working on a project right now on what are the very hard questions that are underneath most of the problems that we think are a better orienting framework than things like Sustainable Development Goals. And how do you solve multipolar traps is an example of one of those questions. And being able to make that very widely understood, not to bum everyone out, but to say, "Let's get the decentralized collective intelligence of the world, having the best frameworks for understanding the most fundamental problems, as the center of the innovative focus of the creativity of the world."

(01:35:38):

If we have people understand those constraints widely, of course some people will say, "I don't know what the fuck to do with that," but a lot of people will be like, "Oh, this is an engineering problem, let's start to work on it." And some of the problems, like how do you solve multipolar traps, don't have a single solution, they'll have lots of partial solutions. Well, in order to get enforcement, you have to be able to see, so there's going to be transparency tax. So, how do we create forced transparency in some places, and how do we create incentives on transparency? And other things will have to do with enforcement, others will have to do with incentive, others will have to do with better regulatory process.

(01:36:07):

And then of course, whenever you figure out a thing, it'll be gamed, because there will still be an incentive to game in. And that's why it's not, "Here is the answer forever," it's why it's a orienting question, how do we continue to pay attention to things like perverse incentives, and externalities, and multipolar traps, and do a better job ongoingly and procedurally upregulating our responses to these things that are fundamental to all the other problems?

(01:36:33):

And if people like you are not articulating the design criteria well, then other people will be coming up with solutions really well-intendedly that were just missing some of the design criteria. And this is one of the problems, is, as we were mentioning, we define the problems with narrow definitions of what success means that still externalize lots of harm or miss some of the constraints. Getting the constraints set better might make it harder, but actually it makes it possible. Whereas before it was impossible because all the things were bound to fail, because they didn't understand what the success required. So, rather than go from easy to hard, the easy was for sure going to fail, so it wasn't easy, it was impossible. We're actually going from impossible to hard, which is a movement in the right direction.

Nate Hagens (01:37:14):

Okay, so you wanted to unpack a little bit more about atoms, bits, joules, and maybe dollars and human behavior. So, go for it.

Daniel Schmachtenberger (01:37:23):

Yeah, just to kind of underscore the energy blindness that you talk about, I think the first time I heard the term atoms and bits together in terms of describing the economy was from Peter Thiel. And of course makes sense that from someone who made money in Silicon Valley and the domain of bits, recognizing that there is still stuff to do in the domain of atoms, which is what Peter's very favorable of, which is why he likes Elon and people who build physical technologies. For the people coming out of Silicon Valley where everything was about digital tech, and obviously digital tech kind of subsumed so much of the world, and particularly the financial world's attention because of the capacity for the scaling dynamics, the network dynamics that Metcalfe law that gives you kind of natural monopolies.

(01:38:18):

And the speed at which you can get 3 billion users into a platform, which is so unheard of for anything else like that. And the speed at which you can get to a billion-dollar valuation or anything else because the bits give you exponential returns, right? I can make a piece of software once and then sell it an indefinite number of times. And that obviously started with computation and software. Then when I get beyond just software, and that would be like the Microsoft story, into something that is a network, so it's software, but then it's applied to mediating human interaction where the value occurs across the interaction. So, the number of people that goes up, the value squares as something like a second power to that, which would be true for digital currencies, Amazon, Facebook, all those types of things. Now you're dealing with something like an exponential curve with another exponential, or at least polynomial curve on top of it.

(01:39:16):

And so of course, from a financial point of view, money into software equals more money out relative to most other things. And so, that sucked up a lot of the world's attention, but then people recognize there's still stuff to do in the domain of atoms that matters. But even calling it atoms and bits... Of course these guys are very sophisticated, I've heard Peter Thiel refer to it that way or biology, of course they know that the energy sector is one of the biggest sectors. They get pitched at VCs all the time on new energy tech. They know Saudi Aramco is maybe the biggest, or one of the biggest valuation companies in the world. And yet, just even in the framing, it's not explicit in the framing.

(01:39:57):

And the first time I heard the three together, atoms, energy, and bits, as the key parts of the materials economy, is from Forrest Landry. And that obviously doesn't still include all the human aspects, but from a materials economy point of view, kind of reducing it to the things that have fundamentally different physics, it's a good structure. The atoms we don't really get more of, right? The amount of copper we have on the planet is what it is, outside of mining asteroids, we're not going to get more. And even then it's still within a larger space of Earth plus the asteroid belt, or whatever that we're looking at. And we also don't get rid of them. So, we have a finite amount, and then we turn them into pollution if we don't go closed loop on them.

(01:40:38):

And so, we have to go closed loop on the atomic accounting of things. Energy, we're getting more of all the time, but we have a kind of fixed bandwidth of how much comes in, and we have to work within that bandwidth. How many joules are coming into the planet from the Sun per day, and like that. Bits, there is not the same fundamental limit of either a fixed amount that we have to work with or a fixed input, so they have a different scarcity dynamic. It's really only limited by the energy and atoms needed for the computational substrate, but then also limited by human time. The attention-seconds thing of how much software is useful if it requires either an interface... The software is either going to move atoms around, so you have to couple it to atoms, it's going to move bits around in ways that take energy, the software is going to require energy, so it's coupled with that. And/or it's coupled to entertainment or some kind of human engagement directly, so it's coupled to finite amounts of attention. So, you don't get an infinite scaling on the value of bits that is decoupled from human attention, atoms and energy.

Nate Hagens (01:41:47):

Well, there's also a qualitative aspect to the bits too-

Daniel Schmachtenberger (01:41:50):

Totally.

Nate Hagens (01:41:51):

... based on what culture cares about.

Daniel Schmachtenberger (01:41:53):

And one thing I would say on the atoms, energy, bits, the first thing is, of course, atoms aren't that useful unless we can rearrange them and move them around, and that takes energy. And energy's not useful if we aren't moving atoms or bits around with it, or moving it through things made of atoms. So, we care about it to have a motor that moves an atom around or something like that. And bits are going to be coding for the digital pattern that we're actually going to build in the physical world, or something that is related to... and at minimum, running on a computational substrate, energy and atoms. So, there are coupling coefficients between them where you don't get to just increase bits indefinitely independent of atoms and energy. You

can increase them to some extent, and those are where you'll get increases in efficiency, but then that's why the Jevons paradox still matters, is what happens with those increases in efficiency.

(01:42:51):

So, those increases in efficiency have to not Jevons paradox, which means we need a binding dynamic. Because the pure market dynamic will just turn that into a maximum power principle and forever growth. Those increases in efficiency have to also turn into less total utilization to deal with actual limits of growth. And you're not going to get that through a pure incentive system, you need that through a binding system. That'll get into what we talk about later, of how do you make governance in the presence of international multipolar traps, and the fact that markets typically capture the regulatory system rather than the other way around.

Nate Hagens (01:43:23):

So, how do joules, bits, and atoms map t

Daniel Schmachtenberger (01:43:32):

Well, the first thing I want to say is there's something like a Jevons paradox on all of them. And Jevons paradox was obviously named that looking at energy, but it's because energy is a relevant input to any kind of industrial process, any kind of market process. So, when energy gets cheaper, more total market space opens up. Well, compute has become useful to pretty much every market. When compute becomes cheaper, we use more total compute. That's another kind of Jevons paradox on computation.

(01:44:02):

And we don't say, "Great, now we'll compute with less energy," we say, "Great, now there's more total shit that we can apply computation to." But it would also be true to say anything that is an industrial input that is useful not in one industry but widely when it becomes cheaper will increase total market. So, if we can extract steel more cheaply, and steel is key to our ability to build vertically in high-population spaces, as that gets cheaper, we will build more shit, grow populations more, and grow net markets more. So, what I would say is there is this generalized Jevons paradox that when anything that is relevant for the market as a whole gets cheaper, the market as a whole grows. And so, you have that kind of boomerang on efficiency, not just on

energy, but kind of writ large. And that's an important part of understanding maximum power principle.

Nate Hagens (01:45:00):

I agree with that, though I think the opposite is about to start happening, that we've gotten a clue with Ukraine and Russia, and Europe's dependence on Russian hydrocarbons, that as energy gets more expensive, everything in society is going to get more expensive. Including solar panels and wind turbines the last three months, et cetera. So, as we've been focusing on the powers of what technology can provide for us, during that era, that narrative was supported by pretty much every year we grew our access to fossil energy. And most of the time it was very cheap. But there's a multiplier effect, that we add thousands to ten-thousands of units of fossil energy to replace tasks that the ox, or my great-great-great-great-grandfather did in the fields. And so because of that, our industrial processes, our bits and atoms, are incredibly sensitive to price increases in energy. At $200 a barrel, oil is still effectively magic for what it can do for us. But many of the energy-intensive processes in the world would become unprofitable at that point.

Daniel Schmachtenberger (01:46:27):

Yeah, the entire market depends upon pricing... you talk about pricing, the cost of energy, the cost of extraction, rather than what it would actually take for us to make that substrate, and the total externality cost. This is also another kind of corollary of the market dynamics and maximum power principles. It's not just the cost of energy, but the cost of steel, the cost of anything is going to be the cost of extraction, and then some margin. And this is kind of that return on investment topic, it's going to cost us something to get out of the earth. But we didn't make it there, and there's going to be a lot of cost that is externalized not to our balance sheet, in terms of we just destroyed rivers, and extincted some species, and ruined some Indigenous people's lives and whatever.

(01:47:21):

And we just can't make hydrocarbons at scale like that, that have that organic chemistry complexity. But if anyone just extracts it, because there isn't a law... we call it being industrious to extract, there isn't a law saying stealing from the balance sheet of nature, because nature doesn't have a balance sheet, is anything other than being

industrious. Then I just have to have enough margin to sell it, and I don't want too much margin because somebody else will do it and come with a lower margin, so the market will end up setting the price. The market incentivizes extraction and externalization. And so, what that means is, because you can't keep extracting and externalizing and using unrenewable resources forever, a sustainable market, almost everything that we currently have would not be viable. Almost nothing would be profitable.

(01:48:13):

And the profitability dynamics, if we weren't externalizing all of the costs and burning through unrenewable things unrenewably, would be completely fucking different. And this is the thing you're underscoring, it's like what would that actually look like if we made sure that we were using energy in ways that we could continue to use energy, and we were using atoms in ways that we could continue to use atoms? What would that system look like? And it looks fundamentally different. I think this is what's so fundamental in your work, is saying, "Hey, we have to really rethink what does it mean to have a system that you're not continuously subsidizing? As we're about to lose our ability to keep subsidizing this thing."

Nate Hagens (01:48:50):

Totally agree. A slight clarification, we actually can make low-carbon hydrocarbon fuel with technology. We can overbuild solar panels and wind turbines near bodies of water, via hydrolysis we can create methane, which is basically natural gas. But the all-in cost of that is $10 a gallon, oil equivalent, which we could have a viable society around that. But not this society, not this amount of goods and services and complexity. And we can talk about that in our next conversation. The plan is to continue to grow, to reach some sustainable technology level. There is no plan to have a smaller society because our system won't select for that plan. And that's part of the impossible to hard distinction that we made, is I think we have a 19-terawatt society right now, which is 190 billion light bulbs turned on 24/7. That is the metabolism of the human enterprise.

(01:50:05):

What is more sustainable? What is using our remaining lower quality, higher cost hydrocarbons, hopefully not any coal at all? And in combination with our best renewable tech, and AI or whatever. Our work suggests it's closer to 10 terawatts,

maybe it's 5, maybe it's 12, I don't think anyone really knows. But it's not 30, and I don't think it's 25 either, and it's not 19. Because these fossil armies that we've woken in the last two centuries, we can't continue to add their labor to our workforce. They're going to be retiring. And waking more, also they poop and they breathe, and the externalities from that are mucking up future generations of ours and other species' house, or home where we live.

(01:51:05):

Anyways, I'm digressing. Just to say that we have the technology to create energy, it's just the quality of it and the scalability of it is not what we have to today. Thank you, Daniel. Seriously, doing these in real time with you helps me understand my own story better. And I think we're working towards something important. So, thank you. To be continued, my friend.

(01:51:33):

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