Bret and Heather 3rd Live Stream\_ Bats, Bio-Weapons and Soci...

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**SPEAKERS**

Bret, Heather

**Bret** 04:57

Hey folks, Brett here Again with Dr. Heather Hyang. For the third in our series of Dark Horse livestream conversations about the current predicament the world finds itself in. We are going to start with some announcements, some structure about how we are going to move forward with this live stream and correct some of the problems we ran into in in the previous to Heather, would you like to say?

**Heather** 05:24

Sure. So I think what we're going to do, now that we've enabled Super Chat is do two consecutive live streams. So we will take 45 minutes or an hour here and talk about some of the topics that we've been wanting to talk about, and not take any super chat questions. But our son and tech support Zachary is busy logging them right now. We'll take maybe a two five minute break or so and then immediately launch into a second live stream again, about 45 minutes or an hour in which we answer the Super Chat questions. We may not do all of them, we are going to reserve the right to edit, we're looking for nothing pre modern, nothing postmodern, only modern questions that actually are interested seem to be interested in, in furthering the knowledge and compassion that we are trying to bring to this topic. And I don't know if there's anything else to say about that. Right now.

**Bret** 06:22

To be clear, you can lodge your super chat questions during this stream, we will look over them in the break, and then we will return to those questions in the next one. At the point that we move to break you will have a link that you can click that takes you to the next stream the link will be in the description. I don't think the one that you will see on screen is clickable. But if you scroll down, you'll find it.

**Heather** 06:41

Yeah, just I guess one more thing is that we're going to try to do this on Tuesdays and Fridays for a while, at least while we're all in some kind of locked down together. We've had to move it a little bit later. Because as of today, Zach is back in virtual school, which means he has obligations up until about 20 minutes before we're starting here. So we're going to, in general try to be doing this at 330. Pacific time. We know that's a little bit late for a lot of people. We apologize on Tuesdays and Fridays.

**Bret** 07:08

Yes, unfortunately for people in Europe, this is quite late. The streams will be republished as Darkhorse podcast so that you can use them on a podcast app. All right. All right. So shall we start with corrections? corrections? Yes, one major correction for me. I said in our last stream, that coronaviruses were retroviruses That is incorrect Coronavirus is our RNA viruses. But there are three kinds of RNA viruses and Corona viruses are not retroviruses, which means that they do not reverse transcribe from RNA to DNA. And they do not insert themselves into the genome of the cells as I said. So that is, in one sense, a technical correction. And in another sense, it's very important because it has implications and in fact, it changes my assessment of the likelihood that we will see a viable vaccine. These coronaviruses are better targets for a vaccine than retroviruses are, by virtue of the fact that they are more slowly adapting and therefore, the targets of a vaccine that is to say the antigens that the virus produces are a much more slowly moving target. So I would say my estimation of the chances of us having a vaccine in short order, I have improved substantially as a result of the fact that this is not a retrovirus that we're dealing with. I still think the medical situation is very serious. I did want to say though, I saw at least a couple of comments where people had suggested that I was portraying the viral situation as extremely dire. And that effectively I was leading the viral situation or the vaccine situation, the viral situation as extremely dire and suggesting that maybe we were all doomed, which is not at all my perspective. Even if we were to do nothing about this virus, the huge fraction of people who seem to get the disease and be asymptomatic suggests that there's a way for selection to fix this problem without our intervention. The problem with that solution is that it involves a tremendous amount of needless suffering and death and a tremendous amount of tragedy for individuals who would lose people that they cared deeply about. So we have to avoid that outcome for deeply human reasons. But we do not have to avoid that outcome in order for humanity to survive this as the virus currently functions. It creates a lot of devastation, but it leaves a lot of people on injured and so that's, that's quite positive. I am however, quite frightened of the consequences of this crisis for society, and so we will get back to the societal implications later. But to the extent that people read me as very concerned, I am concerned about the virus, I'd like us to avoid as much tragedy as possible, but I'm much more concerned about what this reveals about the fragility of our system. Alright, let's see. Oh, other corrections more minor. I had wondered during the last podcast whether people actually eat pangolin turns out they do eat pangolin. But it is also the case that pangolin is being used as a medicinal that the scales scales understood to have medicinal properties, especially in Chinese medicine. And so pangolin shows up in these wet markets for both of those reasons. And let's see.

**Heather** 10:55

Finally, correction you were going to talk about was about whether or not SARS cov. Two is found in dogs.

**Bret** 11:00

Alright, so I had said that very little, by way of viruses is transmitted to dogs and by dogs to people. And that remains true, although I did see a report where two dogs had been diagnosed with COVID-19. Now there's also a lot of debate about the quality of the testing. And in the case of one of these dogs, the animal was categorized as having died of COVID-19 with the animal was something like 17 years old, which is a really long run for a dog. So in any case, it is not highly transmissible to dogs. And there are no known cases in which a human has picked it up from a dog as far as I know. But

**Heather** 11:45

it is it doesn't. And that doesn't put the lie to the idea that humans in prehistory, may have been selecting against dogs that did transmit diseases. Because again, this this virus, human interaction is brand new, we have no history with this. So even to the extent that prehistorical humans were really good at getting rid of dogs who showed sign of diseases that could be transmitted to humans. The fact that this relationship between source code to and humans is brand new, suggests no history.

**Bret** 12:17

Yeah, no history. So there are two questions. One, are we are our dogs unlikely to carry things that we would catch because our prehistoric ancestors did a good job of eliminating dogs that carried things that we caught? And then there's a question about whether they may have selected for something in dogs that has special immunity to things in which case it might have some implication for, for COVID-19. But we don't know this is all evolutionary speculation.

**Heather** 12:47

That's right, watch us with our arms. So with regard to excuse me corrections that I want to make, I this, this could be the subject of a conversation that lasts hours and of itself. But getting back to this question of bush meat and exotic meat and what it is, excuse me, who tends to eat these things, and what the risks are to the rest of the world. When people do eat these things. I, I initially categorized the types of situations in which these things are eaten into to. And although Brett tried to add the third category, which is far more important in the current conversation, it wasn't one that I paid any attention to. So let me just walk it back a little bit and say, I understand bushmeat to be meat what meet of wild animals that is hunted in the place where both the animals and the people hunting them are from. And I think of exotic men in generally bushmeat is a term reserved for tropical places for the developing world rather than the developed world. But you just like peccary is being hunted by the Waorani in the Amazon has 1000s of years of history. And so those packers are unlikely to cause much harm to the will Ronnie who eat them. North Americans hunting deer. As you know, most North Americans now hunting deer don't have 1000s of years of hunting deer but certainly there is a 1000s of years history of Americans hunting deer in north and even South America. And so that is also unlikely to cause any long term long term harm to anything but the deer Peyton obviously. So I think of all of that as Bushmen. And there is, you know, a long evolutionary history of of hunting meat that is wild. And I don't think I don't think that anyone really is making the argument that people should not be allowed to hunt wild animals anywhere ever again. So that's one category and it is fairly common, generally honorable and fine, right. The second category I mentioned in our last live stream is the is what I think of as exotic meat where people are creating demand in the system for the meat, the flesh of wild animals from places that they aren't, and may never even have been. And so the rich, rich Londoners in fancy restaurants ordering up, whatever it is from, for instance, Africa is an example of this. And there's just no justification for this whatsoever. But it is a tiny, tiny piece of the global market for exotic and Bushman. There's no excuse for it, we shouldn't tolerate it. But the far larger issue is the far larger market is for what either either meat of wild animals or the parts of wild animals like pangolin scales, for instance, or Tiger penis, right? in places where those animals are local, and then encouraged through because of culinary cultural reasons. And humans don't have as long a history as extensive history eating or using these things. And they're much more likely to bring out zoonotic diseases like the virus we're now dealing with. I don't know if you want to add anything more things.

**Bret** 16:21

I would say again, the gold standard for errors in this regard is the eating of chimpanzee which as far as we know, was people who live nearby to return pansies are native. But chimpanzee is not on anybody's ancestral menu, it was being hunted because it could be hunted in because it could be sold. And the price that humanity paid for HIV jumping the gap from chimpanzees into humans was absolutely immense. So we have to prevent that, irrespective of what category it falls into. It's just too dangerous to contemplate, you know, and it's not the only reason, obviously, as you said before, not to eat chimpanzee, but it is sufficient unto itself for us to stamp out all that kind of behavior, which does mean that the people who find themselves hunting these animals and selling them have to have viable economic alternatives.

**Heather** 17:18

That's right. So Zack, do you can you pull up the Yang at all? 2020 paper? If if it's easy, great. If not, it's not a big deal. Yep. Yang at all. It's near the top of the second page of notes that I gave you. So the in that third category of meats that get eaten and are often often end up being dangerous, but often also provide much of the protein. Yep, thank you. For, for people where this kind of media sold, we have this this concept of wet markets, which is you know, a phrase that probably many of us have never heard six months ago, but now is on the tip of everyone's tongue. And let's just talk about what what that actually means. Because as is almost always the case when we have a new linguistic term entering common parlance under times of duress. It's being politicized as being weaponized. So what a wet market actually means is that perishable goods are sold. So a produce market market devoted entirely to selling mangoes is a wet market a market entirely devoted to selling dead chickens. Could you put that back up? Cool. Thank you and so as this paper is suggesting live poultry trade in some wet markets is quite different from markets that sell only dead dead chickens. So in the US we generally have entirely markets of of animals that have already been killed and generally butchered as well. And what market does not make a distinction between whether or not it's meat as being sold versus produce or whether that meat is live or not. But what this article finds is that in in several in several regions in China when they compared the transmission of virus between areas where markets were selling live chickens versus I think it was between areas where live chickens were sold but between in in those areas live chickens themselves were not being transferred the viral load in humans was much higher now it's been unfortunately couple days since I looked at this papers I think I've got that right. But the the long and the short of it, the take home message you can take it down if you want to, is that virus. Viruses transported far faster in markets and between markets where live animals are being sold and we're dead markets are being sold. So this raises the question of is it really wet markets, all inclusive You know, since you since you lotto that we are trying that we are talking about what we're complaining about what markets? Or should we be actually making a distinction distinction between? Is it? Is the meat being sold alive or is it dead, and if it's dead, it has a far lower chance of, of transmitting virus, and also is that meat wild or domesticated. And again, there's plenty there are plenty of people in the world who hunt wild animals, and do so honorably and without great risk and special, especially if they aren't then selling that meat if they are, if they're keeping that risk within themselves. But what market the term what market does not distinguish between live versus dead meat being sold, or wild versus domesticated animals being sold, both of which are going to be important factors in determining the risk of those markets.

**Bret** 20:47

So we should probably point out that there is a reason that people would prefer to keep live animals in a wet market, which is that once the animal is dead, a clock starts with respect to how long that meat is viable. And so anyway, keeping animals alive is a way to preserve the meat. And so what we have is a trade off. And again, I would say if we are to make requirements about what can and can't be sold, we have to give people a viable means to do what they're doing. If they're in a place where refrigerating meat would be impractical or freezing, it would be impractical than keeping the animals live, as you know, it's part of the supply chain for the meat. And so anyway, we have to provide viable alternatives to the extent that one of these mechanisms is putting humanity at danger in danger, which which it is

**Heather** 21:39

this This reminds me actually of one of the last times we were at the animal market and Quaker in the Andes in Ecuador, and they were selling guinea pigs. And I asked the guy is this, what are you selling this for? Is that food or pet said as you like, whatever you want to do with it, cometo? And let's go either way.

**Bret** 21:57

Yep. So anyway, that we also, before we leave that topic, we should probably just say, the precautionary principle is a very contentious matter. Clearly, what we have here is a circumstance where some version of the precautionary principle has to rule there are behaviors that go back 1000s of years, and we have no reason to think that they are dangerous. And then we have other behaviors, which have just been invented, or have only recently become possible by counting chimpanzee, or hunting chimpanzee for sale at a market. And we should treat those with much greater care.

**Heather** 22:39

I know historically that you've really enjoyed talking about bats. So let's do it. Bats, bats,

**Bret** 22:43

bats. Yeah. Yep. So I wanted to talk a little bit about why bats are showing up in this story and why they showed up in the SARS story. And there are really two components here. I've seen a lot of ink spilled over this question. None of it, I thought to good effect yet. And so there are two two components. If you're asking yourself why why is it the bats are transmitting disease to humans? There's one fairly straightforward answer. And then there's another one that's more interesting. The straightforward one is that bats probably comprise a much larger fraction of the biota, and in particular, the mammalian biota, then you would think so it turns out there are something like 1000 species,

**Heather** 23:27

it's actually say that we actually have more than 6000 species of mammals. Now, with the fractions holding steady.

**Bret** 23:34

With the fractions holding roughly steady. It's not that so when I was in graduate school, I studied bats and bats were a quarter of all mammals that were thought to be 4000 species of mammals, the fact that there are now thought to be something like 6000 is not a result of a lot more mammals having been discovered, it's a result of a lot more fine gradations having been named whether that's durable or not. But nonetheless, bats comprise something close to a fifth to a quarter of all mammal species. And so when we talk about bats, we often think about, you know, things that we sort of vaguely see flying around. And we think that there are only a few species in which case, it would be truly remarkable how many viruses were being passed by them. But when you know that there are 1000 species of them out there doing all of these different things, it is less surprising.

**Heather** 24:27

I think, just to back up a little bit, why would we expect mammals to be the source of these zoonotic diseases because we are mammals, and therefore, we expect the transfers to be easiest between more closely related species. So it's, it's been proposed for instance, that, that SARS cov, two came from a bat, yes, but then its intermediate host was a snake infecting the lake but like a relative of a cobra or a secret, and it's probably not the case as it turns out. But that would be more surprising a bit than if, for instance, it had an intermediate host and a pangolin. Because snakes are so much more distantly related to us, that are mammals. So why you know why mammals? Why are so many species of rodents implicated in transfer? You know, in transferring diseases? Well, half of all mammals are rodents, a quarter ish of all mammals are bats. So we've got you know, why mammals? Because we're most closely related to my walls, because we are mammals. And then why are rodents and bats always the ones who are being implicated? Well, together, they make up three quarters of all mammals.

**Bret** 25:36

So this question about phylogenetic proximity is clearly important. The mechanisms for viruses that transmit within a species to jump to another species are more likely to be present if that species is closely related. But there are obviously a large number of cases of things like bird flu, right? That's a pretty big phylogenetic gap. Yet we see viruses having jumped it. And that leads me to the second point about bats, which I don't see, forgive me if I've missed somebody's description of it somewhere. But there's a very obvious reason for viruses to be coming from bat. And that has to do with the viruses preference, I use that term in quotes, because obviously, viruses don't have real preferences. But to the extent that the viruses purpose is to get itself as deeply into the future as possible. Bats are an especially good host. Why? Because they fly. Same reason that birds are an especially good host, because they fly. And so

**Heather** 26:38

they have fewer, they present fewer barriers to dispersal as a host, and therefore they open up more landscape, metaphorical landscape and literal landscape for the virus with them.

**Bret** 26:49

Yes, they, in fact, they provide a solution to a dispersal problem. And it won't be all bats either. He really have two different kinds of, of dispersal problems. So actually, Zack, could you put up the picture, first of me on the forest floor? You have that one? Yeah. Okay. So here's a picture of me. A couple months ago, actually, before we had ever heard of COVID-19, on the floor of the Amazon, taking a picture of one of the species that I studied when I was in graduate school, Heather and I were in the Amazon and I managed to find a few of these guys, can you now put up the picture of the bats? Now, there we go. So here we have some tent making bats these are

**Heather** 27:35

this is this is the picture that Brett was taking when I was taking the picture of Breton.

**Bret** 27:39

Yep, there you go. So that's a little bit meta. But anyway, these bats are new world frugivores. And they are roosting in what's called a tent, which is a leaf that they have modified into a structure that protects them from being seen and protects them from rain. So these guys have the potential to disperse a virus from one place to another. In other words, a river wouldn't be any obstacle to these animals moving from one part of the forest to the other, but they aren't very good as hosts, because you see a small number of them roosting together here, whereas there are many species of bats that roost by the 1000s. And sometimes the hundreds of 1000s in these very large caves. So such an animal would be an ideal host, because to the extent that it became infected, the virus could spread within this very large colony, and then all of the individuals in that colony would be capable of spreading it across the

**Heather** 28:34

landscape, such an animal meaning not these guys, right?

**Bret** 28:37

So it isn't going to be all bats, but there are going to be certain bats certain ecological parameters, which make bats a particularly good host from the point of view of doing the viruses bidding, which is what the virus is interested in, right, the virus wants to get into the future. And one way to get into the future is to hitch a ride with a creature that can cross boundaries. Like for example, you know, in Indonesia, any animal that is restricted by water isn't going to be able to get from one island to the next, that is going to often be undaunted by the water, and many of species will regularly transit between islands. So it makes a good host from the point of view of the virus leaping from one place to another. So we always have to think in this evolutionary form. And one way to say it is to the extent of the virus is trying to get into the future. It hooks, its wagon to the star of some creature that is capable of crossing these boundaries. Therefore, which viruses is it that we see in the present? They're the ones that have done so well in the past. What were the characteristics that allowed them to do well in the past, well, the fact that they are transmitted between bats and other bats and from bats to intermediate hosts, like maybe a pangolin, than they would be potentially successful, so we shouldn't be too surprised. And in fact, this is a general property that isn't even really about viruses. If you think about The the flavor of the spicy flavor of capsaicin, the sensation of hotness in food. And chili pepper is particulars. That is a molecule a secondary compound that has been loaded into those chili peppers. And it appears that it was loaded in to dissuade mammals from eating the chili peppers. Why? Because the chili pepper plant gets into the future better if the seeds are carried off by a bird. Why should the chili pepper plant prefer a bird over something like a monkey? Well, because the bird flies and therefore will take the seeds farther. So a preference for a flying vector is seen in many different contexts. And it shouldn't surprise us when it shows up in in bats.

**Heather** 30:48

So let me just finish off the prediction for the story you just told which is a true story about capsaicin, and hot peppers and mammals. All having an aversion except for humans, many of which have developed a a predilection for the spiciness of hot peppers. Birds cannot taste it. The capsaicin is still in the peppers when birds eat it but birds have no reaction the same way that that mammals due to the capsaicin and hot peppers. Yep,

**Bret** 31:14

that's that's correct. I should have should have said that. All right. So I think

**Heather** 31:20

it's a bats that's all you get. That's that's all you have for bats. That's all well, did you want to actually you? I thought you might want to say something about the three clades that you think maybe not but you say a similar strain of Coronavirus is likely in the run a low Feds, the HIPAA Sara the hippo said Aaron's HIPAA misspelled that, and maybe something similar? myotis? I don't maybe this is too too much in the weeds, but

**Bret** 31:43

no, not really, all I would say is I'm not an expert on the kinds of bats that have been implicated here they are old world insectivores. They are potentially good hosts for a virus because they many of the species in these couple of clades do roost in large cave settings where the virus would have a better chance of spreading one animal to the next. It is interesting that we have seen analogs of this virus in two closely related families, the HIPAA security and the Rhine oferty. And that now a distant family has shown similar viruses as a species of meiosis and mitosis is found all over the world. These actually if

**Heather** 32:29

you know, bats in North America, it's almost certainly at least in this family so desperately on it, right? That's petroliana,

**Bret** 32:34

especially if you live up in the northern reaches. It's the only family that that gets to you. But But in any case, one of the things that happens in these large cave wrists is that frequently many species are roosting together. And so you can imagine a virus that had the special characteristic of being able to hop from one species to the next and found itself in a roost of bats that may be 95%, Rhino low fins, but as a few myotis, here there would have an advantage. Now this does point to one opportunity here, which is to the extent that the virus is good at jumping from one species to the next. It is not a specialist, and therefore, from the perspective of coming up with a vaccine or something that's actually a hopeful sign, because what it means is that the mechanisms of adhesion, the antigens on the surface of infected cells, for example, are going to be generalist in nature, and that generalism means that they are probably a bigger target for us to hit with the vaccine.

**Heather** 33:38

Yeah, so a couple of reasons today that we are thinking, well, maybe a vaccine, we still should not be banking on it. It should not be the one and only strategy, but maybe it is more likely than we at least were thinking a week or two ago. Yep. Good. Okay, do you want to launch into conspiracy hypotheses, which is the term that you invoked last time and I said there's no way this is going to catch on? Everyone calls them conspiracy theories. But let's let's go ahead and try to call them conspiracy hypotheses, maybe a few words first about why you would rather call them conspiracy hypotheses rather than conspiracy theories.

**Bret** 34:13

Sure. So you would imagine that Darwinists would be particularly sensitive about this issue because sometimes we have to field these accusations that evolution is only a theory, when in fact, when we say that evolution is a theory, we mean something very strong by it, which is to say that it is a well tested idea. It's not to say it couldn't be displaced by something else. But as far as we know, evolution is the explanation for all living creatures, because it is the only explanation that has withstood test. So when we say that something is a conspiracy theory, we don't mean to drag in that level of certitude. In fact, in the case of conspiracies, we have a significant problem which is that the the whole allegation of conspiracy suggests that somebody is trying to make x look like why. And so in order to responsibly deal with things in this quadrant, we have to be very careful to rate our level of certainty and not over rate. So to say that something is a conspiracy hypothesis leaves open the possibility that it makes predictions and that we could discover that it is true. But it does not claim that it is true.

**Heather** 35:32

And I guess the one risk of using this phrase conspiracy hypothesis is that it is it is very common for people to misunderstand when you say, I've got a hypothesis, or here's a hypothesis, that what you are, in fact saying is I think this is true, or I want this to be true. And sometimes when you say I have a hypothesis, you are saying, I think this is true. But that's not always the case. You whenever you are confronted with an open question, you know, why is x, you are expected to come up with as many possible hypotheses as could possibly explain x and then discern between them. And so all of those hypotheses are unlikely to reside in your mind is equally likely to be true, although it is what we what we aim for when we are doing science. So saying, we're going to talk about some conspiracy hypotheses does not mean that we think any of them necessarily are true, and certainly some of them we absolutely don't. But it the term as you've already said, conspiracy hypothesis reduces the likelihood in the head of the person speaking that it is it is a certainty.

**Bret** 36:41

All right, so how should we address the question of conspiracy hypotheses?

**Heather** 36:46

Well, I mean, it's one of the things that's happened. Sorry. One of the categories of conspiracy hypotheses has mostly disappeared, which is, even until a couple of weeks ago, maybe even a week ago, people were still saying, This isn't real. It's a hoax. If you've ever met anyone who's had it, right. And mostly, this one has disappeared. I haven't I haven't seen this too much. There's still people claiming different levels of of hoax Enos. But the idea that the entire thing is a fabrication. And that SARS cov. Two doesn't exist, and that COVID no one has ever gotten sick from or died from COVID-19. I have not seen that popping up in the last week or two. So originally, when we were talking about distinguishing between conspiracy hypotheses, one of the things that we were talking about was, you know, conspiracy hypotheses, conspiracy theories, and in common parlance, almost always have the tinfoil hat. implication, because so many of them are crackpot, right. And the idea that this was a hoax, and from pretty much the beginning was kind of crackpot. But there are a lot of other ideas that don't fit the mainstream narrative, right. The institutionally that, what's the what's the acronym Your brother has? Which one? gin? The gin? Yeah. Which stands for institutional narrative? Yes. So the gated institutional narrative is one thing. We know it's not been true in some regards. So anything that goes against the gin, the gated institutional narrative, might be considered a conspiracy hypothesis. Are some of them going to be true? Of course, yes.

**Bret** 38:24

Yes. The gin, in fact, uses the idea of conspiracy theory to dismiss viable ideas, right? So it calls them a conspiracy theory, which automatically hinges them with this sort of exactly a unhinged wild eyed connotation, right,

**Heather** 38:41

which is, which is exactly how the game is played. So I think I think we don't need to talk about any of the idea that this doesn't exist, that it's not real, right, that we're not experiencing an actual global pandemic, or the social response is to nothing. But beyond that.

**Bret** 38:59

Yeah. So let's let's just launch into some of these things. There is this question that routinely comes up which has to do with what to make of the fact that this virus appears to have emerged in Wuhan, which just so happens to house a lab that was studying such viruses from bat sources with a possible eye towards utilization. I must say, I'm not in a position to evaluate any of the facts here. I certainly assume that there is a virology lab that matches this description. And given that that is the case, it is a very difficult to dismiss. coincidence, it could of course, be just coincidence or it could be something more.

**Heather** 39:53

Well, let's say there's there's three possibilities right within within just this framework. It is a coincide That's, and this emerged from some clade of bats jumped into pangolins, or maybe Cobra like things and then into humans. And the fact of there being a competent and relevant virology lab very close to Wuhan is a coincidence, that's one. Two is at the other end of the spectrum, that this is in fact a bio weapon produced and, and by by that lab, and they just didn't take it very far, which seems like poor planning, but okay. And then there's this intermediate one, which is that there was something in development. And there's all sorts of actually nuance possible within here that there that we there's actually, I don't think I have it in the notes. So I don't have it for you, Zack, but there's a paper from a couple of years ago, which in which some of the authors are actually out of that lab in which they say, look, we know from SARS one, which of course, wasn't SARS, one at that point was just being called SARS, there was a risk that there is a reservoir in bats of similar viruses. And we would like to know more about it. And here's what we've done to try to understand it. So we know that that lab was indeed investigating SARS, like coronaviruses, in, you know, in the virology lab in Wuhan within the last couple of years, that is a totally legitimate appropriate in fact admirable thing forever LG lab to be doing, if they understand this is a risk that could produce a global pandemic. Were they then or some members of that lab considering developing it as a bio weapon? That's a possibility, but hard to hard to know what the likelihood is? Is it possible that it escaped by accident? This is maybe the third sort of middle of the road hypothesis. That doesn't match either? Come on, guys, it's a coincidence. What are you talking about, or this must be a bio weapon from China, and we need to get them,

**Bret** 41:48

right. So escape could mean a number of things, it could mean that, you know, somebody goofed with a sample and, or something like that. It could also mean, because what they were doing was apparently looking for SARS, like coronaviruses in baps that they were going into caves and that somebody in the lab contracted it. And you know, they're working in Wuhan in this lab, and the thing escapes into the world, and the coincidence is too much for people to ignore. From the point of view of it being a bio weapon. There are a couple things, I'm more compelled by the argument that it's not a very well put together by a weapon. And that that argues against it being one and

**Heather** 42:30

this is there's a new paper, again, I don't have the reference right here for Zack to pull up there's a new paper that says definitely not a bio weapon. But the argument is primarily, this isn't what people who were engineering a bio weapon would have made. And I'm not fully compelled by this as an argument because it imagines that you can see into the minds of people who would be trying to engineer a bio weapon accurately. And it seems like they would be exactly trying to not have their minds seen into. But it is nevertheless an argument that's been made in at this point, the published scientific literature.

**Bret** 43:00

Well, like I said, I like this argument a bit better than you do. Unless there was a phase two. If this was a bio weapon, then I don't think it's sufficient in itself to be a very effective one. But it doesn't mean that coupled with something else it couldn't be. So I guess the prediction of the hypothesis that it is a bio weapon is that there would be some second blow that something would emerge, it is possible that it was constructed as a bio weapon, and that it has evolved through some mechanism either understood or not understood. So if we step into the flu, like RNA viruses, there is a mechanism for recombination between viruses that would allow some novel virus to emerge. I don't believe we know of such essentially a bio weapon they got away from them, right? Well, imagine that they put together a devastating bio weapon, and they released it. And then evolution shuffled it because evolution isn't really interested in human bio weapons. Evolution is interested in creatures getting into the future. And so if it quickly changed into a form that was more effective at being past and less effective at doing whatever devastation, then that would be a win from the evolutionary perspective, and it would up end the intent of whoever created it. But I should say, Were you in Wu Han, creating a bio weapon? It would be foolish to release it there.

**Heather** 44:27

This is what I was trying to suggest earlier. They really didn't take it very far. Did they? Right, they didn't, they put it right in their backyard. If if this is where they develop it, and this is where it was released, and at risk of stepping into even more dangerous territory than we're already in. The idea that you can engineer something and have total control over it is obviously hubris of the nth degree and is exactly the reason that we have a much more cautious and nuanced dare I say, take on genetically modified organisms than most scientists are supposed to. Because you just cannot assume that the thing that you put out into the world will stay as it was, if it's an evolve in entity.

**Bret** 45:07

Yeah, if it's an evolving entity, then it may have other plans. Now, were you somebody else who wanted to create a bio weapon and you wanted the blame to fall on the Chinese, for example, you might release it in Wuhan. And then people would be unable to ignore the the coincidence. But nonetheless, I would say I'm far I'm far more compelled by the idea that I got away from somebody who was associated with this lab. And that that's the reason which

**Heather** 45:35

I'm sorry to interrupt, but which says nothing about the intention of the people who are working on it. Right, it could have been the most honorable, public health driven work out there. And it could have been totally acceptable. And there's no there's there's nothing in this story as it escaped from the lab as to which of those or anywhere in that spectrum it might have been?

**Bret** 45:57

Yeah. So anyway, I think the important thing, if you're going to traffic in conspiracy hypotheses is to recognize that at the moment, we don't have sufficient information to sort between these various things, all we can do is sort of say the chances that the Chinese developed a bio weapon in the form of COVID-19 and released it in Wuhan doesn't really add up, it doesn't fit very well with the virus, it doesn't fit very well with the release in Wuhan. Why would they do that? Rather than transport it, which is obviously easily done? Could somebody else have transported there so that the virology lab would take the blame? conceivably, but again, it's not very well constructed? Did it evolve out from under somebody? Did they build a weapon that then evolved into something much more benign? Who knows? But,

**Heather** 46:43

and again, just to circle back a little bit? All of these are conspiracy hypotheses only because they are outside of the gated institutional narrative?

**Bret** 46:54

Yeah, I mean, I would say there are hypotheses. And but

**Heather** 46:56

I mean, so the point is that the Djinn, yeah, they gave institutional narrative. Makes rogue of hypotheses, anything that doesn't fit what it's already telling you is true. And so this is we are trying to be thorough, recognizing that there is so much information we don't have, the information that we do have is changing regularly. And we don't know if the new or the old is actually true. But we are trying to sort of walk this weave this line through all of the information. And almost none of the things that we've talked about here are part of what we are being told by our government or public health leaders.

**Bret** 47:36

And this is really, it's there's several things contributing to the problems with what we're being told one, the data is truly crappy, right? We don't have good data because the testing isn't high quality, it isn't widely distributed. And that's resulting in an extremely noisy data set that may be more misleading than it is informative,

**Heather** 47:57

having nothing to do with human failures, though also given how high array of asymptomatic carriers there seemed to be absent, worldwide testing of everyone yesterday, the data will inherently be bad, no matter how good any particular government had been about developing and disseminating tests.

**Bret** 48:15

Yeah. So the data is crappy. The political apparatus has gone into high gear making use of the crisis. And this is something that should worry us tremendously. So among other things, we have seen a continuation, I believe it has not passed, but if you've seen an attempt to broaden the appalling provisions of the NDA 2012 for indefinite detention. Now, when NDA 2012, passed, the indefinite detention was specifically with reference to a worldwide war on terrorism. And in this case, what we've seen is a legislative attempt to broaden it to any crisis. So

**Heather** 49:05

or it might have been, we should look, we should look this up, we should come back to this on the next livestream. It might have been extending it specifically to a public health crisis. And I thought it was explicitly extending it to judicial branch maybe or maybe that wasn't part of it, which we should get back

**Bret** 49:21

to, we should figure it out. But nonetheless, there does seem to be a number of different fronts in which the chaos that this is creating has opened the door for some agenda that clearly existed beforehand to move forward while we're all occupied thinking about viruses. So that's, that's a very destructive process, and independent of the simple fact that the data isn't any good. And then the third, maybe this is actually just an extension of the data not being very good, but I've started to see a lot of analyses about how we are increasing rapidly categorizing various things like death by COVID-19. And I want to take a little detour here, and just sort of lodge an idea in the public consciousness. We hear a lot in other circumstances of people dying of the flu, right old people very frequently die of the flu. But dying of the flu isn't really what happened. What we've got is a situation some of you will know that I worked on telomeres back in graduate school. And telomeres are the ends of chromosomes, which have a repetitive sequence that is, basically functions like a timer, it is eroded slightly with each cell division. So every time you get damaged, or you do maintenance, you lose a little bit of this telomere, and eventually your cells can't reproduce, which causes you to have, you know, your organs begin to fail. This is what growing old is about. When you are born, you have effectively a fixed capacity to do repair for a lifetime. When you get damaged, you spend some of that capacity. If you do damage to one tissue, repetitively, you can die of the failure of that tissue, even if the rest of you is effectively young. When we say people have died of the flu, what they've done is they've gotten old and they've spent most of their capacity for repair. And then the flu has pushed them over the edge, it has pushed some Oregon beyond a limit. And that has caused their death. But the fact that their death certificate says flu and it doesn't say, you know old age by flu, right, those two things multiplied by each other is really what killed the person.

**Heather** 51:47

And this is this is exactly why diseases. In the case of COVID-19, it doesn't seem to affect the very young in terms of killing them. But there's a separate reason why diseases tend to affect the very young and the very old most that those of us in the middle of our lives are less likely to be taken out by by pandemics.

**Bret** 52:07

But it really doesn't mean that you walked away from it just because you've recovered. So the fact that old people are pushed over the line and end up dead as a result of these things, is a proxy for the fact that it is doing substantial damage, right, it is spending your lifetime capacity to fix some tissue like your lungs. So we we should assume that that is just simply going on. And it's fair to assume that it is going on with the flu, you get the flu, you recover, you have knocked some capacity off of your lifetime total.

**Heather** 52:41

Nothing is no cost, right? These things, there's lifetime cost that you're you're taking a hit every time you get sick, and

**Bret** 52:48

you are taking a hit and you're spending some of your total repair capacity. But in any case, the reason that this comes up is that in the case of COVID-19, there's a temptation to figure out, you know, in the absence of good data, there's a temptation to find all data and so people who die are being tested where people who haven't died are not so likely to be tested. And that means that we're catching a lot of cases in which somebody was infected. But they may have had other pathologies, I've seen this described in several places now and it is resulting in that's not even noisy data that's systematically biased data, where if you've died, we're much more likely to figure out that you had COVID-19 than if you're still alive. And so it's creating a bias that we have to be aware of.

**Heather** 53:37

This reminds me of what you discovered with regard to the hunting abilities of our cat Crenshaw, when you ran an entire 75 person introductory biology lab based on his kills let me just set it up and then have you tell the story so we had this cat, whom we'd gotten as a 10 month old he'd been on the streets who's a stone cold killer total sweetheart with us but Stone Cold killer, and he was one of few cats we've had we just we could not always get inside at night. He'd go on a walk about four days at a time. And he'd he'd bring us things he'd bring us animals and we discouraged it but it was very hard to train this cat. And as biologists or want to do when the animals came in in good shape, we bagged them and put them in our freezer, because that's what we did. So at some point, our chest freezer being rather more full of dead Crenshaw kills than it was of the half a cow that we bought. Brett, who was at that point teaching introduction, natural science I believe it was and had 75 students said Why should I run an entire lab? Having my students to suck these animals? Let's clear out a freezer get rid of the cat kills and see what we find it was mostly mammals, a few birds a snake or two maybe and go for it.

**Bret** 54:50

So the thing which I I still find stunning, but did not think to predict was that some thing like two thirds of the animals that the students deselected had a completely obvious path ology I remember, one in particular was a Robin, and its lungs were full of this powder, right? I mean, it was just amazing that the animal was still walking around to the point, it was killed. And so the, presumably some of the ones that didn't have a pathology that an undergraduate could diagnose, still had a pathology was just, you know, how would you know, an animal that had a leukemia, or you wouldn't be able to spot it. But,

**Heather** 55:33

I mean, you had animals with lots of little tumors, like many, many obvious tumors throughout the bodies of many of these animals. They had

**Bret** 55:40

very interesting pathologies. But the upshot of this was that this cat was a very good hunter, but that he was clearly ending up with animals who had been compromised by some other force, right? They were made vulnerable by some pathology, and then the cat ends up bringing them home. And so anyway, it is very much like that, you know, flew by old age interaction is, you know, did the animal die of being hunted by a cat? Or did it die of a pathology actually died by the interaction of them? Exactly. So yes, it is a it is an excellent parallel.

**Heather** 56:21

Alright, enough enough conspiracy talk for the time being? Yeah, I think so. All right. What What time are we at 15 minutes. All right. That's good. Do we want to sort of last time I mentioned that we wanted to say a couple words about the Works Progress Administration. And I started off thinking it was the 40s. And I was kind of right. And then I went forward rather than the back, you said the 30s. I was I was wrong about that. So this is this was introduced by FDR as part of the New Deal. the Works Progress Administration in 1935, and mostly killed in Congress by 1943. As we were at war. 3 million jobs out of 10 million jobless Americans during the Depression ended up with jobs through the WPA alone. And WPA workers built highways and schools and playgrounds and hospitals, they restored theaters and lodges. They put creatives to work in various ways, through federally sponsoring plays, and murals and literary works. And we, we were thinking about the WPA, probably three, four weeks ago, as it was becoming clear what was what was going on, and what was what was coming at the same moment that large This isn't a federally sponsored project, of course, but near our house, there's a long in the planning, piece of work infrastructure work that is actually began yesterday. That's slated to be to go on for seven or more months, and that is causing huge traffic rerouting and you know it's going to snarled traffic, a tremendous amount for for many, many months to be done. It's a new

**Bret** 57:59

bridge that's being put in both to facilitate wildlife. In fact, salmon being able to move, the salmon are currently blocked by the culvert that would go onto the road and they're going to have their habitat restored as people are being granted access to walk under the bridge rather than across this busy road in order to get into the State Park that's nearby.

**Heather** 58:22

Yep. So it's a terrific project that needs to be done. And, of course, it's going to cause disruption. We received we've been receiving notices about this for months, telling us about how you know the traffic calming measures and how traffic is going to be rerouted. The most recent thing that we received maybe a couple of weeks ago seemed apologetic and tone. You know we it said you know, we know we know what's going on COVID-19 is happening. But we really think we need to continue on and do this. And my thought was why on earth are you apologizing? Why is the city of Portland apologizing for continuing with a project that passed I assume in bed I don't know if it's being paid for by bonds or what but you know, it's it got the funding somehow. It is widely understood to be important and valuable. And it is scheduled for now at a moment when many people are losing their jobs, or they have less work than they have had in the past. And at the you know, the lowest level of importance here of all moments to be doing work that's going to be disruptive of traffic isn't this exactly the moment to be beginning it right? Where there is almost no traffic anywhere then where people will be the least disrupted because we're already so massively disrupted by the lockdowns that are in place in Oregon as an as in so many other places in the country. So it's not the same as WPA, but it got us thinking that this is this is exactly the moment that you know there is going to be vast economic fallout from the societal measures to flatten the curve that have been put in place the important necessary societal measures have been put in place to flatten the curve. But there are people who are hurting. And there are systems that are going to fail. And lots of small businesses put out of business. And something like a WPA, for the modern era, could fix our infrastructure, rebuild our arts and sciences and get a number of things back coming again, the way they haven't in a long time.

**Bret** 1:00:25

Yeah, so if you put this up against the various stimulus packages that have been proposed, where people are going to be, given some infusion of cash, those things are good. And it's necessary that something be done, because so many people have been sidelined. But something that did double duty where people were put to work, doing things that were epidemiologically safe for them to do things that need doing, and are being paid for, it would be a very positive thing. I have a concern. I've seen over my lifetime, a paranoia in some political circles, about letting the government do anything effective, and that the only interpretation that I can come up with is that there is a desire for people to prevent there's a desire on in some quadrants to prevent functional government. So people don't remember that government is important. So if you live in some industry, where you fear governmental regulation, then getting rid of government by rendering it feeble and ineffective, and then declaring it a waste of money is a strategy. And at this moment, we can't afford for those voices to hold sway, we actually have to see government wield it effectively, because frankly, there's no other way out of this predicament.

**Heather** 1:01:52

That's right. So I guess 133 final points before, before you sign off. Our governments should be getting testing of both sorts, both the so called molecular testing and the serology testing underway and widespread as quickly as possible. We see conflicting reports as to whether or not that's happening. I think, mostly it's not, but I have high hopes that the various labs that are working on it are making progress, what happens then with regard to the supply chain, and getting them to people, I don't know, but I hope it happens quickly. We need to keep keep and get support systems up and running. I was in contact with a with an acquaintance of ours, who has a you know, in Oregon, who was trying to make her way through the the latest bill that specifies what what the lockdown means and who has to shut down and all this and she's got a small business. She's raising herself into the middle class. But she's not allowed to do her business for now. And she's trying to figure out if she's allowed to apply for unemployment, given that she wants to resume work as soon as, as soon as this ends. And what she said to me was, I'm hoping that support systems will work right now that i think that's that's the big thing here is that we need the extent functional systems to work. And I fear that there is a concern among some that if support systems cannot collect everyone, absolutely everyone that they should not be employed to help the majority. And this seems anti democratic. So there is legitimate concern for people who are homeless, for people who don't have enough to eat. You know how it is that our extended support systems can help them. But we we need to be using the support systems that are there to keep, for instance, small business people from going under permanently.

**Bret** 1:03:50

Can I piggyback on your point about the homeless. As I've been moving around the world, we have a lot of homeless here in Portland, as are in every major American city that I know of. There are a couple of different concerns. One is obviously that these homeless encampments, and they're everywhere are going to be centers of epidemiological spread, the information that circulates among the homeless is certain to be a dim shadow of what the rest of us have access to. So knowing how to control the spread is liable to be difficult for them to to figure out. They also don't necessarily have the means, right. If you don't have running water, then this becomes a much more complicated problem. So there's likely to be a special epidemic inside of these encampments. The other thing that I've been thinking about though, as I've watched the city, absolutely shut down, is for the first time in my life, I've started to think about what these folks eat under normal circumstances, and I can't Escape the sense that probably most of what they're eating is food that's being thrown away by other people. And if other people are not, at the fast food restaurants, throwing away a half a burger here or half a burger in their trucks, then I'm imagining starvation is actually going to be a special problem. And starting weeks ago, as people were beginning to be shy about going to these establishments that they would usually frequent. Did the food supply that these people have been quietly depending on suddenly dry up? And if so what's taking place,

**Heather** 1:05:36

especially in concert with what we know to be true, which is that food banks are having a hard time staffing, whether or not there's food, if they can't stop them, they're not there to give up food?

**Bret** 1:05:45

Yeah, yeah. So anyway, it's a it's a, it's always a puzzle that deserves more thought than we give it and in this case, quadruple E. So

**Heather** 1:05:55

yeah. So one more point on my list here. Zach, can you pull up the Willamette week, the march 26, Willamette week article, on the Forest Service, we have governments who are, frankly, confused about what it is that we should be doing here. Shelter in Place has become a stand in for social distancing. Now that's the nature one. We're not talking about chickens anymore. We're talking about the Columbia River Gorge. Now it's on the, the maybe fourth from the bottom, it's on the final page, middle of the page, Willamette week link. So the fort so here in Oregon, the border between the Oregon, Oregon and Washington, is the vast and mighty Columbia River, which is less fast in Medina that's been dammed in so many places, but it is a gorgeous 85 or so mile stretch of natural landscape that is truly diverse at the ecological level. And, and just extraordinary. And the, it's the Forest Service, the US Forest Service has closed down every bit of land that it has. And it this strikes me, when I saw this, I thought, I didn't even know they had that, right. I thought these were public lands, right? I thought these will these lands belong to us. So I have two strong objections to this, I thought I thought these lands were public lands, I didn't think that it is not, they're not even closing just trailheads and saying you can't park here because we're doing maintenance on the parking lots and like, we're not going to keep the bathrooms open. They're saying you're not allowed to use our trails. But they're even saying you're not allowed to use your trails, you're not allowed to go on the land. Regardless of whether or not we've ever seen this, that piece of the land. It is an in part, this was prompted by the fact that the order that came down last week, I guess, in Oregon, closed all the state parks and all the days parks. So already, people have almost no place to go to be outside and in nature, which is exactly the thing that people are going to need more and more and more, the longer this goes on. I mean it is it is patently insane and counterproductive to keep people locked inside where they are going to be more likely to get sick, they are less likely to get exposed to something new. But if they've already been exposed, they're more likely to get sick. If they are, if they are locked inside. Without any sun without any fresh air without the ability to be active. And without the ability to see anything new. If the only thing we are able to see that is new is the stuff that's coming in our screens. As opposed to being out in nature, we are all going to come out of this much less healthy, much less happy, much less able to be productive

**Bret** 1:08:37

when we're creating a needless psychological crisis. It's insane. Now, it does strike me as probably motivated by the concerns of a litigious society. Sure, which is to say, if you leave the state parks open, but you don't staff them because the staff is sheltering in place, then what happens when somebody gets lost? That's a question that has to be addressed. But it does seem to me seems like it's addressable to me. It's addressable some parks better than others. But you could at the very least, you know, put rules up at the front that say this, you know the way they do off trail at a ski resort. They say beyond this point. This is a drone risk that's not being patrolled. And potentially this could be a haven for people so that anybody who was feeling trapped as many people are and will continue to be had somewhere to go and lots of parks This is completely manageable. Even without a staff available

**Heather** 1:09:44

this global fiasco this combination of the pandemic with the economic fallout that will happen everywhere. does not need added to it. The disaster that is every one in the world emerging weeks or months later. Unable to remember what it's like to be outside and human. And instead it could actually this this could be this could have the opposite effect. Like if people now have nothing else to do but get out into nature, you could find that a result of this is that more people understand that there is value that there is virtue that there is pleasure, there is fun in doing so. And we have more people actually using our natural lands, which is on balance a good thing.

**Bret** 1:10:27

Yep. All right. All right. It's an important point. So we are now going to end this live stream and take a few minute break and then we will return you will have a link in the description to this one that will take you straight to the next one. And we will answer in a second. Oh, we are still working on the link. Okay. So check back in the description of this. If you don't have a link to the q&a section of this live stream, then it will show up, be sure to refresh and that will bring it onto your screen. And we will see you in a few minutes. All right.