Hannah Ritchie Transcript

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Ben: Hey everyone, I'm super excited to be speaking to Hannah Ritchie. Hannah is a data scientist and lead researcher at World in Data. She keeps a substack at Sustainability by Numbers and Hannah has a new book out, Not the End of the World, how we can be the first generation to build a sustainable planet.

Hannah, welcome.

Hannah: Thanks so much for having me.

Ben: What do you think was the biggest myth or piece of misinformation you discovered in your research?

Hannah: I think the biggest myth that I'm trying to combat in the book is that this message that seems to be coming through more strongly now, which is that we're doomed and there's nothing we can do about it.

I feel like, especially in the, in the book, I tackle seven different big environmental problems, but I think everyone tends to focus on the climate one. And I think in the climate one, I think we're like very quickly tipped from like this kind of part denial that we're facing a big problem.

Like we've somehow done a 180 into like now a big prominent message is, it's too late. We're doomed. There's nothing we can do about it. And I think what I'm really trying to push back on in the book is that I just don't think that's true. Like I think. There's a massive, we have a massive problem in terms of climate, it's very serious.

But I think there are solutions coming through now, so I think at a point in time when we need to be moving most quickly and have the most action, my concern is that people turn away because they think this is an unsolvable problem. So I think that's the overarching like big myth I want to try and combat in the book.

Ben: And in the book, you argue that the present time today might be the first time that we can both grow human flourishing and diminish our environmental impact. And you're quite clear that sustainability really has two parts to it in the

sense that there's forward looking, and we want to sustain future generations and the future planet.

But actually, you've got to think about current generation as well, which is poverty as well as climate and the like. What's your evidence or argument for why that might be so today?

Hannah: Yeah, so I think when we think about sustainability, like I'm from an environmental background, so we think of this, often think of this forward looking of, we want to protect the environment for future generations and other species.

I think our ancestors like did achieve that. Like they, did have overall quite a very low environmental impact. But I think the challenge there is that often like human wellbeing or human metrics were not great. So if you take an example of child mortality, like for a lot of human history, like around half of children wouldn't reach adulthood.

Now, what we've seen over the last few centuries is the scales on that have tipped, right? So we've made amazing progress on many of these human well being metrics, like extreme poverty, child mortality, maternal mortality, life expectancy the list goes on. And of course, the world is still very unequal today, so it's not like we're done with this human progress lens but things have got much, much better.

Now, they've got much better. to a large part to the detriment of the environment. So we've, burned fossil fuels for energy, we've expanded farmland often at the cost of forests and wild habitat. So we're now putting lots and lots of environmental pressure on the planet. Now what, where we are today.

I think it's now possible that we continue human progress, so we continue to make progress on all of these marine metrics, while also reducing our environmental impact at the same time. And I think a big driver of that is that we now have the technologies to switch away from fossil fuels, to switch away from using lots of land for farming, and I think we're now in quite a unique opportunity, a unique position to do that, where I think these things are no longer incompatible.

Ben: And the book seems to be fairly skeptical on the idea of depopulation. So this is the idea that we should have fewer people to solve the problem. And also relatively skeptical on degrowth, which sort of follows that humans should

grow and consume less to be more environmentally sustainable. Although there's some sort of overlap in some of the ideas, like food waste.

You could easily call a degrowth idea, although you might solve it technologically. Would you explain why you've come to the conclusion that population is not depopulation is not going to be the solution and why you may a little bit skeptical of the degrowth idea?

Hannah: I think a big part of this is.

So I think if you look at, if you take the population example global population growth rates peaked a long time ago. They're actually falling. Like I think people still have this impression that the world population is growing exponentially and it's not. Population growth is slowing quite quickly and we expect that.

The latest UN projections are that by the 2080s global population will peak. So we're going to see much, much slower population growth. And that's because we fertility rates across the world have dramatically declined. Now the question in there is, should you try to drive that down much faster?

I think one point is no, we shouldn't do that through coercive. policies. And then the other lens is, do you invest in women's education? Do you invest in women's rights to contraceptives, to employment opportunities? All of, we know that all of these things tends to reduce fertility rates, especially in low income countries.

Now my argument there is, yeah, we should do that. We should just do that because that's a good thing to do. I think the putting the climate lens on it. doesn't make sense. Because if you're looking at where fertility rates in the world are still high, they're generally in the poorest countries.

And the poorest countries have very low CO2 emissions. The population numbers in these countries actually don't make a massive difference to a global CO2 emissions. And then if you take it at a broader level Even if you were to see really rapid drops in fertility rates across the entire world, I still don't think it would massively shift CO2 emissions on the timescales that we're talking about.

We're talking about addressing this in decades, and I think demographic change tends to be much longer term. I think on the degrowth thing, I think, I think the intuition for this makes sense. Like CO2 emissions have been really tightly

coupled to GDP over history. As you get richer, you use more energy and we were getting that energy from fossil fuels.

Therefore we had higher CO2 emissions. Now why I'm not, or why I'm very skeptical of it as well. One is that. I don't think we can have global de growth because we still have billions of people living in poverty and I think it's well within their rights to move out of that and I think a de growth global strategy would basically leave them there.

And then the question is in rich countries, should we shrink our economies a bit? I think they are the biggest challenge for me, is political. Like I just don't see Any leader standing up and getting political support for this, so like we could spend the next 10 to 20 years trying to get this enacted, but, I'd rather just spend that time trying to decarbonize, because we know that can work, whereas I think on a de growth strategy.

Like I just don't see it happening on the timescales by which we need to solve this problem. But it's true that, like in my book, like I, I outline a range of good behavior changes that in some sense would reduce resource use. Like I'm, like I advocate quite strongly that a big environmental impact is meat consumption.

Is degrowth strategy? I don't know. I would like to see less food waste, so sometimes maybe some of the behavioural changes we need are somewhat in line with degrowth strategies, but I think specifically going on with a message of, we would like degrowth, I just don't think will actually work politically.

Sure,

Ben: and you give the example of your brother. Eating a impossible burger or one of the alternative burgers. And if you can't tell the difference, and I guess Bill Gates has this with his argument as well, the green premium, if it's basically zero, then you transition, like you transition with any technology.

I read that you didn't really think of yourself as a techno optimist, more of a techno realist, or sometimes heard it as a techno pragmatist. Is there anything about your views which you think distinguish that? And I'm interested also in some of those intersects such in fact, we heard this from Chris Stark, who's on the podcast, who said, you should just call climate jobs.

And, intersectionality with healthcare, you can also just call them jobs or intervention. And there, there is a little bit. Of that so I think that's the sort of

theme. But I was wondering why you wouldn't call yourself a techno optimist and more of a techno realist.

Hannah: Yeah, so I think where I distinguish that is that I'm very bullish on technology, like even if, so even if you were to go for degrowth you still need massive deployments globally of renewable technologies, transport technologies, like you still, there's still a massive technological lens that even if you reduced energy demand where I see myself as a techno realist is that I'm just really yeah. bullish on many of the technologies that we have, like solar, wind, batteries, electric vehicles. I think there's a range of technologies there that aren't like high in the sky. They're like very realistic. Like they're becoming really economical. You can deploy these technologies very quickly.

So that's where I think like a lot of my optimism lies. This isn't a technology that seems very realistic to me. I think there's probably like another. segment of the population that are like more, like way more optimistic on like really dramatic technological change, which like some of these technologies I'm like a little bit skeptical of at the moment, but I'm very like hell bent on, the technologies that we have now that are good, that are scalable, that are cheap, like we just need to build them very quickly.

Ben: I see, yep, that makes sense to me. The book was perhaps a touch more critical of the Doomsday narrative than perhaps I was expecting. Obviously, the argument is that it was unhelpful, and I think it can be really unhelpful to people to one of the things you mentioned, which is you get from animal behavior, you see this learned helplessness.

If you think you can't do anything you stop doing anything. But you argue further that actually they might be dragging back people who are doing something. I was interested to see why you've come to that view or whether there's more nuance to where the Doomsday narrative is.

Hannah: Yeah, I think I think one thing is to clarify what I mean by doomstir.

It's not people that think it's a big problem or it's really silly because I think all of that, like I think the impacts of climate change could be really catastrophic. It's not about that. It's more about this message that I see coming through, which is, we're doomed. It's too late. There's nothing we can do about it.

And I think that's a, I see it and I speak to climate scientists where they are also noticing a real uptick in this where, we used to spend a lot of our time. Pushing

back like climate denialism and we spend as much time if not more pushing back on people saying, we're doomed and there's nothing we can do.

And that's, that's not, that's completely out of line with the science and I just don't think it's helpful. I think it's unhelpful for several reasons. I think I think it was really damaging for many people's mental health. Like I get a lot of young people that get in touch and they're really in a dark place and they're often in a dark place because, and they'll send links to like some blog or some YouTube video where this is the message.

And this is not the message coming from mainstream climate science. This is people taking that message and extrapolating it way further than it actually should be. So I think damaging mental health is one thing. But I also think that Yeah, I think it's just not helpful when there's so many people trying to work on solutions, trying to push forward, to continually get the message of you're wasting your time, there's nothing you can do about it.

To me that just leads to inaction.

Ben: And I think you made the argument that it damages the science which you quite make quite forcefully, and I can see this all around obviously there's a scientific method and there's all of this, but anything which actually is going to damage that further plays into the hands of deniers, and actually at a meta level, Impacts all sorts of things where science is useful.

That's vaccines, healthcare, all sorts of these other things do you think that's true? And if anything, do you think that might be getting worse with that or what's your impressions? Yeah, I think it

Hannah: is true. I think Often there are really exaggerated claims and they're often said with the phrase in front of it, the science says, and then they say a statement that's not what the science says.

And I think these voices often get a really big platform and I think it is damaging to science. I think one thing is that if you continuously say, it's only X years until disaster, X years until disaster, once that period of time passes and the world hasn't ended, then scientists look stupid because people expect that this is what scientists said and it wasn't what they say.

So I think this deadline framing is often really unhelpful. And then I think in some sense, yeah, it does push. Push people away that would have been really

engaged in the topic because they see these messages and they seem so far fetched that it's impossible for them to engage.

Ben: And so if you did have a magic wand and you could do perhaps one or two policy levers, so let's put this at the big systematic level do you have one or two policy thoughts that you particularly favor?

Hannah: I think that, I think a big one. I think if you look at where countries have actually made a lot of progress, it tends to be on electricity. So the UK, for example, like we've actually done a pretty good job of getting coal out of the electricity mix, like it's basically gone when in the past most of our electricity was coming from coal.

And I think for many countries they are making progress on that. I think one sector that's really made zero progress is transport. So we've made, in the UK, we've made basically no Progress on transport for decades. So to me, like a big policy lever there would be trying to bring forward the deadline or giving support for people from moving from petrol cars to electric vehicles.

I think a big The issue there is that when someone buys a car, they have it for 15 years or so. So that's 15 years of emissions from a petrol or diesel car locked in. So I think on transport we need to be moving much faster. And then another big policy lever

it would be something around the speed of building electricity grids. Like I think on electricity there's a range. Of issues that are getting in the way. I think one is just, and this is going to be probably pretty boring for people, but just like permitting, like getting a permit to build renewables or getting a grid connection, like getting a grid connection, like people would never think about.

You know how to get a good connection or the time it takes to get a good connection. So we actually have loads of renewables basically waiting to go on the grid. They just can't get a good connection. So I think there's like lots of what sounds like really boring stuff but really essential stuff on just providing the infrastructure and the setup to actually for stuff to actually get built and get plugged in.

I think this is this decade in particular, we need to build these technologies very quickly. And I think there's currently some barriers really getting in the way of that.

Ben: Yeah, the planning issue, there's actually lots of wind farms ready to go in terms of, they can be deployed, but there's planning and political economy things around that.

Transport's one heat pump sometimes comes up. Maybe we will get to that as well. A couple more and then a high level before diving into a couple sections in your book. Do you have a favorite visualization? Or graph that you like. Could be one of yours, could be one of the others. I know you're inspired by a lot of Hans Rosling's, which people have been.

And I know people in the visual data world really hate pie charts. So I'm always very intrigued how that's come about. But do you have either a favorite visualization or way of visualization that you'd like to share?

Hannah: I think I'll actually pick one that doesn't have data in it, but I think is just really core to the framing of the book.

And, just like really core to like most global problems that we face. And it's a Venn diagram that Max Roser, who I work with at Our Own Data Drew, and it's a basically it's about being able to hold three thoughts in your head at the same time and it's a Venn diagram of three different circles and in one it's that the world is still awful.

So on all of the problems, even the human metric problems, but especially also on the environmental problems, we're not in a good position like the world is still awful, but the world is much better on many of these metrics we have made. Progress. And the final circle is the world can be much better.

And I think it's really important to be able to hold all three of these thoughts in your head at the same time. I think many people get stuck on the world is awful. And they can't see that in many ways we've made progress. And they can't see any way by which we can make more progress. Equally, their people get stuck in the world is much better.

So then they become complacent and they just assume we can just sit back and progress will continue when it won't. And the key is that you use all of these, or you use the understanding that there's still problems to solve, combined with the fact that we can actually tackle problems in order to get the third circle, which is that the world can be much better.

So I think for me, I think that's just a really important summary of all the stuff I tackle in the book, but in general, all of the big problems that we face.

Ben: I really like towards the end of the book although you were inspired by someone else with the arrows, we referred to earlier about people who are pointing roughly in the same direction should consider themselves on the same team as opposed to people who are pointing in a different direction.

And I feel that applies to a lot, but it particularly applies to the climate. And I hadn't seen visualized as much. So in the book you. speak about quite a few sectors, climate, biodiversity, food and the like. So maybe we touch a pull of theirs. And I guess climate's on the mind of everyone. So we could maybe start that.

And perhaps your framing of that was quite a good way of doing it about what has been good and what the challenges are. But perhaps through the lens of climate, again, why do you think that we are in a position to be more sustainable and what gives you hope?

Hannah: On the world is awful bit, the bad news is that the world is currently on track for two and a half to three degrees of warming.

Now that's well above, our climate targets and it's a really bad position to be in. Like this, the impacts there will be really severe. So the trajectory we're on at the moment is completely unacceptable and we need to bend that curve. I think on the frame of the world is much better. I think we are.

actually on a better trajectory than we were 10 years ago. Like we were often talking about four or five degrees of warming and we're talking about less than that now. And why I'm cautiously optimistic on climate or where I think a big change is that the climate problem is that humans need energy for development and historically our only sources of energy were wood or fossil fuels.

And there was no way of. Producing low carbon energy in an economical way. And this was still the case even like 10, 15 years ago, right? If you were looking at solar or wind or batteries or EVs, like they were way more expensive than fossil fuels. There was just no way that the world was going to deploy these technologies.

What we've seen now is a really dramatic decline in the cost of these technologies, such that there's no longer this, trade off between, do you reduce CO2 emissions or do you provide people with energy? Like you can provide low carbon energy in a cheap way. And actually the cost of these technologies is still falling.

Like solar like continues to be all of our expectations. And in terms of prices, but also in terms of how quickly we are deploying them. So there's this kind of trope of the International Energy Agency and many other agencies, they, they come up with forecasts of like how much solar will grow.

And year after year after year, like they consistently underestimate the growth in solar. Like you would think that they would just for a year say we're just going to go like wildly overshoot. So we have a chance, but no, they still undershoot every single time. So I think many of these technologies are completely defying our expectations.

And I think what's really important about these is that these technologies do not necessarily scale linearly. I think it's, I think you become quite pessimistic if you look at where we're today and just draw a line out from where we are in a kind of linear fashion. But that's not really how these technologies work.

They tend to follow what we call an S curve, where initially growth is very slow, but then you reach a point where the, you can get very fast growth. And I think on many of these technologies, countries are now starting to hit that inflection point where they really do accelerate.

So I think that's why I'm cautiously optimistic on climate. I think because our need to address climate is now aligning with people's like short term economic needs. I think in the past it's been really hard to convince people, you should just have higher energy bills or or yeah, you should move to a much more expensive electric car or a much more expensive heat pump.

That's just not going to work. Like you need these two things to align. And I think we're very quickly getting to the case where they are aligning. Yeah, I always think about

Ben: it as ideally you want cheap energy, green energy, and I guess in today's world secure energy, and they are in a much better place than before, although obviously we have a long way to go.

When I was reading your chapter on food and the like I hadn't been aware that we were perhaps close to peak fertilizer use. That there's some arguments that maybe might increase a little bit, but it's not going to be the trend that we had before. And intersectional, I hadn't realized that maybe in terms of farming land, we may be approaching peak farmland.

And I was aware that forests had Restored in some countries, although not all over the world, but actually the restoration was probably faster or it looked better than I thought. So I guess with the same sort of framework, how are you thinking about food and the deforestation land piece in terms of what's going and what's not going so well?

Yeah. So

Hannah: again, historically. The only way to really increase food production was to use more land, right? For a long time we just got really low crop yields, and they just weren't increasing. Now, over the last century, and over, in particular, over the last 50 years we've seen crop yields across the world rocket, like doubling, tripling, quadrupling, like a really significant increase in crop yields.

Now what that means is you can grow much more food using much less land. So we can produce food very productively. Now I think the caveat to that is that often there's like some trade off there okay, you can maybe get higher yields with less land, but you will use more fertilizers or pesticides or all of these inputs, as a substitute for one for the other.

But I think what we've also seen is that I think we are now learning to produce food. Using less fertilizer, not no fertilizer. But we are learning to use fertilizer much more efficiently. And I actually think our potential to do that in the future is even greater. Like I think the range of technologies by which we can use fertilizer much more smartly, like for example, like you can use.

drones to see map out where on the field actually needs the nutrients, whereas before you would just spread it on everywhere. So I think there is actually the potential to, to reduce fertilizer use. I'm, yeah, I put a question mark over the peak in the book because I don't think we're at a definitive peak, but we're certainly seeing much slower rates of growth than we were like a decade or two ago.

Defore like so on, on the land use piece croplands across the world are still expanding. And I think that's the cause for concern. They are still expanding and we are still seeing like very high deforestation rates. Now I think there's two dimensions to that. I think one on the solution side is just continuing to increase productivity.

Of farmlands, which will save land again. And I think another big one there is also dietary change, like the leading driver of deforestation is cattle ranching.

And just in general, meat can meat production uses much more land than plant based foods. So I think there's two dimensions to that.

One is we need just much more productive agriculture, but I think we also need to see significant dietary shifts. If we're to, Okay. To not only stop deforestation, but I think we have the potential to massively reduce the amount of land we're using for agriculture. And that would be able to restore forests, that would be able to restore wild habitats but it would need a significant shift in global diets.

Ben: The story I heard on fertilizer maybe it was a world in data or a tweet or an essay, has a sort of elliptical sense, is that there's is Haber-Bosch. But one of the reasons that they worked so hard on the fertilizer problem is that they'd experienced severe famine in their childhood. And so because of that, they were determined never to see that famine happen again.

And so that sparked the innovation which led to that. And I wonder whether there's a little bit of that now, that of the innovation that we need to spark, because we don't want to see these type of things happening again. issue of plastics, which you raise you're admit or appreciate that actually plastics have a lot of use.

There can be a really useful material and that probably some in the climate movement might underrate them a little bit, but there's obviously the problem on waste and all of that, the like. So I was interested how you went about researching that and what your kind of conclusions were in terms of plastic and plastic waste.

Hannah: Yeah, so I think there's a couple of angles to the plastic. I think one that's becoming much, getting much more attention now, but is a very open and unanswered question, is microplastics and impacts on human health. I'm very clear in the book I, I, if we want to stop plastics I don't have the solution for that.

And I think whether we want to stop using plastics also depends on If there is actually an impact on human health from microplastics, there's a range of stuff. There's just an endless range of studies saying, there's X amount of microplastics in your water and then your food and like we know microplastics are everywhere, but the open question is Do they have an impact on human health?

And what is that impact? And I think that's a really open, but like really important question. But the problem I tackle in the book is like more focused on

like plastic pollution flowing into rivers and flowing into the ocean. And for that, for me, that's a much more practical problem.

That is actually a problem that like, with just some like reasonable amount of investment you could solve, and you could actually probably solve it quite quickly. It's less of a problem of plastic use and it's more a problem of waste management. Around, so estimates that are around half a percent of the world's plastic waste ends up in the ocean, and it ends up in the ocean because after people have use the plastic and dispose of it, there isn't sufficient waste management infrastructure to store it safely.

Now most plastic waste that's flowing into rivers and oceans tends to come from middle to low income countries, and that's because plastic use has massively increased as people have got richer, but waste management infrastructure hasn't kept up. Now there's a, in some sense, a quite a simple solution to that, which is just build waste management.

The problem there is it's quite expensive and not necessarily really high on the priority list. But even just la just putting it in a secure landfill is better than it leaking out into the environment. So you don't even need really really efficient recycling facilities or incineration facilities, even just a really secure landfill would go a long way here.

So that's one element to the problem is just like massively improving waste management. There are like more like techier solutions. So I cover in the book Boyan Slat who launched like the ocean cleanup. Project and their initial project was to get plastic that's already in the ocean out of the ocean So not necessarily stopping it going in but like dragging up the stuff that's already in there But they've also now launched what they call like the interceptor, which is basically the they basically put machinery at the mouth of rivers to stop and gather the plastic that would otherwise flow into the ocean.

Now technically you could put all of these in all of the major rivers that emit plastics and in some sense that would tackle the problem, but I think you would Rather do it by massively increasing waste management infrastructure and in these countries

Ben: That he has some very impressive pictures of the cleanup in the rivers, particularly the rivers in a lot of those places going So yeah, very impressive, but a bit open on the microplastics question another part of the book which I thought was somewhat open was on Essentially biodiversity or the potential for

mass extinction, and I guess we sometimes see headlines with all we're losing all of the insects and we've had a lot of these massive extinction events.

It wasn't perhaps quite as bad as some of those headlines but you do seem to leave a couple of open questions in the book in terms of where we're heading. What were your thinking on the mass extinction risk and the biodiversity challenge.

Hannah: Yeah, I think biodiversity loss is probably like the hardest problem in the book and the, where I'm probably like most pessimistic.

I think biodiversity in general is very hard to measure and also really hard to communicate. Like I think the, one of the statistics you referred to comes from like the living planet index, where they try to summarize what's happening to the world life into a single number. And often that numbers misinterpreted and it's not actually what people assume it is.

So know. The numbers, I think it's 69 percent now they basically measure the population change across like thousands and thousands of different wildlife populations and then they calculate like the average change. No, that then is reported as. The average decline across the different populations is 69%, but people interpret that as 69 percent of populations have gone extinct, or we've lost 69 percent of the world's wildlife, and that's not how that metric should be interpreted.

So I think just in general, measuring and communicating such a varied range of biodiversity is very difficult. But I think when you look at rates of biodiversity losses is a question of, are we in the midst of the sixth mass extinction? Now mass extinction has quite a specific definition, which is that you basically lose 75 percent of species within, it's called a like short timeframe, but it's 2 million years or something, but it's like geologically short timescale, but for us, obviously very long.

Now if you look at the rates by which we are. Our animals are going extinct, mostly because of human pressure they are actually going extinct at a faster rate than they were in each of the five previous mass extinctions. So you'd go on the basis of that yeah, we're in the midst of a sixth mass extinction.

I think where I differentiate from that perspective is that, we would need to carry on with that rate of loss for a really long time before we would hit a mass extinction. And I have some faith that We can be, we can stop that and we just won't continue this really consistently high rate of loss.

So I think, yeah, on biodiversity, the signs are very worrying, but I think there are reasons for cautious hope that we can tackle it. I think what's key to it is being able to tackle basically all of the other problems in the book. I think we often biodiversity loss is often framed as like death by a thousand cuts so we need to tackle we need to tackle direct exploitation of animals.

We also need to address deforestation agricultural land expansion, climate change, overfishing, like I think there are a range of environmental problems that we need to solve and only then will we actually be able to get a grip on biodiversity loss.

Ben: I saw a film about a person who's trying to bring back the woolly mammoth.

I didn't know quite how I felt about it. I actually felt fairly positive on the plant and fauna that I think bringing back a lot of plants and things. The idea of bringing back the woolly mammoth, I think also because it could help the tundra and there's a kind of climate systems piece.

But I think that type of thing gets critiqued quite a lot within those who think we have hopium and techno optimism. On the other hand, I also did think that sort of technology and things might be useful in some, rewilding and reintroducing in some ways are adjacent to that type of thinking about what can we do?

Humans have caused the problems. Maybe humans are going to. Have the solutions what do you think about bringing back the woolly mammoth or some sort of those sort of technologies? I guess this is mostly on biodiversity, but it's intersectional with some of these types of things

Hannah: Yeah, I think it would be cool.

I think i'm a bit skeptical about the Tundra benefits and I think i'm a bit skeptical of that like i've seen arguments about like methane and being able to manage these environments better, I think I'd mostly just be in favor because it would be cool but I think they are like less on a like bringing back extinct species.

I think the, there are actually like pretty positive conservation stories, like for example across Europe or North America where we've managed to massively restore populations that were really on the brink. of extinction for example, in

Europe, there are like a range of like really significant mammal species that we're doing really poorly.

And actually with rewilding, with reintroduction efforts, with conservation efforts, we've mass managed to massively increase the populations of these species. So I'm probably more in favor of investing. investing and protecting the species we have and trying to restore the species we still have left rather than trying to restore extinct species.

I don't know how much money is pouring into that. If it's non significant, then I think it's quite cool. But if it's like actively taking away money that would otherwise be spent on conserving existing species, then I'd be in favor of that.

Ben: The talking about money, that's a good segue to one thought I had, which is, therefore, if you had a billion dollars, actually, let's make it larger, because actually, in the grand scheme of things, a billion doesn't go very far.

If you had a hundred billion dollars, what would you do with that? And perhaps an adjacent question to that, because it might not all be climate related, but do you have a favorite charity or a favorite non profit, apart from World in Data, which we should obviously support, certainly at the meta level, because without the data, we don't know where we're going at all.

But what would you support if you had a hundred billion? So I guess this would make you like Bill Gates, but yeah, how would you think about

Hannah: that? I

think one key area where I might invest a significant sum is in cultivated meat space, I think that I think energy is already getting, we still need massive investments in energy, but I think overall, like there's more money flowing in that direction. And I actually, I'm much more optimistic about the energy transition than I am about like the food transition.

I think food systems in general, create a range of. pretty large environmental problems. I think dietary change away from me is like really key to us alleviating a lot of that pressure. And I think at the moment progress on that is going very slowly. Like diets are just not shifting very quickly at all.

Even though we actually have a range of like really Or what I think are really good meat substitutes on the market, like I think the Impossible Burger is really good, Beyond Meat's really good, I think there are really tasty stuff on there.

But I think for a lot of people, I think they will just want to eat meat and they will only move away from meat from a farm in the field if there's almost like a direct substitute.

So I'm, I have a little bit of Hope and lab grown meat to be able to do that and move that transition forward So I think I would definitely invest like a significant sum there

maybe No, maybe a bit local. Maybe I agree with your earlier comment on heat pumps. Like I think for Renewable technologies, I think for batteries, I think for electric vehicles, they're getting very close to price parity, even up, upfront cost. And I think they will continue to, the prices will continue to fall.

On heat pumps, I think like upfront costs is still like a massive issue. So I'd probably invest a lot on that. I don't think it would go very far at the global level. So I'd probably have to just give it to Scotland or the UK. But I think for a lot of people, yeah, upfront cost of heat pumps is. is still a big challenge.

Ben: We could do a lot of learnings with heat pumps as well, because I think maybe you could use heat pumps from water sources and rivers. And part of the political economy skills issue is, I'm not sure if you've met Many Scottish engineers, but they're quite skeptical of heat pumps because they're really used to installing gas boilers.

And although actually in Scandinavia and even Germany, it's not a problem. They just think they're not reliable. They don't really know how to install them and there isn't this kind of mass adoption. So you need a lot of heat pump engineers as well as the coordination. Yeah, I think that's viable. And meet alternatives.

Yeah, for sure. I think we need a tasty alternative ribeye steak. I think if they crack the ribeye steak, because they're there on the burger, but if they really crack the steak, they did it. And then you need someone like I don't know, Arnold Schwarzenegger to be your front, maybe Schwarzenegger with a Kardashian or something like that.

So you've got the kind of pan I guess that's the sort of celebrity signal change or something that you will need to provide that adoption. But yeah you're going to say a third one with your a hundred billion. No, I

Hannah: think that was my 100 bow and spears.

Ben: It's all gone. Great.

So when you were writing the book, I was interested, did you have a particular writing process, or a process that you have when you think about data and how you want to visualize it, or how you go about researching? Are you a kind of write in a three hour burst kind of person, or do you write all day, or how do you come about your writing process or research

Hannah: process?

Yeah, I'm going to answer that, but I'm going to go back to the charity question. Oh yes, we didn't answer that one. Yeah, so I think I think I, so I took the giving what we can pledge where I give like a 10 percent of my income to effective charities. Now I think like being in the environmental space, like I think you'd assume that I would just give them to environmental charities, but actually I think like a, I hope what people take from the book is that I think the Human, poverty standard of living part of the equation is just as important as the environmental bit.

And I think especially when we're thinking about stuff like climate change, like one of the biggest ways to mitigate impacts of climate change is just to lift people out of poverty and to progress human development. Like those at biggest risk of climate change are typically the poorest in the world, but they just don't have resources to adapt.

So I think it's like equally. Viable to, to give money to just overall like global development charities. And I think that is just equally as useful as environmental charities. So I give a significant amount to like global health funds and in particular the Against Malaria Foundation which has like quite consistently came out as like one of the most effective ways to spend a pound or a dollar.

So yeah, I think that's, I think that's, a useful way to think about this, where do you give your money that I think the we need to keep in balance one the environmental change, but also the human impact lens. And I think it's just equally as valuable to just try to lift people out of poverty as a measure against climate change as deploying renewable energy.

Yeah, and I think

Ben: that's one of your themes is that actually we can work on many things at once and that's okay, maybe not the same person because the same person isn't

going to be doing all of this but across that and that's okay too, but also that we should be thoughtful about it so I think you mentioned give well as well, which looks at, Assessing the effectiveness of charities, again, there are many different sort of options, but if you are want to give, you might want to just give a little bit intentionally.

So I thought that was a really strong theme, because there's so many things that we need to solve across so many dimensions, that you can just choose the thing which suits you when you're doing something. And you might want to do something else, because you might want to work on health, or you might want to work on your art, and you might want to work on all of these other things, which are important too.

And that. Pluralistic value within your book came across and was a nice theme. But maybe circling back to the writing

Hannah: process question. Yeah. Yeah. Yeah. So I, I loved writing the book. Like I really enjoyed it. I think I just really like writing in general. I think. Part of what I enjoy is one, having a question and doing a lot of work to figure out the answer for myself that's just really fun to me, and then on the end I have to tell everyone what I found, which is the writing bit.

But I do, I really enjoy writing. I think it helps me develop my thinking. I think I use writing to, to get my thoughts in line, to work through stuff I maybe don't understand. I think that's a really effective way to understand do you actually understand what you're talking about?

So I, I loved writing. I would My routine is that I would get up really early in the morning, like it was really calm, like no one was expecting me to reply to emails, no one was expecting me on Slack, or, so I felt really peaceful really early in the morning, and I'd just sit and write for like several hours.

I'd probably write for two to three hours. I think actually, I'm skeptical that if I had more time to write, I would make more progress. I think after two to three hours of really intense focused writing, I think you're done. I think you would start to, or at least I would start to really wane after that.

So I would do that really early in the morning, and then I still had my normal job around data and other stuff. So I'd do that for the rest of the day. But it was like, I tried to like, keep a really like rigorous routine. It's very easy to like skip a day and then skip another day and then skip another day.

So I tried to just take it like really rigorous, like day by day. And I got there in the end and I didn't really have a last minute rush that, that you might have if you like keep putting it off and off.

Ben: I was that almost. every day, five or six times a week, that you'd do the two, three hour stretch in the morning, or was it not quite, or was it

Hannah: every day?

No, it was pretty much every day. I would sometimes take a Saturday off away from writing, but yeah, no, it was pretty much every day.

Ben: Excellent. There is one theme with that. Some people say that actually one thing which links creatives and writers is to have all sorts of different routines and they write at all hours of the day.

Some write at night, some write in the morning, some write at lunch. But the theme is they all write and they all write consistently no matter maybe it's an hour, maybe it's five and it's really regular. It's almost every day or. at least on a very regular basis. So that's interesting to see that it that it echoes with your process.

Was there anything you found really surprising or maybe you had a conception which went then the other way? You talk about some of the kind of typical misconceptions, but it seemed a bit counterintuitive. But I was wondering if there was anything that you came across either about how you thought, Oh, I would be writing like this and it didn't turn out that way.

Or maybe something when you did the deeper research it's Oh, this isn't exactly how I thought it was going to be.

Hannah: I think on the research front, I think the re, it was a build up of research I'd done our own data over six or seven years or so. So I think in terms of like hardcore research for the book, I think a lot of that was already done.

It was about how do I distill this? Every environmental problem gets one chapter and I could have written a whole book on each problem. So I think the challenge was how do I distill this into a really. Simple, but nuanced narrative by which people can understand the nature of the problem and understand the really key solutions.

So I think the shrinking everything down into to a much smaller package was really difficult. And I think as a, what I always find difficult is like as a scientist or kind of academically minded person, like you, you really want to provide every single caveat. And we often do that because we think we're writing for our peers in our given field.

So when I'm writing about, I don't know, something specific on climate change, the temptation is to write to other climate researchers and put loads of detail in and show that you know all of the caveats and all of the assumptions. But that's not who the book is for. I'm not writing the book for climate scientists.

I'm writing it for a very general audience, which means that you have to let go of a lot of the intricacies and the caveats and try to write it in a simple and accessible way while also sticking to the truth and the science. And I think that balance is quite. Yeah,

Ben: and I think you've done really well in achieving it.

I think I read an anecdote about Stephen Hawking, the physicist. I don't know if it's true or not, but he was told for every equation he put into his book, his audience would halve. So in the end, he was only allowed one equation in the whole of the book because he didn't want to halve the audience. So there is.

There is something to that I wanted to touch on two or three things which kind of run adjacent to the book But comes across in your on in your sub stack two or three questions that you answer there. Because it often comes up in conversation Although some are a little bit niche, but I think really important So one was around the controversies or the challenges and opportunities on cobalt Another was on transition metals In general, and the third was around this argument that perhaps smaller.

Richer nations don't have to do so much because they're not such a large slice of the greenhouse gas pie today. What have they got to do with the problem? I put all three together in case you want to dwell on it in the back of your mind. But maybe starting with Cobalt, because I think that it's really interesting.

So one is that Cobalt is in a lot of technology we have. So particularly. batteries, EV batteries, but anyone who's got a smartphone has got cobalt within that. And a lot of the cobalt comes from the DRC. So people might know that as the Congo, which has a lot of issues. It's really poor geopolitically unstable.

But a lot of people because of that poverty mining is actually a really useful source of. I think the majority, or a huge percentage of people in the Congo, you probably know in DRC, live on less than 2 a day or something like that. But it's obviously an important transition metal and we can talk about transition metals in general.

On your thinking around copper, what did you discover and how do you think about the challenges around that?

Hannah: Yeah, so as you say, cobalt has been like a key material in lithium ion batteries, which is generally like all of the batteries on your smartphones, your laptops, like all of the batteries we tend to think about are generally lithium ion.

And that's been the case for decades. I think what's changed is that, yeah, we are now going to massive, need a lot more batteries. Like we're going to need batteries for just energy storage, but in particular for electric vehicles. So that's going to significantly increase. Cobalt demand. Now, as you say most of the world's cobalt comes from the Democratic Republic of Congo, where a large share of the population are living on like less than $2 a day, like the international poverty line.

And and especially in the artisanal so like informal mining sector there working conditions are really poor, like they've got. Like high rates of child labor, working conditions are like really poor, like there's very little regard for safety, like it's really poor and exploitive working conditions and they get paid very little.

Like they may bring them a bit above the poverty line, but it's not like they're like making really good money. That's why often. Families have to use kids in the mines because they can't afford to send them to school or they need income because income is so low. So it's a really bad human rights issue.

Now on the question of where we're going and the energy transition of that, is that actually surprisingly I could see a future where we actually just don't use cobalt in electric vehicle batteries. Now, Tesla, for example, has already started moving away from traditional lithium ion with cobalt. So they're now, a lot of their vehicles have shifted to lithium ion phosphate, which does not have cobalt.

And I wouldn't be surprised if many other manufacturers move in the same direction. So you could actually see that just EVs just don't have any cobalt in them. I think there's a broader question of, is that actually the best outcome for

the DRC? Now people just do rely on that income to get them slightly above the poverty line, and if you take that away, they might fall below the poverty line.

So from an economic perspective, it's not necessarily beneficial for the DRC if we move away from cobalt and EV batteries. At the same time, we shouldn't accept that working conditions are really bad. I think the optimal outcome there would be that One of the poorest countries in the world actually gains significantly economically from a transition metal that the world really needs and you can provide a better income for workers.

You can provide like better working standards. But my fear is that the technological change of just switching to a different battery type is actually easier than confronting like pretty hard governance and political issues. So I think on that, I think actually we will probably just move. To batteries that don't have cobalt.

And I

Ben: think you had a blog discussing whether there aren't enough transition metals in general, and your answer, I think was short term. Yes, but medium term, there was perhaps a little bit of a question mark. What's your thinking around that? So I guess this is lithium. There do seem to be quite a lot of lithium, but there's copper, there's cobalt, there's rare earth metals.

There's quite a lot of transition metals and this kind of issue about what we use or what we don't use. How are you thinking about that now?

Hannah: Yeah, so we will, as we transition, we'll need a much broader range of transition metals. I think there's the question of will we have enough? And I think if you're talking about like absolute quantities of minerals in 2050, I think many organizations that study this say yes.

So like the International Energy Agency or Bloomberg, New Energy Finance or the Economic Transitions Commission or Payne Institute, like they seem. All generally comes to the conclusion that in absolute amounts, yeah, we have enough in longer range scenarios. I think the, some of the bottlenecks could come in the kind of medium term, where it often takes a long time to get permitting and infrastructure there to open a new mine.

And we will just need to open new mines if we're going to meet demand. So the challenge is in 2030 will we have enough? Mines open and supply that's

sufficient to meet demand. And if we want to do that, we need to be opening up mines now, because like often the lead time is like seven years.

I think the medium term bottlenecks, there's a potential to, to hit some roadblocks there. I think the impact would be on higher prices, like I think in general you'd just see a higher price if they, you started to hit supply dema supply constraints. I think the there are various changes that make this like a little bit hard to predict.

I think markets actually respond pretty well to scarcity by, one, either just really finding more minerals. Like I think for many of these minerals we just haven't really looked for them and I think we'll just find more. But often in the short term, like cobalt if prices go up we're actually quite good at substituting for a different material that's more abundant.

So for example, in copper when copper prices are high often you'll switch to aluminum, which is not as good a material for conductivity, but, if it's cheaper it will get used instead. So I think it's quite hard to definitively Pinpoint, this is what the market will be in 2030 because I think actually technologies can adjust quite well to scarcity.

Ben: Excellent. And then the last question in the sort of sub stack series was one I hear sometimes speaking to some people, they say we seem to be such a small part of the problem when you look at absolute share of emissions today, should we be the first with sort of the first move at disadvantage?

Oh, China and Indonesia or Russia? Name some country aren't doing their bit. Why do we face in UK, Belgium, or something like that? A richer nation has a has an issue. And you wrote about this subject. What are your arguments here? And is it still the same as

Hannah: when you made them?

Yeah, I think it's still the same. Yeah, I hear the argument often in the UK that, we met around, 1 percent of the world's emissions. Now, if you just for trade, so take into account the goods that we import, it's like 1. 5%. But it's still less than 2%, so people will say it's so insignificant.

Like, why are we working so hard on this? I think there are, like, several core arguments. I think one is a moral one. And some people have told me like, just don't make the moral one because some people don't want to hear about your

morals. I think there's just a moral one of historically we have contributed a lot to this problem.

We've gained a lot of economic prosperity through burning fossil fuels. Now, I don't criticize my ancestors, Yes, there's fears ago for doing that, but like it's just the reality that we're in a position where we have a high standard of living because we've burned fossil fuels. So I think there's this like moral lens to us taking action.

I think there's just a a very clear. Mathematical one, where if you break down the world's emissions, around a third comes from China. So just under a third comes from China. Another third comes from countries that emit more than 2 percent each. So you might call them like other big emitters, but then the final third.

Actually comes from countries that emit less than 2%. So they are all countries that would, you could use the excuse, we're too small, what we do doesn't matter. But if they all say that, then you miss like a third of the world's emissions. So it's very clear that, we can't, it just cannot work if countries with small emissions all say we're not going to do anything about this.

I think the other big Part of this, especially for rich countries, is one, we need to get domestic emissions to zero as quickly as we can. But I think they can also play a much bigger role when you think about technological change and driving innovations that other countries can use. As we mentioned earlier I think what's really key for me is that these low carbon technologies are cheap, right?

For middle and low income countries to deploy them, they need to be cheap. They need to be much cheaper than fossil fuels. Now, for me, there's a big focus for rich countries to deploy these technologies early even if they're a bit more expensive, to invest in R& D and deploy them such that they pull down the cost for other countries, so that India's not faced with a dilemma of, do they burn coal or do they burn coal?

Use solar because solar is so cheap that they wouldn't even think about burning coal. So I think that for me is a really core argument for why I think small emitters, but in particularly rich small emitters can have a much, much bigger role than just, that 1 percent would suggest.

Yeah, I think the

Ben: moral argument is important. And if you look back in long history on things where you've had transitional social transition, such as slavery, women's rights, the moral argument came before the economic argument on that. And I think you're right, that technological spillover from lead countries is really important.

We had that with say HIV, HIV drugs go to Africa, partly because of moral argument and partly because of the technological spillover that yes, they were invented in rich nations first. And so yes, rich nations benefited. For the first 10 years, but now the world benefits. And I think a lot of people have that as something which makes sense.

Great. So we'll do a short section of underrated, overrated, and then wrap up with current projects and maybe any advice you have. So you can pass, you can do underrated, overrated, or a short comment or however. So underrated, overrated, carbon offsets.

Hannah: Overrated. Overrated. Yeah, most of them are scams.

Ben: Very fair. Most of them are scams and we should work on decarbonizing first. Okay. Overrated, underrated nuclear power?

Hannah: For me underrated I know it's often not popular but I think yeah. I think it could play like a, an essential role in our future low carbon energy system. I don't think, if you look at trends, like I don't think it will grow really quickly.

It won't grow anywhere near the rates of solar and wind now, although you could have argued like a few decades ago, it was growing really quickly, but I think if you want to build a. Reliable grid. I think in some countries nuclear could play an important role and specifically we need to keep our existing nuclear power stations open.

Don't shut them and burn coal instead.

Ben: That seems very fair. Okay overrated or underrated? Utilitarianism.

Hannah: I'm neutral.

Ben: Neutral. Fair enough. Carbon tax.

Hannah: That's a tricky one because I can't gauge what public perception is. Probably underrated.

Ben: So in general, the public. don't like it which is why it struggled but economists really love it. Political economists less so it's interesting it comes about. I do think actually, as we're referring back to transport, it's interesting that for some sector challenges, although a carbon price really helps and the price part helps, you can actually get a sector decarbonization strategy, which doesn't rely on a tax.

So although actually doing things but for instance, at the extreme, if you said we have to convert to EVs by whichever year and raise your standards and help people along that way, you can do that without having to do a tax. Because generally people are quite skeptical about a tax, even where you have this kind of tax and make it progressive by giving back some sort of dividend.

A general population seem to be somewhat skeptical even without the technicals, but There's arguments either

Hannah: way. Is it just that people don't like taxes?

Ben: Yeah, it's partly that they don't like taxes, but they partly don't like the fact that It taxes essentially poor people more right and that also that there isn't a In some cases there isn't a really good substitute.

So when you tax, it'd be really good. It's a little bit like our example with copper and aluminum. You can move to the aluminum, but with energy, particularly for poor people, they can't move to anything else, really. So they might be able to reduce their consumption a little bit, but a lot of them are already, they're not the ones who are over consuming.

It's actually the people who can afford to pay. The other argument is that the signal on those who can afford to pay is still quite powerful. But there's

Hannah: Put some Sure, but you could have a redistribution, right? You could tax and then redistribute to the lowest incomes.

Ben: Yes, so you can, the dividend. It still doesn't seem to be popular, although that would be that would be progressive. So implementation issues political economy issues. But yes, in theory, that's what the economists like. And actually in the U. S., both the left leaning and the right leaning economists got together

and wrote, I think there's a 2000 of them said, this was the idea but it didn't manage to go through.

Political economy.

Hannah: Overrated by economists, maybe underrated by the public.

Ben: Yeah, exactly. I think that's probably, I think that's probably right. And I think actually that's probably right on that sort of charitable giving type stuff, or even with utilitarianism. So people who think about cost benefit analysis a lot, think about it too much because they think that's the only thing which really counts.

But the average person who doesn't think about it at all, could just do with a little bit more thinking about about how they could do it. At least

Hannah: I think that's why I was neutral on the utilitarianism because I think, it has very I mentioned like the against malaria foundation and the like, how far does your dollar go, but I think leans into that.

But I think most people don't necessarily think in that way.

Ben: Yeah, exactly. And then when you get to the extreme, you get all of these issues and say, if you only. We obviously came up with a pluralistic thing, but say if you only valued human life and not, say, art or anything at all, then you have a lot of people and you have no art.

No one wants to live in that world at the extreme ends. So it's one of those things, which has all of these kind of fancy paradoxes with that. Great. Okay. And the last one on overrated, underrated Edinburgh. Oh, underrated. Yeah. What do you love about your city or what's most misunderstood?

Hannah: I think it's underrated for people that have never been, I think like I've spoke to those people that have been to Edinburgh and like they love it and I think it's really beautiful.

Yeah, it's just a really beautiful city. Like it's pretty cold. So I would suggest coming in summer, even Scottish summers are not really summer for most people in the world. Yeah, it's really beautiful. Very varied people are, like, super friendly just tons of history it's managed to preserve a lot of its historical roots really well.

I think the downside is that often when you try to preserve historical stuff, it comes with really poor building standards and renovations. So I remember as a student living in old Edinburgh flats where you can't. get rid of the leaky windows because they're part of the cultural heritage.

So I think that's like part of the downsides of it. But yeah, I think Edinburgh is a really

Ben: beautiful city. And do you feel you are in a big enough, say, innovation or human capital cluster, as the economists might say that you've got enough spillover of ideas that it's a large enough cluster there?

Because I guess people talk about Silicon Valley or the London Triangle and these type of things. Edinburgh's got a few things that it's obviously quite beautiful, but some people might argue, oh, is it too small to have these kind of impacts?

Hannah: It's much I used to live in London, and it's much smaller and there's much less of it than in London.

Yeah, so in some sense, I think I'm probably missing a little bit out on the London hub building. But I think for me the trade offs were worth it, and now a lot of the stuff you can now do online.

Ben: No, exactly. Great. And to finish up any other current projects or future projects that you'd like to mention?

Obviously the book will probably take up quite a lot of this year and all of your work on a world in data, but is there anything else you'd like to mention?

Hannah: Yeah. Yeah. So currently just doing loads of stuff on the book. I would have to say like doing like press stuff is like not my favorite thing to do.

So I'm like really looking forward to getting back to doing like research and writing. Yeah. Like looking forward to getting stuck in again at our own data research. And then again, I think a big focus for me is going to be like. Again, like energy transition stuff, like I feel, again, I feel like this is like such a critical decade for us to move on this.

And I think there's like still lots of, and sometimes growing misinformation about many of the solutions. And I think there is the potential risk that it holds us back and slows us down. So I'm keen to just continue doing a lot more on

these big questions about. The speed of transition, the cost, the minerals, the land, like all of these very valid but open questions that people have and try to put like good information out there.

Excellent.

Ben: And then finally, do you have any particular life advice for people? So that might be people who want to work in climate or some thoughts about how you end up as a independent researcher or a writer or anything you'd like to share in terms of life advice.

Hannah: Yeah, in general, a big part of my book is trying to push back against a little bit the, Doomsday thinking and actually reaching out to people that are like really struggling with climate anxiety stuff.

And I've definitely been there and I've, I'm like, I still struggle with climate anxiety and what the future will look like. But I think what I hope comes through in the book and my advice would be to try to come, try to combine that with a sense of cautious optimism that we can tackle it and we can build solutions.

I think one of the best antidotes to. To anxiety is to get involved in stuff. I think one of the worst feelings is feeling like you're helpless and there's nothing you can do and nothing works. I think actually getting actively involved in stuff that moves us forward can alleviate some of the anxiety.

I think in terms of, I think it's hard on career stuff, I think it's hard to give concrete advice because I feel like my path is not really being linear or straightforward, like I never really knew what was coming next. So I think part of it is just being Trying to create a large surface area by putting yourself out there.

I think I've got the blog and even before I started Our World in Data, I had a blog. And I actually think it was really useful for me Getting to work with Max in our own data because he could see that I was actively writing, I was interested in these topics, I was putting my stuff out there and I think if you don't have any of that online presence and you're like trying to get involved in a project or work with someone, I think if they can't see evidence That you're doing that stuff already I think it's really to your detriment.

So I think I would advise people like taking the initiative, whether it's a blog or a project or whatever you're interested in is like having some online presence

where people can see what you're up to. And I think often like spontaneous opportunities come from that, like someone willing to fund you might stumble on your work and really like it and back you. So I think that would be a main piece of advice is to start putting yourself out there. It's also how you learn. I look back on my old writings and they make me cringe. They seem really bad, but I think that's just how you develop the skills. And I think it's really useful to learn in public rather than learning in private.

Ben: Excellent. So that's by doing something you can feel less anxious and speak to people and build in public as a way for learning for yourself but as a way, as a signal for everyone else out there as well. Now that seems to me like excellent advice. So just a reminder for everyone. Hannah's new book is not the end of the world and which I highly recommend.

And Hannah, thank you very much. Thanks so much.