

**Demetri Kofinas:** 00:00:00 Today's episode of Hidden Forces is made possible by listeners like you. For more information about this week's episode or for easy access to related programming, visit our website at [hiddenforces.io](http://hiddenforces.io) and subscribe to our free email list. If you want access to overtime segments, episode transcripts, and show rundowns full of links and detailed information related to each and every episode, check out our premium subscription available through the Hidden Forces website or through our Patreon page. And remember, if you listen to the show on your Apple Podcast app, you can give us a review. Each review helps more people find the show and join our amazing community. And with that, please enjoy this week's episode.

**Demetri Kofinas:** 00:00:51 In the prescientific societies of Ancient Greece, fated aristocrats, heroes, and kings, troubled by the prospects of their uncertain futures, consulted oracles ordained by the gods with the power to foretell clouded destinies settled at birth by three weaving goddesses whose power even Zeus was obligated to obey.

**Demetri Kofinas:** 00:01:17 The future was, for the Greeks, inescapable. And while it could be ordained in the form of cryptic poems and ominous verses, its path was inalterable, its reasons unknowable, its tragedy inexplicable. It was not until the development of philosophy and later the arrival of the scientific revolution, that the tools of prediction passed from the temples of the gods to the observatories of the scientists. And with them came the promise that the future was not only predictable, but explicable.

**Demetri Kofinas:** 00:01:54 We came to know that there are reasons for the motions of the planets, the precipitation of the clouds, and the precession of the equinoxes. Laplace's Demon vested with the knowledge of the locations and momentums of every atom in the universe could predict, with absolute certainty, every moment from here onto eternity.

**Demetri Kofinas:** 00:02:19 And yet chaotic orbits exist. Their occurrences are near infinite in nature while humanity's understanding remains hopelessly finite. But our machines offer the promise of better, more accurate predictions. Already superior to humans in behavioral markets and climate systems, they are assuming the roles once held by oracles, shamans, and prophets. Ordaining the mystery of an unknowable future but without reason, explanation, or cause. In such a future, what is the role of humanity, our models, and our science? Are we relegated once again to a place of helplessness, fated to inactive futures ordained for us

by oracles whose deterministic calculations predict a universe that we can never hope to understand?

**Demetri Kofinas:** 00:03:14 This week on Hidden Forces, David Weinberger, complex systems, inexplicable models, and the future of human prediction.

**Demetri Kofinas:** 00:03:24 Dr. David Weinberger, welcome to Hidden Forces.

**David Weinberger:** 00:03:44 Hello, great to be here.

**Demetri Kofinas:** 00:03:45 The audiences know this, but I was trying to pronounce your name before and for whatever reason, I was having difficulty. And maybe it's because I'm hungry, and I kept calling you David Wein-burger.

**David Weinberger:** 00:03:55 Yeah, well that's... up to the fifth grade, I used to get that joke all the time.

**Demetri Kofinas:** 00:03:58 Oh, really? What did people say?

**David Weinberger:** 00:04:01 "You want some burger with that wine?" Pretty hilarious.

**Demetri Kofinas:** 00:04:04 That's really funny. That's really creative.

**David Weinberger:** 00:04:06 Okay!

**Demetri Kofinas:** 00:04:07 That's really classic. A burger with that wine, I like it. So, David, thank you so much for coming on the show.

**David Weinberger:** 00:04:13 Thank you for having me.

**Demetri Kofinas:** 00:04:14 It's wonderful having you on. I'm not surprised that your publisher pitched me on this book. Its title is "Everyday Chaos." The subtitle is "Technology, Complexity, and How We're Thriving in a New World of Possibility." I understand you're not a big fan of subtitles.

**David Weinberger:** 00:04:30 They're so carefully constructed. I think they can be really, really helpful. And the subtitle to my prior book, "Too Big to Know," takes three lines. I can't even remember what it was, but for many people that's what they remember from the book. So, subtitles can be great but they're such complex objects to create.

**Demetri Kofinas:** 00:04:47 Well, the book covers a lot of areas. So, it's not really clear where to start, but I guess we could start where... in the area

that I found most interesting. Which is this idea, and in fact, you actually call one of the chapters "The Evolution of Prediction," or "The Evolution of Predicting." And this was what I found most interesting, this comparison of machine learning algorithms to conceptual and working models; the way we traditionally do science. And the evolution of prediction through the use of science and epistemology from... You really kind of begin at the Enlightenment, but I actually go back to at least the Athenians because I think the progression of epistemology and epistemological philosophy plays such a role there. And of course, I emailed with you before today and I expressed also my interest in this relationship between moral philosophy and epistemology, given this stuff with machine learning algorithms. That's a big word vomit I just put a lot out there, but that's how you start the book. Maybe the appropriate question to ask you is, what do you think this book is about and why did you write it? What were you hoping to accomplish?

- David Weinberger:** 00:05:51 Well, those are three different questions.
- Demetri Kofinas:** 00:05:54 Take them as you will.
- David Weinberger:** 00:05:57 So, why I wrote this book I think is... I mean, I can tell you it has to do, I was... but I don't know how important it is. I'll tell you really briefly.
- Demetri Kofinas:** 00:06:03 Yeah, or what were you hoping to accomplish? What was your objective in writing it?
- David Weinberger:** 00:06:07 The book started out as a book exploring ideas about, that were spurred by the rise of open platforms on the internet. And I was co-director of the Harvard Library Innovation Lab and my project there was to build an open platform that made available as much of the information that the library has. The metadata about books and whatever, whatever else we could gather. Make it available to any developer, anybody on the web, but any developer.
- Demetri Kofinas:** 00:06:33 In the 1980s? 1990s?
- David Weinberger:** 00:06:35 No, this was five years ago.
- Demetri Kofinas:** 00:06:36 Oh.
- David Weinberger:** 00:06:37 Yeah. So, as with an open API anywhere, a developer can come and use whatever services and data and information we make available in order to do something that we, the owners of the

information, hadn't thought about. Or, had thought about but it's too niche for us to do. And this platform was by far not the first, I mean, these things have a fairly long history one way or another. But I got really interested in what seemed to me to be an important change in how we think about, we want to manage the future. Because traditionally, in business and in organizations, you tightly control. You make your product, you anticipate what people are going to want.

- David Weinberger:** 00:07:18 If you're Henry Ford, you anticipate what people are going to want in a car in 1908. And for 19 years, you do not change it at all. Tiny changes, and you sell 15 million of them. He anticipated user needs incredible well, sort of the benchmark. And in product design and development, that's what we did before Ford and it's what we've been doing ever since. Until, to a large degree, until the internet came along and it made it possible to do things like an open platform where the product succeeds not by the owner of the product, the producer of it, anticipating everything a user is going to want.
- Demetri Kofinas:** 00:07:55 Right.
- David Weinberger:** 00:07:56 But says, "We can't anticipate, so let's set up a platform where we don't have to."
- Demetri Kofinas:** 00:07:59 You launch a minimally viable product.
- David Weinberger:** 00:08:01 Exactly the same point, right? But done differently.
- Demetri Kofinas:** 00:08:03 And your focus group are essentially your early customers.
- David Weinberger:** 00:08:06 Yes.
- Demetri Kofinas:** 00:08:06 In a sense. In a sense.
- David Weinberger:** 00:08:08 Yeah, yeah. That's completely right, except I actually think it's useful to remember how unreliable focus groups are.
- Demetri Kofinas:** 00:08:17 Yeah.
- David Weinberger:** 00:08:18 It's a very artificial environment. You're giving them M&M's and you're asking them to imagine how they might use it. And it's sort of well-known I think that focus groups, people will wishlist stuff, anything that comes to mind. And they'll be wrong about what they actually turn out to want. So, with minimum viable product, you put it out and you see what they're actually doing with it. In some ways, it's the same thing as AB testing online.

Where instead of trying to figure out which would be the best ad, you put the model on the right or the left, a green background, bottom of the page. Let's give up.

- Demetri Kofinas:** 00:08:49 And just for those listeners who don't know, AB testing is when you decide which ad to run based on repeated tests of running two different ads, two different groups of people that are statistically similar. And making a decision about which ones works better, and then refining and refining. And that's the same way that we train machine learning algorithms in many ways, correct?
- David Weinberger:** 00:09:07 Yeah, yes. And in the same way, so everybody online does AB testing. Almost everybody, New York Times has done it for headlines even. The thing that's remarkable about this is nobody, as far as I know, nobody tries to come up with a theory of...
- Demetri Kofinas:** 00:09:21 As to why.
- David Weinberger:** 00:09:22 Yeah. And it's very likely that there isn't a good general rule for-
- Demetri Kofinas:** 00:09:26 So, there's a great example in your book where you give the example of the picture of the Obamas in black and white, right? Right before they won the election or right after.
- David Weinberger:** 00:09:33 It was on their campaign site.
- Demetri Kofinas:** 00:09:35 Or their fundraising?
- David Weinberger:** 00:09:35 When he was running, first time he was running.
- Demetri Kofinas:** 00:09:37 Yeah.
- David Weinberger:** 00:09:37 They had a color picture of the family, charming colored picture. And they found out that when they switched to black and white, which is very counterintuitive, right? Wouldn't you think? That the donations went up, the number of clicks on the button went up.
- Demetri Kofinas:** 00:09:50 It's fascinating because it doesn't mean that every single presidential candidate should put it into black and white.
- David Weinberger:** 00:09:54 Exactly, right.

**Demetri Kofinas:** 00:09:55 It just means that that particular picture of the Obamas at that time, to this group of people that were seeing it, it was better in black and white.

**David Weinberger:** 00:10:03 Yes. I think that's exactly the point, that's why I find it so interesting. Normally with AB testing, you're talking about putting the model on the right turns out to drive up clicks by 2%. And that's not nothing, right? But that's 2%. The Obama case happened to be way more significant than that, but even when it's just 2%, it's quite likely that it goes up for some delicate balance of transient reasons. Because you don't learn a lesson from it, you don't say, "Okay, clothing ad, always put the model on the right. Barbecue add, bottle on the left." Indoor, we are not developing general principles, and we don't need to because you just run another ad, right? The first 100,000 people see model on the right, second 100,000 see model on the left. Just do it again.

**Demetri Kofinas:** 00:10:46 This also... we'll get to this later because I was thinking in very philosophical terms about what constitutes an explanation. And is causation objective? I gave you the example of the recent Game of Thrones episode, spoiler everyone if you haven't seen the episode.

**David Weinberger:** 00:11:04 Are you sure? May I speak for those who have not yet been spoiled?

**Demetri Kofinas:** 00:11:07 Yes.

**David Weinberger:** 00:11:07 Can you... no, don't spoil it.

**Demetri Kofinas:** 00:11:10 No, no, I won't. I won't.

**David Weinberger:** 00:11:11 Okay, sorry.

**Demetri Kofinas:** 00:11:11 All right, so I won't mention it, fine. But there was just simply a moment or an important part of the second to last episode of the season. We haven't had the season finale yet, we're recording this the week before the season finale comes out.

**David Weinberger:** 00:11:23 I'm sure everything is just going to be fine.

**Demetri Kofinas:** 00:11:25 Well, the season finale comes out the day before this episode will publish. But there was an important scene in the second to last episode. That scene would not have been possible if it were not for many other instances throughout the course of the seven seasons, the prior seven seasons. In so many instances,

were different decisions taken, that would not have occurred, right? So, it's very difficult. How would you even point to one objective cause? But then there's also, do ontological explanations exist? In other words, for this discussion around the picture of the Obamas, is there such a thing as a sort of base reality explanation for why that is? So anyway...

**David Weinberger:** 00:12:07 Man, those are really difficult questions and good questions. So, I believe in causality. You have to be-

**Demetri Kofinas:** 00:12:15 Do you believe in Laplace's Demon?

**David Weinberger:** 00:12:16 Yes, I think he's actually very relevant here. I believe in scientific laws, I believe in science. I want more funding for science. I want more explanations, more theories. But at the same time, these theories get applied to a world that is vastly complex. And figuring out... because everything affects everything else all the time, all the time. In a causal world, everything affects everything. Our example of causality typically is a billiard ball, cue ball hitting a billiard ball. I mean, that's a sort of classic.

**Demetri Kofinas:** 00:12:45 Yeah, yeah, yeah.

**David Weinberger:** 00:12:47 And sure, who would deny that there's some causality going on there? But the point is, it's not just some causality, it's actually all causality. Everything affects that. We pick out the two balls because that's the thing that we can control, is a point that Danny Hillis makes. We can aim the cue ball, and so that feels to us like the cause. But the felt underneath the ball is on the pool table, and the pull of the earth's gravity, and the pull of distant stars' gravity, and the photons hitting the balls. All these actually have an effect because everything affects everything all the time. And so when we think about causality, the issue isn't, oh there's no causality. At least for me, it's so vastly more complex than the model that we tend to give ourselves.

**Demetri Kofinas:** 00:13:29 So, I'm going to quote Joseph Ford. I sent you Joseph Ford's quote in an email because this is what I thought about in the context of the book. "Chaotic orbits exist but they are like Gödel's children. So complex, so overlaid with information that humans can never comprehend them. But chaos is ubiquitous in nature, therefore the universe is filled with countless mysteries that man can never understand." I think that is a big part of the message of this book and it speaks to the point of what you're saying now. Which is that causality exists, but the systems are so complex that our, as you write, there's a quote I pulled out of yours. "Our old, oversimplified models were nothing more than the rough guesses of a couple

of pounds of brains trying to understand a realm in which everything is connected to and influenced by everything."

- Demetri Kofinas:** 00:14:17 So, I think those things work together, right? And it brings us back to sort of, are we just a small, infinitely stupid organism trying to understand this vast complexity? And how meaningful really are our explanations? There's another quote, I don't have it written down, but it's one I often refer to. It's of Edward O. Wilson where he talks about if aliens were to arrive on earth, and what would they be interested in? They wouldn't have much use for our science, they are vastly superior. But they would be interested in our humanities.
- David Weinberger:** 00:14:47 So, can we go back to the Ford quote?
- Demetri Kofinas:** 00:14:48 Yeah, yeah, yeah.
- David Weinberger:** 00:14:50 Because I do agree with that, but I think something has changed. Which is that we now have technology, in the form of machine learning in particular, that is able to take account of more, vastly more of the small collisions and chaotic interactions. More particulars, and serve our needs in ways that sort of feel cognitive to us. I'm not a big believer in machine intelligence, so I'm putting air quotes around all of this stuff, but we didn't used to be able to do this. We did the best we could, we had our miraculously discovered general principles and laws. And then we would limit the amount of data that we used, that we could use, in order to try to figure out how some things worked.
- David Weinberger:** 00:15:30 Now, we have machines that don't start with general principles. With machine learning system trains itself, it builds a model. It starts just with data. You don't tell it how you think the world works, what the principles are, what the connections that we know about are between say the medicine, diseases, cures, symptoms, and organs. We know a lot of this stuff, but generally you just pour in the data. I am oversimplifying, but you pour in the data and the thing iterates endlessly in finding statistically meaningful correlations among just these little pieces. And from this, there might come some general principle we hadn't recognized before, but that's actually pretty rare.
- David Weinberger:** 00:16:14 Even when we look for generalities and general principles, we often just fail to find them in these systems, at least ones that we can understand. And yet we use them because they do some things better than we do. In some cases, they can diagnose diseases better or predict the weather better.

**Demetri Kofinas:** 00:16:29 So, to follow Ford's quote and to take with what you're saying, when he says that the universe is filled with countless mysteries that man can never understand, it seems that we're moving into a place where that doesn't change. We still can't understand the mysteries, but we're able to predict they're outcomes.

**David Weinberger:** 00:16:46 Yes, and so one of the guesses that the book makes, one of the hypotheses, is that now that we have machinery that enables us to take advantage of this non-understandable chaos, we're able to see it. When we had the chaos and the set of laws, and we were able to do pretty well with it, right? We should be proud about what we've been able to do as a species. We paid more attention to the laws, and so it's very common for somebody to talk about, "Oh, that's just an accident. It's merely happenstance." But nobody ever says, "Oh, that's merely a universal law." And I'm not saying... my point is not, oh, those universal laws, they're just merely... the point is the opposite. That now that we're able to benefit by feeding these particulars into a system that can output results that we care about, it may be that we'll be able to stop always thinking about the particularity of our lives and our universe as merely, as the mere.

**David Weinberger:** 00:17:39 Maybe we can lose the mere from that and begin to recognize, and see in front of our eyes, and acknowledge the basic fact of our lives. Which is, we live in a chaotic environment.

**Demetri Kofinas:** 00:17:51 Fatal. Chaotic but fatalistic, is that where you're...

**David Weinberger:** 00:17:54 No, I don't... that's...

**Demetri Kofinas:** 00:17:56 Because isn't that implied in what you're saying? I mean, if chaotic orbits exist, but do we live in a deterministic universe is my question?

**David Weinberger:** 00:18:03 Well-

**Demetri Kofinas:** 00:18:04 Do you think? This brings us back to Laplace's Demon, which you can explain to our audience for those who don't know who Laplace was and what his demon was.

**David Weinberger:** 00:18:12 Okay. So, I'll do that, I just want to make a note.

**Demetri Kofinas:** 00:18:15 Sure.

**David Weinberger:** 00:18:15 I am not going to be able to answer your question. I don't know whether... but I don't think the answer changes depending upon

whether or not we're able to acknowledge the chaos in which we live. So, Laplace was the Newton of France. He was called that, he was a genius, maybe at the level of Newton. His contributions were astounding, including addressing problems that Newton raised and sort of working out some of the issues. Newton was a very devout Christian and Laplace was a very straightforward atheist. So, Newton had a problem with this because Newton described universal laws. They apply to everything in the same way to everything, and that was new in the world. The ancient Greeks, and I agree with you by the way, this is one place it started. You can take it back to the Hebrews as well.

- David Weinberger:** 00:19:02 The book starts with the Enlightenment because that's the beginning of where we are now. Nevertheless, so Newton had a problem because in specifying that there were universal laws that basically can be used to explain everything. And these laws are simple enough sort by accident, you have to wonder, but they're simple enough for humans to understand. There didn't seem to be any room for God. It seemed to be a mechanistic universe that once God creative the universe, wound up the clock, you didn't need God nudging anything.
- David Weinberger:** 00:19:27 There is sort of an interesting detail about Newton. Comets were a big deal at the time and Newton, purely in the form of speculation, right? Just sort of, I'm thinking out loud when I say this. In that mode, said, "Maybe these beautiful elliptical orbits..." But because Newton understood that everything affects everything all the time, the combined gravitational pull of all the distant stars should pull the planets eventually out of these marvelous orbits. Very pleasing orbits. And so Newton said, "I don't know, I'm just thinking maybe comets are thrown by God in order to pull their gravitational pull, to nudge the planets back into their beautiful orbits."
- David Weinberger:** 00:20:10 Laplace, flat out atheist and drew the conclusion that Newton didn't want, Newton was trying to avoid. Which was, if you had a creature, later got called a demon. Not because he's evil but because he's basically an all-knowing God.
- Demetri Kofinas:** 00:20:23 Just like Maxwell's Demon, same sort of idea.
- David Weinberger:** 00:20:24 Yeah, yeah. Exactly.
- Demetri Kofinas:** 00:20:25 Or Descartes' Demon. A conceptual thought experiment.

**David Weinberger:** 00:20:29 Yes, and I think it's likely at least in the case of Descartes and Newton that it's a demon because... it's really God, but you can't call that thing God. There's only one God, so if you had a demon who knew the state of the universe at any one moment, the position of everything, the forces and the acceleration, all that stuff. That demon could apply Newton's laws and figure out the next moment is, and of course then keep repeating it and predict the entire history of the universe. And go backwards and figure out everything that had happened from that one moment. That is a universe in which God is unnecessary. That sounds like a deterministic universe for sure.

**David Weinberger:** 00:21:12 The fact that this gets driven down in the modern age, we're able to... First of all, we know about chaos. That there are non-linear systems in which the behavior of something can change with a very small, incremental change.

**Demetri Kofinas:** 00:21:23 Financial markets, the weather.

**David Weinberger:** 00:21:24 Yeah, weather is the classic example, right? A little change in, I don't know, humidity or something, and now you have a hurricane. Up until then, it was just getting more and more human, then boom, hurricane.

**Demetri Kofinas:** 00:21:34 I think Edward Lorenz was a climatologist, right?

**David Weinberger:** 00:21:37 That's-

**Demetri Kofinas:** 00:21:37 Or a weatherman, or some mix of the two, or something like that. I think his expertise was in climate systems.

**David Weinberger:** 00:21:43 I accept that, I don't know.

**Demetri Kofinas:** 00:21:44 I could be wrong.

**David Weinberger:** 00:21:45 My good friend Google knows. I could always ask him, but-

**Demetri Kofinas:** 00:21:47 We can consult it later, but I interrupted you. Go ahead.

**David Weinberger:** 00:21:50 The fact that we now are aware of the chaotic nature of the universe in that sense, non-linear systems and the like. And are able to deal with massively more data than we have ever been able to because our machines, our computing machines, got much bigger. We have sensors all over the world and outside of the world. For me, that doesn't change the question, is it deterministic or not? It's just sort of the grains of dust have gotten smaller, and I don't know. It's too big a question for me.

**Demetri Kofinas:** 00:22:19 So, this is a good way to bring it back to where I wanted us to begin in order to give a foundation. No, it's true, because where I was beginning was the evolution of prediction. That we began, human beings began in a world where we had no notion of being able to predict the future. For example, we had perhaps certain animistic ideas. Say if I chanted a certain song, the rain gods would make it rain. Or, you mentioned the Israelites, their future was binary. At some point, it tips and the Messiah comes, right? Or something like that, right? There wasn't a sense of... am I misstating that? You wrote some point in the book about-

**David Weinberger:** 00:22:59 Yeah, yeah.

**Demetri Kofinas:** 00:22:59 About how sort of different contours of the future.

**David Weinberger:** 00:23:02 Sure, it's different if you think the Messiah has come or if you are working towards it. Let me give you a different example that I think is maybe clear also from the book. The Egyptians knew when the Nile was going to overflow because it coincided with the Dog Star. I think that's right.

**Demetri Kofinas:** 00:23:20 The what?

**David Weinberger:** 00:23:20 The appearance of the Dog Star. I'm bad at facts.

**Demetri Kofinas:** 00:23:23 That's okay.

**David Weinberger:** 00:23:24 But let's say that. They would not have what we would call a theory about why it causes, the question of causality itself is an issue. It was a sign, that's a special class of thing. And so you might want to say, "Well, they can predict that it's going to come when they see the sign, see the Dog Star." But it's not what we mean by a prediction. To have the sort of thing that we count as a prediction, you need a very special set of circumstances. Because if I say to you, "I have a prediction, Demetri. You're not going to believe it, but I believe, I predict that tomorrow the sun is going to come up." That's formally, it's in the form of a prediction, but it's not a good example of a prediction.

**Demetri Kofinas:** 00:24:01 It's not colloquially a prediction. No one would say, "I predict the sun will rise." It's a meaningless statement just like saying, "I'm going to guess at who's going to arrive," I think this is from your book. "I'm going to guess at who is going to arrive at my unborn grandchild's eightieth birthday."

- David Weinberger:** 00:24:18 Yeah. Predicting that would be a borderline case of prediction because you don't have enough information. With the sun, you've got too much information, so it's not really a prediction. For there to be, as a culture of predictions or predictions in the sense in which we understand them, you need a world that is orderly. Where the order can be known, where there is some sense of causality, not mere coincidence. And it can't be too orderly because then you're back with predicting the sun is going to rise. And we've got that set of circumstances rather late in our history. It's more or less an Enlightenment idea.
- David Weinberger:** 00:24:54 So, I think this is a tricky idea that may not hold up because it has a lot to do with how we use a particular word. Nevertheless, we eventually got to the point where predictions are a real big thing for us.
- Demetri Kofinas:** 00:25:06 So, to just drive that point home, I'm going to take a quote from your book which is what you just said, basically, but enunciated clearly. "Predictions live in a sweet spot between surprise and certainty. A prediction is a statement that attempts to say what's going to happen when there is room for belief, but also for serious doubt and disagreement." So, I want to actually rewind back again because this is why I found this interesting. Because I tried to imagine... When I prepare for these interviews, one of the things I do, I ask the question that I answer in my rundowns which is, why do I care? What is it... because I might read a book and not care. And then if I ask myself that question, I actually might end up caring about the subject of the book more than let's say other books that maybe the caring came to me spontaneously.
- Demetri Kofinas:** 00:25:51 There's something about meditating on the message of the book or the message of the story, or whatever it is. And I sort of put myself in the shoes of an animistic Aboriginal man or woman, or whatever. Or, some sort of pre-prediction society, premodern. And so there's this line in the book that I really like. At this point, we're further along the evolution of man, but I think it's still interesting. You write, "The Greeks talked about the future not as what lay ahead of them, but as what was behind them, according to the late Harvard Professor of Greek, Bernard Knox. The future, he explained, was for the Greeks, primordially unknowable, as invisible as what is going on behind us." This resonated with me, this idea that the future is happening behind us. Sort of like it's going to sneak up on us, right?
- Demetri Kofinas:** 00:26:43 We don't live like that today, right? And the ancient Greeks consulted oracles, which makes me think a lot about the

conversation around machine learning. The Greeks believed that they lived in a fatalistic universe, right? To bring us back to Laplace's Demon and determinism, they lived in a fatalistic universe and there were oracles that could divine your fate. But even then, you couldn't necessarily understand what they were telling you. And it's an interesting thing because we seem, in a sense, and there are caveats to this.

- Demetri Kofinas:** 00:27:14 There are interpretive algorithms that attempt to understand the methodology of these machine learning algorithms. But it's interesting to imagine that we might be moving... So, we went from a world where we had oracles or shaman or whatever, that were divining the future. We couldn't understand it but they were divining it, and we took their predictions at face value or we believed in them. To a place where we applied epistemology and reason, and the scientific method to understanding the future and predicting it, and understanding why we predict it from our conceptual and working models of the world. To a place where machine intelligence can provide predictions that are superior to those that are obtained from using our own models that we can understand. But they are predictions that derive from a methodology that we cannot understand.
- Demetri Kofinas:** 00:28:01 And so when we ask the machines, "Why," for example, "do you tell me that I have a probability of 90% of developing breast cancer and that I should get a preventative vasectomy? Why should I do that?" And the machine will not necessarily be able to give you an answer. And yet you'd rather go with a prediction with a higher statistical certainty based on prior tests of patients than relying on a conceptual model that has a 50% chance of being right.
- David Weinberger:** 00:28:30 So, you'll do that even if the machine can't tell you. You ask your doctor, "Why? What's the indicator? I mean..." And the doctor in this scenario will say, "Well, actually, we don't really understand that." Some said, "It's a little bit like, at the other end of seriousness, of triviality, it's a little bit like the AB testing where, why does the model on the right sell 2% more barbecue kits? We don't know." The doctor will say, "Look, there's some complex set of factors and delicate balance that these systems are able to see. The model accounts for them, too complex for us to see, but here's why you should do it. It's not because the machine said you should, it's because the machine has been right. When it says, '92% chance,' so far, yeah. It's been 92% chance."

**David Weinberger:** 00:29:20 At that point, you will very likely take it very seriously. And if it hasn't been testing and tried, and hasn't been... then you won't. So, it's the fact of the machine's reliability, when it is, that's going to move you. In most cases, you use these machines, you don't use them. Everybody who has a cellphone, basically all your listeners, use machine learning all the time. It's managing their spams, it's why we don't see spam. It's doing the routing on their maps and the rest of it. We don't know-

**Demetri Kofinas:** 00:29:49 It's also increasingly managing the decisions you make behind the scenes. We did an episode with Shoshana Zuboff on surveillance capitalism dealing with exactly this.

**David Weinberger:** 00:29:57 Yeah, she's pretty smart. Yeah.

**Demetri Kofinas:** 00:29:59 Yeah, and it's pretty scary.

**David Weinberger:** 00:30:00 It is scary.

**Demetri Kofinas:** 00:30:01 Which brings up a question of what is the distinction between behavioral algorithms or algorithms that work on data sets which are subject to change as a result of the answers that you are being provided? Versus those that are, let's say of natural systems like the weather. My expectation about the weather is not going to alter the weather, but my expectation about let's say crime in a low income neighborhood could actually impact crime in that low income neighborhood. Or, my expectation for sure about the price action in financial markets is going to impact the price of financial markets.

**David Weinberger:** 00:30:34 Yeah, so there are two senses of this interaction and it's really important that we understand both. So, there's a benign case where there are machine learning systems that learn based upon feedback loops. And in benign circumstances, that's good I think. We want them to do that, they get a little bit smarter from seeing how we respond. The much, much more worrisome cases are ones in which the systems in which the machine learning systems are embedded are changed by those machine learning systems. So, the predictive policing example, it could really... and those can be extremely dangerous because, well, here's the example.

**David Weinberger:** 00:31:12 So, with predictive policing, which is being used, machine learning systems look at some set of data they've been given about crime and whatever else. And they predict where the next crime hotspot is going to be, and the police, they're sent there. They start patrolling there, running, patrolling with their

cars or on foot or whatever. And sure enough, there's an increase in crime. But that increase in crime is, at least in this example and very likely, it's because there are more police looking out for crime. So, there are more arrests, and this then confirms that this area, which distressingly often, because of biases in the data... Machine learning learns from data.

- Demetri Kofinas:** 00:31:54 Sure, yeah.
- David Weinberger:** 00:31:54 The data reflects biases.
- Demetri Kofinas:** 00:31:56 Data is not objective.
- David Weinberger:** 00:31:57 You've just confirmed, and because basically nothing is.
- Demetri Kofinas:** 00:32:01 Exactly.
- David Weinberger:** 00:32:02 So, now you've installed this police predictive system. It's doing its job and it looks like it's doing it great because yes, there was indeed more crime there. Thank goodness the police were there, but it's a phony sort of confirmation. And then there are all the consequences of deploying significant police squadrons into an area that it's now stopping and frisking more people. And possibly deteriorating relationships between the population and the police, which has a whole set of consequences, I'm going to say all of which are bad just about. So, that sort of feedback loop is very seductive and very dangerous. But the good thing about the recognition of this, in part because of people like Shoshana Zuboff but many others who are working in this field.
- David Weinberger:** 00:32:50 I think it's really exciting and important that so many people are now focusing on this. Is that what I hope comes out of it, what I think many of us hope comes out of it, is a recognition that these systems need to be designed and evaluated not within the closed loop of technologist who simply look, well, did it predict this correctly? Has it been optimized correctly for... but rather look at these as systems that are used for social purposes within social environments, and that have been designed with lots of human decisions in them. This is not mere operating on data magically. We've decided what data to put in. We've decided to carefully, as carefully as we can, clean that data to look for hidden biases and correlations that express hidden biases, or we have not.
- David Weinberger:** 00:33:38 We've involved the people who are affected by these systems in the decisions about what we want them optimized for. In the

sense of, with autonomous vehicles, do we want them optimized? Everybody wants them optimized to drive down the number of highway fatalities.

- Demetri Kofinas:** 00:33:53 Right.
- David Weinberger:** 00:33:53 That one's easy.
- Demetri Kofinas:** 00:33:53 Let's just... yeah.
- David Weinberger:** 00:33:54 But do you want them optimized for fuel efficiency? Do you want them for comfort? For travel time?
- Demetri Kofinas:** 00:33:58 So, that's a-
- David Weinberger:** 00:33:59 For cost? And these are incompatible things.
- Demetri Kofinas:** 00:34:02 Right. Well, that's a great segue into a conversation about general artificial intelligence and narrow AI and the importance of value loading and utility functions, and the explanatory gap. But before we go there, though, I just want to say one thing just to tie it off. I think the way that I think about behavioral algorithms is that they are self-fulfilling prophecies. Whereas a prediction in a natural system is not self-fulfilling, there is no impact on the system of you having an estimation about its future trajectory. In behavioral systems, when you are an agent within that system, you gaining information about the future of that system is going to impact the outcome. So, it can be self-fulfilling. It's the reason why if you think a sufficient number of market participants expects the markets to drop tomorrow, the markets are going to drop tomorrow. And they're not going to drop in the way that you expected. That's interesting bringing us back to the Delphi's oracle and Oedipus. Killing his father on the way back home.
- David Weinberger:** 00:35:04 Yeah. So, the Bernard Knox quote, which I really like, because to me it makes sense, too. To me, it's really foreign, the notion that the future is behind us. It seems such a settled part of our metaphorical understanding. We think in metaphors, and the future is ahead of us. The Greeks, as I understand them, ancient Greeks, they were deterministic about the big events. The fates controlled your birth and death, and your marriage and that. The big events, the tent pole events of your life. And the rest of it was basically chaos, it was a set of gods who were drunk and squabbling, and demons who were just the wildcard and life. At any moment, a turtle could drop on your head and kill you.

**Demetri Kofinas:** 00:35:44 But even the gods were subject to fate.

**David Weinberger:** 00:35:47 But fate is the big picture stuff.

**Demetri Kofinas:** 00:35:49 Exactly.

**David Weinberger:** 00:35:49 In the course of the rest of it.

**Demetri Kofinas:** 00:35:51 Right.

**David Weinberger:** 00:35:51 In the modern age, we have lost the sense, even though it is clearly... and it's not just death, I mean, what happens to you every day in ancient Greece was the result of crazy factors that had no principle behind them. It was drunken gods.

**Demetri Kofinas:** 00:36:10 No observable principle behind them.

**David Weinberger:** 00:36:11 Well, no rational principle.

**Demetri Kofinas:** 00:36:13 Well, they had a tragic view. That Greek tragedy arose from the understanding that life was full of suffering that was inexplicable.

**David Weinberger:** 00:36:21 Yeah.

**Demetri Kofinas:** 00:36:21 People dying suddenly, and that again, that's the notion of tragedy. This is what was so remarkable, I think. One of the things that I find so remarkable about the Greeks is that they worked through these difficult, difficult feelings. We actually did an episode with Rebecca Goldstein on moral philosophy, and we talked at length about this. This to me is one of the most sort of interesting things about the Greeks, the way they dealt with the tragic, the tragedy of life. How tragic it can be and how comical it can be, depending on how you look at it.

**David Weinberger:** 00:36:52 Yes, that's well put.

**Demetri Kofinas:** 00:36:55 So, this thing we were talking about, you were bringing up autonomous vehicles. This is a perfect example, and I said the explanatory gap. What I really meant was the epistemological gap, the gap between what we say we want and what we actually want. And I was thinking about this, all right? I've talked at some length on prior episodes about the work of Nick Bostrom and notions of perverse instantiation. The example is, let's say I say that the goal that I give the AI is that I want it to maximize human happiness. The AI may decide that the way to maximize human happiness is to make people 50% stupider.

Because human beings overthink things and it makes you unhappy. And you can say, "Well, then I want to minimize human unhappiness."

- Demetri Kofinas:** 00:37:38 Well, then the machine decides, the AI decides, "Well, then we're going to kill everybody. That's the best way to minimize human unhappiness, just eliminate human beings." And I think what happens is, and this is a philosophical question, and I wonder what you have to say about it. On a top level, I think we can all agree that we want to be happy, right? There's no difficulty in enunciating, "I want to be happy."
- David Weinberger:** 00:37:58 I don't know, I'm a Jew. But okay, yes.
- Demetri Kofinas:** 00:38:00 I've been to Seders. I know, I know.
- David Weinberger:** 00:38:03 Yeah. I think almost by definition we can say we all want to be happy.
- Demetri Kofinas:** 00:38:06 We want to be happy, but when you dig deeper into that... so like I said, there is the first problem of okay, I tell the AI. Now we're going into general AI, right? We've moved away but we'll get back to autonomous vehicles. But big picture I tell the AI, "I want to be happy, genie." Because the AI is effectively a genie in this sort of...
- David Weinberger:** 00:38:23 Okay.
- Demetri Kofinas:** 00:38:24 Hypothetic when we're talking about super intelligence. "I want to be happy. Make me happy." There you have a problem with miscommunication. It's the epistemological gap, but if you drill down deeper into the question of, what do I really want? What do I mean when I say... I think there's a point where all of us hit a wall. There's a point in which when you drill down deep enough, you realize you don't actually know what you want. You don't actually know what you mean about anything. What do you think about that? That's my statement, you said declarative statements. I don't know how much I can support it with reason. I'm going to hit a wall.
- David Weinberger:** 00:38:55 So, I don't know how to think about that. But I want to suggest a way of thinking about it with machine learning that is not aimed at questions like, make me happy. The genie question.
- Demetri Kofinas:** 00:39:04 Okay, sure. So, we'll go back to the narrow AI for example. Autonomous vehicles, you mean?

**David Weinberger:** 00:39:07 Yeah, because I'm actually sort of hopeful. I'm not sure it will happen, but I'm hopeful about...

**Demetri Kofinas:** 00:39:11 Sure. Let's go back there.

**David Weinberger:** 00:39:12 ... the effect that machine learning, applied to problems like most of the things we apply them to, but let's say autonomous vehicles. May help to shape our way of thinking about moral problems. That is, I think, well it's clear that AI and technologists responsible for AI have a lot to learn about fairness, removing bias, and that sort of thing. Without question.

**Demetri Kofinas:** 00:39:33 Sure.

**David Weinberger:** 00:39:34 It also seems to me that there's a lot that we can learn from AI about fairness and morality. So, take AVs. It's a real thing, right? You don't say to the machine learning, "Make the best AV you can." What you have to do, and I think this is a really useful thing that machine learning is forcing us to do. Is to list what we want those machines, that machine learning to me optimized for. Machine learning folks use optimization in two senses. In one case, it means sort of tweaking it to make it more accurate. That's not the sense that I mean. What I mean is we want them to... fewer fatalities. We want comfortable rides, we want better gas mileage or electrical, you know, we want lower impact.

**David Weinberger:** 00:40:10 We want longer distances, lower maintenance costs, lower cost of owner, or whatever. There's a whole set of values. The only way you can, as far as I know, develop the machine learning for something like that is to say, "Okay, here is what we want. We want to make sure lower fatalities, but also environmental savings are also really important to us. And property damage, maybe not as much as..." I'm making this up, right? But those set of values, and it really-

**Demetri Kofinas:** 00:40:36 These are utility functions. These are, I mean you're referring to a utility function, aren't you?

**David Weinberger:** 00:40:40 Sure. That's the machine learning way of thinking about it. Our way, as humans, way of thinking about it is either, I think about it in terms of optimizations.

**Demetri Kofinas:** 00:40:50 Right.

**David Weinberger:** 00:40:50 We've kind of been corrupted by machine learning language, or what values we want to support.

**Demetri Kofinas:** 00:40:54 Right.

**David Weinberger:** 00:40:54 And as you are instructing the machine learning, you tell the designers of the system, "This is what I want." The designers are going to come back to you, we hope they'll listen, right? And they'll come back to you and say, "Yeah, no. We can absolutely make these things so safe, they're going to drive down to 98% fewer fatalities." And you'll say, "Yeah, absolutely." And they'll say, "Okay, but you understand that you also had this value of the shortness of... you want to make the rides faster. Good for the economy, right? And so in order to get the numbers down to 98% savings of lives, these things are going to go 20 miles an hour."

**David Weinberger:** 00:41:28 And there's another thing that they'll say, "Because you want comfort, sure you want comfort for the passengers. But in order to get the saving you say you want, these things have a threshold for when they're going to put on the breaks when they think they see something on the road."

**Demetri Kofinas:** 00:41:41 Yeah.

**David Weinberger:** 00:41:42 "A pedestrian on the road. And if you want it to be super safe, then any time there's any possibility, it's a shadow and it's a 0.1% possibility."

**Demetri Kofinas:** 00:41:50 Yeah.

**David Weinberger:** 00:41:51 "Put on the breaks."

**Demetri Kofinas:** 00:41:52 Yeah.

**David Weinberger:** 00:41:52 So, if you're single and sole priority is fewer fatalities, the cars are going to go 20 miles an hour and they're going to be sort of bunny hopping because they're stopping all the time. And one of the reasons we're not going to do that is because we realize there's a sort of second order effect, which is nobody is going to get in a car that goes 20 miles an hour and bunny hops. Then, you won't get any of the benefits. So, machine learning forces us to think about a set of values or optimizations that matter to us. Recognize that there are tradeoffs, that fairness is not an absolute. That in every moral decision, we talk about principles and elevated voices, at least we used to. These are always, always, always tradeoffs. And if we can remember that, and machine learning forces us to remember that, we may be able to have more productive and realistic moral conversations.

**Demetri Kofinas:** 00:42:39 So, here's a problem. This reminds me of, to quote Shoshana, who decides who decides? And this is the classic, who will guard the guardians? From Plato's Republic. In my view, this is not a statement about what should or should not be done, it's just an observation. I think this is totally incompatible. The future we're going into is incompatible with a Democratic, Republic, or any form of democracy. Because there's no way that you can load those values with Democratic input. This is why I think you disagree. In other words-

**David Weinberger:** 00:43:08 Yeah, I do disagree.

**Demetri Kofinas:** 00:43:09 You do, okay. So then how-

**David Weinberger:** 00:43:10 But I'm curious to why you say this.

**Demetri Kofinas:** 00:43:10 Well, so you've got a very small section, subsection of the population, which is making decisions about how to load these values, right?

**David Weinberger:** 00:43:20 So, sorry, I'm going to interrupt. I'm just going to jump in.

**Demetri Kofinas:** 00:43:22 Sure.

**David Weinberger:** 00:43:22 Do you feel the same way about city planning? That cities cannot make decisions about whether they want to have bike lanes at the expense of more commuter traffic?

**Demetri Kofinas:** 00:43:31 They can make those... that's a very great point. But I do think probably the distinction I would make is that the implications of that level of power at the city planning level, in terms of the architecture and design of the city, pale in comparison to what we're describing here, right?

**David Weinberger:** 00:43:48 So, it's hard to... you've got a Robert Moses, which is a terrible example of-

**Demetri Kofinas:** 00:43:54 No, that's a great example.

**David Weinberger:** 00:43:54 Of it gone wrong, sure.

**Demetri Kofinas:** 00:43:56 I'll say we did an episode with Hannah Fry where this was actually in her book, and we described this exactly. And you could let our audience know who Moses was and why that is a great example. I mean, he built the Cross Bronx. That was a big middle finger right to the middle of Bronx.

**David Weinberger:** 00:44:08 Yeah, right. So, he-

**Demetri Kofinas:** 00:44:09 And other things as well.

**David Weinberger:** 00:44:10 He was the city planner in New York with basically unbridled power. So, it's a bad example of a democratic response, little D democratic response, who had fantastic visions for what the city should be. Many of which are very valuable, but which he implemented without regard to...

**Demetri Kofinas:** 00:44:27 He just didn't think black people should-

**David Weinberger:** 00:44:30 ... human cost.

**Demetri Kofinas:** 00:44:30 He just didn't think black people should be involved in those.

**David Weinberger:** 00:44:31 Well-

**Demetri Kofinas:** 00:44:31 He was notoriously racist.

**David Weinberger:** 00:44:33 Certainly the results of what he did skewed racist, but he actually, as far as I know, didn't let anybody... he was a megalomaniac. In any case, so that's a good example for your side. It's a bad example for me saying, "No, we do regulate these sorts of things." This is what politics is, and sometimes it works really well, sometimes it's terrible. Robert Moses, in many ways, terrible. These days, many ways everything is terrible, but this is why we have government. So, let's say New York decides that yeah, they really want to push forward with autonomous vehicles for all sorts of reasons. But they are concerned that if they go too fast, then people won't see the city. That we'll lose tourists, or people won't be able to stop and get out, and visit the shops. And they're also worried about what this is going, the skewing towards the wealthy areas and the rest.

**David Weinberger:** 00:45:23 What is it going to do to bikes? Pedestrian life? All those are decisions that are sort of city planning decisions that the city is actually going to have to make. It is really going to have to make those decisions as all cities are going to, and they will. And then some cities have broken governments and they're going to corrupt, and they're going to do it badly. And some are going to be shining examples of actually consulting and caring and considering all of the people who are affected by all of these changes.

**Demetri Kofinas:** 00:45:53 Well, that's definitely not to Bill de Blasio in New York City, that's for sure.

**David Weinberger:** 00:45:56 I'm from Boston, I have. I would not dare to [crosstalk 00:46:00]

**Demetri Kofinas:** 00:46:00 Well, New York is a notoriously corrupt city, as is New York state. But I mean, to bring it back to Robert Moses, one of the things that we discussed with Hannah Fry were racist bridges. He had bridges that were built that were very low, I think headed towards Jones Beach. Because he didn't want to have poor people coming to Jones Beach, so that was a clear moral decision that impacted who could go and who couldn't go. And yet my real point here, the distinction I draw is that these are a small number of decisions in comparison to what we're describing with value loading on autonomous vehicles. And there's also still some ability to impact them.

**Demetri Kofinas:** 00:46:35 It's not so disproportionate where you've got a small section of people, let's say in Silicon Valley, who are making decisions for all of the world. And I think that's a real problem...

**David Weinberger:** 00:46:43 It is.

**Demetri Kofinas:** 00:46:43 ... that we see also politically in the United States, too.

**David Weinberger:** 00:46:46 For sure. There is, however, increasing awareness of this issue not only for Silicon Valley in general, but for autonomous vehicles as well. And it's occurring not just in the U.S., and there are many, many countries around the world. Germany has evolved a set of ethical guidelines for AVs which are pretty good. I of course don't know how it will turn out. It's a chaotic world, after all. Personally, I really do not want the manufacturers to blively be making these decisions about what values these cars should instantiate. And I think there's a fair bit of pushback and recognition that no, we really don't want the individual [crosstalk 00:47:24]

**Demetri Kofinas:** 00:47:23 But they are going to decide.

**David Weinberger:** 00:47:25 That's not at all clear to me.

**Demetri Kofinas:** 00:47:26 Well, the reason why I say they're going to-

**David Weinberger:** 00:47:27 There's going to be a lot of regulation under way.

**Demetri Kofinas:** 00:47:28 But I'm saying even the regulation, they've got to interpret it. They're the ones that are putting those utility functions together, it's not the legislators.

**David Weinberger:** 00:47:35 Well, so...

**Demetri Kofinas:** 00:47:36 Brings us back to the epistemological gap. There's an epistemological gap between the engineers and the legislators, and the public which is saying to the legislators what they want.

**David Weinberger:** 00:47:45 So, I will not pretend to have a policy answer, but I guess for a moment I will. I have no confidence in it. It's plausible and reasonable for a government to say to the manufacturers of the autonomous vehicles running on its highways or city streets, whatever. That, "Look, here's what we think are the important optimizations. Lower fatalities, lower pedestrian fatalities. Comfort comes fifth, and there are dependencies among them. You are required to support those. You need to tell us that you are tuning these systems to support those values, and you need to give us metrics every month. Or, continuously, because these things are going to generate, these AVs, huge amounts of data. We need the data about how it's fulfilling the optimizations that we have required. It's just like putting ingredients on a wrapper, we need to know."

**Demetri Kofinas:** 00:48:35 We need to be able to audit it.

**David Weinberger:** 00:48:35 Absolutely, and maybe in real time. And if you're not, then the normal regulatory things. Fix it, be fine, whatever.

**Demetri Kofinas:** 00:48:41 But doesn't that bring us back to the problem of the black box, and the fact that we don't know how these algorithms are arrive at --

**David Weinberger:** 00:48:45 Doesn't matter.

**Demetri Kofinas:** 00:48:45 Because you're auditing the utilities. The utility function, you're auditing the subjective values.

**David Weinberger:** 00:48:51 You are auditing how many people these cars killed.

**Demetri Kofinas:** 00:48:53 The outcome.

**David Weinberger:** 00:48:54 The outcomes.

**Demetri Kofinas:** 00:48:55 I see.

**David Weinberger:** 00:48:55 There are other places in the machine learning process where you can ask where, I think it makes a lot of sense to ask for transparency. For example, transparency about the process by which you gathered data and vetted it to try to eliminate as many of the inherent biases as you can. For this part, I'm not sure that you need transparency into anything except the metrics, the results.

**Demetri Kofinas:** 00:49:17 So, this is off the fly, off the top of my head. Let's say we set this ball in motion. Fatalities drop by 90%, let's say that was the target. But fatalities among children jump by 50%.

**David Weinberger:** 00:49:28 Fantastic point. I'll make it worse for you, fatalities among poor people. The poorer you are, the more likely you are to die in one of these cars.

**Demetri Kofinas:** 00:49:37 Right.

**David Weinberger:** 00:49:37 And possibly because if it's private ownership, you may not be in a Mercedes that has all of, you know.

**Demetri Kofinas:** 00:49:42 The reason, where I was going with it is just, I was just imagining, for example, children play in the street more than... or actually, that doesn't make sense. Because I was thinking that the cars would avoid neighborhoods where children play on the street, in which case let's say you get neighborhoods that wouldn't be serviced. So, certain neighborhoods wouldn't get car service, let's say, as opposed to others. But you wouldn't be able to figure that out, you'd be able to make guesses about why those areas weren't being serviced. That brings us back to the question of what constitutes an explanation.

**Demetri Kofinas:** 00:50:08 How do you go back and, again, because you don't know what's driving it, how do you fix it? How do you know what's causing this? You just see that something is causing it, but you don't know if it's actually the demand that fatalities drop. It could be something else.

**David Weinberger:** 00:50:20 It could be, and it may well be that the manufacturer gets told, "Fix this. Not acceptable. Full force of the law," and the rest of it. Well, we do pretty well at regulating products in this country. The products are generally really, really safe. And there's a set of processes when they're not for dealing with it. And so when we send cars back, they're recalled because they're catching on fire or whatever. The recall, I'm not a lawyer. As I understand, if the recalls don't say, "Fix the problem with the..." and then they say what the cause of it is. They say, "Stop your cars from

catching on fire," and the manufacturer then goes through whatever processes, internal forensics, whatever, in order to figure it out.

- David Weinberger:** 00:50:59 We don't need to know how they figured it out so long as the car has passed the tests. There may well be instances in which in order to know what the problem is, we need to understand what's causing it. That, I think it's not hard to think of examples.
- Demetri Kofinas:** 00:51:13 So-
- David Weinberger:** 00:51:14 But not always.
- Demetri Kofinas:** 00:51:14 Right. So, this kind of... I mentioned something else to you when I sent you an email yesterday about our conversation today. And that had to do with the importance of epistemological philosophy versus moral philosophy. Epistemology has traditionally, I think, been the sexier philosophy, right? These are questions that I don't-
- David Weinberger:** 00:51:35 You are so... you know, I used to make... I have a degree in philosophy and I met my wife in grad school. And I still say, "How did we meet?" And I consider it a joke. We met in remedial epistemology. Epistemology is like the driest of the... traditionally, so I don't want to draw any personal conclusions from that, but...
- Demetri Kofinas:** 00:51:56 That's interesting. I stand by my statement. I-
- David Weinberger:** 00:51:58 Sexy epistemology is not a phrase I've heard before, I'll just put it like that.
- Demetri Kofinas:** 00:52:01 It's the sexier of the two branches of philosophy in my view. Moral philosophy, when doing it in school, I didn't major in philosophy. But I took a few classes in philosophy and I studied philosophy on my own. I read a lot of different philosophers, it was interesting to me. And what interested me in philosophy were the big questions, you know? What is the nature of reality? How do I know what I know? Again, epistemology. Ontological questions, but they weren't question about what's good. I just didn't care about what constitutes the good life or what is bad and what is good. I didn't really care about that. Maybe because I was a teenager and I was more interested in doing as opposed to the implications of my actions.
- David Weinberger:** 00:52:41 Yeah. So, epistemology is such a natural draw for the teenagers these days.

**Demetri Kofinas:** 00:52:46 Okay, but besides my weird intersecting interests-

**David Weinberger:** 00:52:50 I got a PhD with a dissertation on ontology, okay? So, I cannot cast stones.

**Demetri Kofinas:** 00:52:56 But it seems to me that what we're talking about here is a world. We're moving towards a world where epistemology takes a back seat to moral philosophy. Because if we're increasingly not able to understand the pathways through which decisions are made and predictions are formed, and where we are in a position to have an impact is in setting those utility functions. And determining what values are important, what do we want? What's important to us? Because increasingly, we're creating these genies in a black box, right? That is what these are. They're genies. We don't really understand how they do their magic at the limit, right?

**David Weinberger:** 00:53:39 We don't understand the particulars. Obviously, we understand the general way that these models work.

**Demetri Kofinas:** 00:53:44 But as we get-

**David Weinberger:** 00:53:45 We can't explain. In many cases, we simply cannot explain particular outcomes.

**Demetri Kofinas:** 00:53:48 But isn't the idea that as we evolve, as the decades go by, at the limit we would be living in a world where everything is a mystery? That is being created by our machines?

**David Weinberger:** 00:53:58 Haven't we always lived in that world?

**Demetri Kofinas:** 00:53:59 I agree. Fundamentally, at the very bottom of the turtle shell, we do live in that world. Which is actually interesting, so-

**David Weinberger:** 00:54:06 I'm sorry, I derailed you with that.

**Demetri Kofinas:** 00:54:07 Well, I've derailed you. We're sort of derailing each other. This is chaotic, chaotic orbits. The Joseph Ford orbits. One of the things I thought about is actually at the limit, don't we kind of get to a world where, in the ideal scenario, if we don't kill ourselves, and there are plenty of reasons to be concerned about whether this is actually going to work. I'm not so optimistic, but let's say we did. We would have all sorts of leisure, right? These machines would be managing our entire lives. The moral questions are what mattered, but to bring it back to your point, haven't we always lived in the mystery?

**Demetri Kofinas:** 00:54:40 It seems that would intellectually preoccupy our time would be trying to understand the nature of our world and addressing that mystery. Because all the scientific questions would be irrelevant, because what's the point of doing science if the machines we have are arriving at answers that are superior to anything that we can create? And so they're doing everything for us, and we can't really understand the chaotic orbits. We don't understand what the nature of the world is without basically throwing bones into the wind and sort of divining the mystery.

**David Weinberger:** 00:55:14 That's a fantastic comment, question, worldview. It's going to be... So, let me try to address some small, random points in there. So, one of the things that drove my interest in the topic that became the book is the sense that even though I made the stupid sort of teasey joke, that aren't we all the mystery? Is that for a long time, I'm going to leave it unspecified, but certainly Enlightenment on, we've always lived in a chaotic world. A world that is contingent and accidental all the time. We can predict almost everything that happens in our life, from whether the coffee pot is going to be warm when we get to work or what color shirt you're wearing. It's all beyond our ability, and we don't care that much what's beyond our ability to predict. And we've always been in that world, but since the Enlightenment, and we've had this idea very different from the Greek idea that that's just accidental. And it's actually a well ordered, safe world, at least for the privileged in the community.

**Demetri Kofinas:** 00:56:13 And we can bring order to that chaos with our predictions.

**David Weinberger:** 00:56:16 That order allows us to make the predictions, and the predictions allow us to go forward and order further. And I want to stress that this view is one, it's absolutely a view of privilege. That your life is relatively safe, that the turtle isn't going to drop on your head if your house floods because of a hurricane. You want to sue somebody, you feel bad that there's nobody to sue. This sense of order and entitlement of safety.

**Demetri Kofinas:** 00:56:41 But aren't we all, although we can all get cancer, we can all lose someone we love, we're all subject to caprice.

**David Weinberger:** 00:56:46 Absolutely.

**Demetri Kofinas:** 00:56:47 Some are more than others, but still.

**David Weinberger:** 00:56:49 I'm not saying that this is the world that we thought we inhabited is actually the world. It has always been the case that the turtle that dropped on Aeschylus-

**Demetri Kofinas:** 00:56:59 Aeschylus' head.

**David Weinberger:** 00:56:59 Yeah. We live in that world as well, right? Absolutely, but we've been in a type of denial, a safe, comfortable, calm denial. Those of us who are lucky enough to be able to persist in that. With the rise of machine learning, the nature of the world doesn't change. It's just as chaotic and full of risk as before, but we may be able to start taking account of that more because our machinery now can accommodate it. We have a way of dealing with it. In fact, benefiting, profiting from it because these machines that take in this chaos are able to produce predictions and efficient sorting, and all that sort of thing.

**David Weinberger:** 00:57:37 It is the same world, but maybe we will get back to the sense that people throughout our Western civilization have had, which is oh no, you could go at any moment. It's just, life is wildly contingent. We've managed to mask that to some extent. Maybe now we can start to appreciate the particulars again.

**Demetri Kofinas:** 00:58:00 So, I want to continue on that thread, Dr. Weinberger. We're going to switch to the overtime. For regular listeners, you know the drill. For new listeners, if you're interested in learning about the subscription, head to [hiddenforces.io/subscribe](https://hiddenforces.io/subscribe) or to [patreon.com/hiddenforces](https://patreon.com/hiddenforces). And you'll see there we have audio file, audio didact, and super nerd subscriptions. The super nerd tier comes with a rundown, David can attest to the beauty of this rundown. It's got, that's Tyrion and what's that guy's name again? Lord Varys, the eunuch. And it has all my questions and my thoughts about this episode and my preparation for it, as well as the transcript to our conversation. But David, thank you for coming on the program.

**David Weinberger:** 00:58:48 Thanks so much for having me. It's been exhausting.

**Demetri Kofinas:** 00:58:52 But we're not done yet. We're going to be real tired, so...

**David Weinberger:** 00:58:53 But really, really interesting.

**Demetri Kofinas:** 00:58:54 ... find us on our overtime feed. Thank you.

**David Weinberger:** 00:58:57 No, thank you.

**Demetri Kofinas:** 00:58:59 And that was my episode with David Weinberger. I want to think Dr. Weinberger for being on my program.

**Demetri Kofinas:** 00:59:05 Today's episode of Hidden Forces was recorded at CMD Studio in New York City. For more information about this week's episode, or if you want easy access to related programming, visit our website at [hiddenforces.io](http://hiddenforces.io) and subscribe to our free email list. If you want access to overtime segments, episode transcripts, and show rundowns, full of links and detailed information related to each and every episode, check out our premium subscription. Available through the Hidden Forces website, or through our Patreon page at [patreon.com/hiddenforces](http://patreon.com/hiddenforces).

**Demetri Kofinas:** 00:59:45 Today's episode was produced by me and edited by Stylianos Nicolaou. For more episodes, you can check out our website at [hiddenforces.io](http://hiddenforces.io). Join the conversation at Facebook, Twitter, and Instagram at [@HiddenForcesPod](https://www.instagram.com/HiddenForcesPod), or send me an email. As always, thanks for listening. We'll see you next week.