Numberphile Podcast Transcript
Episode: The Importance of Numbers - with Tim Harford
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Economist Tim Harford on the importance of numbers and statistics.

Tim Harford's website has links to most of his projects

Tim's book How to Make the World Add Up - signed copies on Maths Gear

Tim Harford books on Amazon

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[gentle piano music]

Brady Haran [BH]: Today's Guest is the economist, Tim Harford. Tim's a well known media figure here in the UK. [music continues] He's a best selling author, newspaper columnist, podcaster, you name it. But for the longest time he's been best known to me for his excellent BBC Radio show More or Less. [music continues] And that's where our conversation started.

[music continues]

BH: What will people hear if they stumble over an episode of More or Less? It's gonna be you talking to people about what? [music fades down]

Tim Harford [TH]: Yeah me talking to people about numbers. [music continues] That's the thing but particularly about [music fades out] statistics

more often than pure maths although we had features about John Conway for example when he died, so we, you know, we do talk about pure maths too.

BH: Hmm.

TH: But your classic episode of More or Less, it's nearly half an hour long and we'll go through several numbers that have come up in recent days or recent weeks in the news and we'll just interrogate them and say well, is that true? And if it's not true then what is true? So we're sort of a current affairs program, we're trying to understand the news, we're trying to understand the world but we're trying to understand it through the lens of being rigorous about statistics. Not super technical.

BH: Hmm.

TH: But just asking smart questions about where these numbers come from and what they mean.

BH: So sometimes you'll be like calling people out for sort of a misuse of the numbers or hang on that's not exactly the way it seems and trying to set the record straight.

TH: The thing that we did a great deal of earlier this year was simply to examine the British government's record on testing because the British government was making a lot of promises about scaling up testing for SARS-COVID-2, the virus that causes COVID and they said a lot of things that seemed a bit implausible and they measured their data in pretty odd ways and so we were just chasing them down and holding them to account. How many tests are they actually carrying out and how many people are they testing? Which is not the same thing 'cause the same person could be tested many many times. So there's an example of a news story, a current affairs story, through the lens of numbers. We'll also, you know, have fun, so we did one about… there's a

researcher in New Zealand who works with parrots who are able to engage in statistical inference. So we talked to her about her parrots and about her experiments and how that all works so it's not all kind of hard news that we try and have a mix.

BH: So you've been doing this for a while now. Was it thirteen years you told me you've been hosting the show for?

TH: Yeah since 2007 and the show itself is nearly twenty years old, it was… developed original by Michael Blastland who was a producer at the BBC and Sir Andrew Dilnot who is a pillar of the British establishment, a brilliant economist, now the head of Nuffield College, Oxford. So those two created this idea of like somebody needs to do a program that is serious about numbers, data, statistics, and when they stopped in 2007, the BBC cast around for another economist, that was me, and so I've been presenting it ever since and we've just gradually been broadening our empire into podcasting onto the world service, more repeats, more episodes… it's just become this… this monster that I can no longer control. [chuckles]

BH: Any given week there are numerous stories you guys are able to get your teeth into and talk from the serious to the trivial but can you think of any other time in thirteen years where there's been a story where statistics and numbers have been a bigger deal than what's happening at the moment with COVID? For a while there it seemed all anyone in the world were talking about were R numbers and graphs and curves. All of a sudden it was like your moment had arrived.

TH: It's been very exciting. I mean obviously tragic… but statistics have felt incredibly important. There have been other examples. The financial crisis, we were trying to understand these huge numbers that were being thrown around in terms of, well, LIBOR, the London Interbank Offered Rate, most important economic number in the world, what is that thing? How do we scale debt, deficit,

GDP, and of course we fact checked various elections, the Brexit referendum, and that's felt important, but I think now this is the big one. And I think the reason is, it's really, I hope, demonstrated to people how important numbers can be… in actually understanding what's going on. So rather than as say with an election campaign where politicians are using numbers as a weapon and the role of a show like More or Less is to say, well, hang on that's maybe not true. During the pandemic we've been scrambling around for good data. How many cases are there? How dangerous is this thing? What's the failure rate of the test? Or what's the specificity, what's the sensitivity? What is disappearing under the radar? What aren't able to measure? Those clinical trials of these vaccines candidates, how are they working out? How seriously should we take them? Et cetera et cetera et cetera. And I think one of things that people tend to have in their mind, I think, unconsciously is they imagine that numbers kind of they come from big spreadsheet somewhere. Some statistical god sticks them on the internet and you download them and that's the numbers. But of course the numbers are always being collected or collated by some person or some process. Or maybe they're not being collected at all and in the case of SARS-COVID-2, they weren't being collected at all because no one… this virus had not existed before. So I think people have started to understand, sometimes the numbers just aren't there and the scramble to get the numbers and to understand the numbers is incredibly important.

[gentle violin music]

BH: I think you are the first economist that has been on the podcast, so I'm really curious to find out more about you and how you became an economist. So can we quickly rewind to the early early years. Where are you from, actually? Where were you born and like…?

TH: So I'm… I'm British and I moved around. So, I was born in Kent, my parents moved up to near Manchester when I was four, and they… which is in the Northwest, then they moved over to nearer to Sheffield in the sort of the

north center of England. And then when I was twelve moved down to Aylesbury which is not far away from London, and so I've been, you know, I've been in the North, I've been in the South, I've been around the UK. My father was a computer programmer and so moved with his job.

BH: Were you numbery? Would I have said, that kid one day is gonna be hosting More or Less on the BBC?

TH: I was a bit of a nerd at school and I loved lots of different subjects so, you might have if you were looking at me doing maths, you might have said, oh this kid's into maths. I did a lot of roleplaying games, there's a lot of mental arithmetic involved in playing, particularly I played a game called Tunnels and Trolls which involves rolling a lot of dice and adding up a lot of numbers.

BH: What kind of dice? Did you have all those multi-sided ones?

TH: Well Tunnels and Trolls is just six sided.

BH: Ahh. [disappointed]

TH: But you roll buckets of them. You might roll ten of them and you quickly add them all up.

BH: Do you still have that skill? If I was to roll ten dice now are you able to like…

TH: Yeah.

BH: …do a Rain man and go…

TH: Yeah…

BH: Thirty-one!

TH: Fairly fast.

BH: Yeah? [chuckles]

TH: I wouldn't say savant. But fairly fast.

BH: Right.

TH: I really remember though… I was trying to design a big war-game on a big board when I was, I dunno… probably about nine.

BH: Hmm.

TH: And the board was… I think thirty-three times thirty-four and I asked my primary school teacher, I said, Miss! I'm trying to figure out thirty-three times thirty-four, and she said to me… it was 'cause she's a primary school so she's not necessarily mathematically trained, she said, what's the thirty times thirty? I said, it's nine hundred. And she well what's three times four? I said it's twelve. And she said well what's thirty-three times thirty-four and I said, nine hundred and twelve? But I knew there was something not quite right about that.

BH: Yeah.

TH: I didn't know the answer but I knew that couldn't be right. And I went home and I told my mum. My mum studied for a doctorate in biochemistry so my mum knew her numbers. She was outraged!

BH: Right? [laughs]

TH: But the… what she did rather than phoning the school to complain about

the teacher, which of course is pointless, she sat me down, with a big piece of paper and she showed me and she drew these two… the big square, the little square, I'm sure Numberphile listeners can picture it now. The big square, the little square and the two long thin strips. And you gotta add the three times the thirty and the four times the thirty and that gives you thirty-three times thirty-four and I remember another time she explained some probability to me and again it was how likely is the Balrog to kill you if you cross the bridge and it was all… no it was like fifty percent plus fifty percent is hundred percent, and she said no, no, it's fifty percent times fifty percent, which is twenty-five percent. And so I remember my mother actually talking through a lot of this stuff…

BH: Hmm.

TH: And being engaged by that, and of course it's always more engaging… well… it's probably not true for everybody but for me I was not interested in maths for its own sake but I was totally comfortable with maths as a tool to help me play games or do anything else I was trying to do.

BH: What did you wanna be when you grew up at that point? Probably a troll or something? [chuckles]

TH: Yeah I wanted to be a game designer. [laughs]

BH: Yeah?

TH: I wanted to write roleplaying games and boardgames and maybe fantasy novels like Lord of the Rings.

BH: Yeah?

TH: And later on I didn't know. So in the UK at the age of sixteen you have to really specialize and you're encouraged to either go arts or sciences and just do

maybe three or four subjects. It's a very annoying fact about British education. I in the end did maths, physics, more maths, and English literature.

BH: Okay.

TH: And a little bit of French, and so that was that sense of, well I'm not turnin' my back on the arts.

BH: Hmm.

TH: And then at university I had no idea what I wanted to do and in the end I thought maybe law, but fortunately someone persuaded me that that was a dumb idea. So in the end I did a degree called PPE, Philosophy, Politics and Economics. And again it's just this classic example of, this is a degree for someone who doesn't know what he wants to do.

BH: Okay.

TH: I didn't know what I wanted to do, so I was just keeping my options open, and, economics has got numbers, philosophy, I thought, was the thing that was really interesting, that's essays like English literature…

BH: Hmm.

TH: And I didn't really know about politics.

BH: So but clearly at this point you've ruled out nuclear physicist and doctor and things like that.

TH: Yeah I have, well I suppose, I gave up biology when I was twelve so I guess doctor was probably always, in the sciences lessons I didn't like to touch the worms or stuff like that. So I'd been a bad doctor.

BH: Yeah.

TH: Physics, I was always very interested in physics but…

BH: Hmm.

TH: …my dad studied physics but no in the end I was just trying to keep my options as much as possible and of course in that process of trying to keep your options open inevitably there are certain options that are closing.

BH: What… so you've got no idea. I mean I was gonna say what you're gonna be when you grow up? You almost are grown up now, you've still got no idea what you're going to do? Everything's on the table?

TH: No, yeah… I still had no idea and I think in retrospect I was really interested in writing.

BH: Right.

TH: And of course I later became a writer. So I wasn't a member of student newspaper or anything like that. I didn't have any journalistic training. But I did, going back to the roleplaying games, have a fanzine at school that I would use primitive desktop publishing software, this is in the late 1980s, put together articles about roleplaying games, edit the whole thing. Edit my friends' essays, put it all together. When I look back I think, you were interested not just in playing games but in writing about the games that you have played.

BH: Communication.

TH: Communication, yeah.

BH: So… what did your computer programmer father and science focused mother think at this point when you were like in university doing philosophy and politics and economics and saying, oh I don't really know what I want to do. What are they saying to you?

TH: Well they were always fairly hands off so… the other thing that I was doing a lot of was public speaking, debating, and I won quite a few school competitions. So that's another strand of communication. But, you know, it was a different time. So this is the late Eighties, early Nineties, I had three younger siblings. My father wasn't very well when I was about seventeen, my mother became terminally ill a little bit later when I was about twenty. [sighs] I had other things to think about, so I don't think they were that worried. I'd gone off to Oxford University, it's a great university…

BH: So you're not the black sheep of the family.

TH: No I was in a very… I think in a very privileged position in life, think they had other things to think about.

BH: How did economics become the thing then?

TH: So I think I was very lucky. I was interested in philosophy, I wasn't particularly interested in economics. I didn't take a lot of the early economics classes that seriously. I mean if I found them interesting I'd get stuck in but I had it in my mind that I would quit economics at the end of the first year and… I mean there's an interesting to me insight into the way you can get yourself stuck in a particular way of thinking. And not really take on board new information, that you should be taking on board. And the information I should've been taking on board is, well you actually like economics, you're good at economics, and the fact that you came into this subject assuming you would drop it, you probably need to rethink that, and I was very fortunate at the end of my first year when it was all still up in the air, one of my economics teachers, a man called Peter

Sinclair, wrote to me, a hand written letter, and said, you know, you should take this seriously, I think you shouldn't quit. I urge you to keep going with the subject. I'm very lucky that I had people like Peter to guide me through that and to encourage me to play to my strengths. I'm sad to say Peter… Peter died of COVID earlier this year so it was… umm… [sighs] quite a loss, 'cause this is the guy who's the reason I became an economist and I love being an economist. So, yeah, I felt lucky.

BH: If you were the guy who wasn't taking economics seriously, what did he see in your that made him write that letter?

TH: Well I think I liked bits of it. But nevertheless I was planning to stop. The two big chunks of economics basically are micro-economics, which is about how individuals behave, how firms behave, there's quite a lot of engineering maths in it. But there's also potentially psychology in it and questions like that. There's a lot of game theory in it, I loved game theory. There's macro-economics, which is about how the entire economy behaves, which I found quite confusing and so I thought well it doesn't matter because I'll be able to drop all this.

BH: So if I went into a normal street anywhere in the UK and I said to someone, economics, what's economics? What do you think they would say?

TH: So economics doesn't have a really encouraging reputation at the moment. I think if you'd asked that question twenty years ago, most people would have said oh it's some stuff about interest rates and stock markets.

BH: Money.

TH: Which… yeah, money. Yeah, money often. I mean money's really interesting but money is more history and anthropology than economics. It doesn't have such a major role in economics for some… well we could discuss that if you'd like. But… it's about money, it's about markets, whereas I would

say, no, no, it's about the decisions all of us make everyday. We're surrounded by an incredibly complex economy, maybe ten billion distinct products and services on sale. It's about how we spend our time and how we're rewarded for spending our time, and inequality, who gets what, and why they get it. Regulating pollution, congestion, building… I mean there's so… and all of these different aspects of human behavior, so there's maths, there's history, there's psychology, there's sociology. That's what economics is to me. But to most people… I think twenty years ago they'd've said, oh it's about money. Fifteen years ago they might've said, oh it's about that cool new Freakonomics book. [chuckles] That briefly economics cool. And ten years ago they would've said, oh it's about greedy bankers and economists not being able to see the great financial crisis coming. So we've been recovering from that reputational hit ever since. Which I think is… hmm… is about twenty-five percent deserved and about seventy-five percent undeserved.

BH: So I after that letter from Peter, that obviously persuaded you and changed your thinking. What did you think you were going to do then? Once economics took over and it became this thing focused on, what did you think you were going to do? Did you think you were going to work for a bank or did you think you were gonna be this like, you know, trendy economist that cares about people and motivation and…?

TH: Oh I still didn't know. I was completely clueless. I really was clueless. And I was loving my studies. I was loving bein' an undergraduate. I was still playin' games. And one day I bumped into of all people Peter Sinclair, at a bus stop, he had moved on. He was a professor at Birmingham by then. He was Oxford, bumped into him out on the street and he said, I know what you should do when you finish, you should go to Ireland, you could teach economics at University College Cork in Ireland for a year. I've got a relationship with them, and they're looking for someone for a year and would you like to do it? And I thought, yeah that sounds okay. So, off I… you can see Peter played a big role in my life.

BH: This is your fairy godfather. [chuckles]

TH: Yeah, he really really was. I mean there have… there have… I've been very lucky. There have been other fairy godfathers and fairy godmothers since but… so Peter sent me off to Ireland for a year and again I was surrounded by these mentor figures. I was twenty-two years old. Some of my students were older than I was. I'm teaching them what I know based on what I've just studied at Oxford. I'm increasingly interested in the teaching, the communication, trying to get these ideas out there. I'm having fun and so I decided, I had a corporate job offer, to go and work for the oil company Shell. And I thought… actually I'm not going to do that, I'm going to go and go back to Oxford, do a Masters degree, get more into this.

BH: What did Shell what you to do? What would you have been doing if you'd gone down that path?

TH: So there was something they wanted me to do that actually I think would've been very boring. But I did do something at Shell. I kept a relationship with them for a few years. Like summer internships, bit of consulting, things like that. And what I did in that time, this is before, during, and after my Masters degree…

BH: Hmm?

TH: …was to work in their scenario planning department and that is a very very interesting place.

BH: Yeah!

TH: So the scenarios department at Shell, it's got a reputation that goes way back. The story that they tell is that they saw the oil shocks of the 1970s coming

and that saved Shell a lot of money and that made the reputation of the scenarios team for life. But the thing about scenarios is, is not a straightforward forecast of, oh we plugged some numbers in and here's the graph. It's a much more qualitative approach.

BH: Hmm.

TH: So you've got political scientists, you've got sociologists, historians, you got technology experts and you're all gathered round and you're talking to the experts in a particular field, you're trying to say, well, what's gonna happen to Brazil over the next ten years? Or what's gonna happen to hydrogen powered car technology over the next fifty years?

BH: That sounds awesome!

TH: So interesting.

BH: Yeah.

TH: I had a love hate relationship with the job because I'm working for a big multinational and what all of that implies, but… so interesting, such fascinating people.

BH: For a guy that likes fantasy games and stuff as well, like you're using the world is your fantasy game.

TH: And again I'm starting to tell stories. Because the way the scenarios would work, I mean the perfect scenario exercise ends up with somebody telling you a story about the future. It's almost like sci-fi. That's completely compelling and because it's a good story all these complex things go into your head and they stick and you're like oh yeah I can really see this future. I really understand how solar power is gonna turn the hydrocarbon industry on it's head. I've got it, I've

totally got it. And then at the end of the story you say, but actually that's not what's gonna happen and then you tell a totally different totally contradictory story that ideally is equally plausible, equally coherent, equally memorable and then what you've given people is two visions of the future, two ways to understand the way the world might evolve. You've gotten to understand that we don't know and you're synthesizing not just, you know, here's the data, here are the economic ideas, oh but here's what this… anthropologist who's lived in Nigeria for the last twenty years, here's what he told me. Here's what this expert in the Chinese political transition, here's what she told me. You mix them all together. So there's more and more of this communication coming together. And I'm still noodling along and I still don't know what I'm gonna do with my life.

BH: [laughs]

TH: And then… one of the people I met. So I met two really important people at Shell. One was my wife to be, who's an environmentalist who was… busy trying to figure out how to get them to clean up their act. [chuckles]

BH: Right.

TH: It was an interesting to try to do. But the other person I met was a science writer called David Bodanis. He was just briefly in Shell to talk to us about like the future of technology. David is, I think, most famous for a book called E Equals M C Squared, which is a great book about the history of all the different ideas in that equation and the people behind those ideas. So like, who came up with equals. Who first put that… the C to represent the speed of light. All of this stuff. And I was having coffee with him and we were talking about this scenario work and I said to him, I would really love to write a book about economics that's like E Equals M C Squared is about physics. And he looked at me and he said, well… [pause] and that was about it, and sort of raised his eyebrow and…

BH: Yeah, do it.

TH: Yeah, what's stopping you? You know, you don't need anyone's permission and so I started working on it part-time in and around other projects that I was doing.

BH: Hmm.

TH: And that very very slowly became the Undercover Economist. I didn't have an agent, I didn't have a publisher, I didn't have any reason to believe. I didn't know how to write a book, didn't have any reason to believe anybody would ever read this thing. But I remember finishing the first draft and coming downstairs and telling my wife, who was by then my wife, I finished it… and if no one ever reads it, it's okay because I really enjoyed writing it.

BH: Right? [chuckles]

TH: I think it's now sold nearly two million copies around the world.

BH: Oh really? Wow.

TH: So… so… yeah… I was lucky. Very very lucky.

BH: Good decision. Cool name for a book too.

TH: Yeah! It took… and of course like with all of these things it takes a while…

BH: Yeah?

TH: …to think about what the name should really be.

BH: Were you writing it because you thought it would make you money?

Were you writing it…

TH: Oh, no. No, no.

BH: …were you writing it because you enjoy writing? Or were you writing because you've got this sort of zeal for the world to understand economics and love it the way you do?

TH: I just yeah… I just… I do love economics. I find it fascinating. I would be going around seeing things in the world and saying, oh, that's like, that's the economics that I got taught and there it is in action and I wanna tell somebody about that. So it was that urge to communicate. Never for a moment any thought that I would make for a money. As I said I didn't even know that anyone would ever publish the book.

BH: You needed a Youtube channel.

TH: Yeah!

BH: Yeah. [laughs]

TH: So this would've been… when was Youtube… when… 2006, Youtube? I forget.

BH: Oh it's around there, yeah.

TH: So I started writing this book in 2001…

BH: Yeah.

TH: And wrote most of it 2002 and finally found a publisher… 2005.

BH: Okay.

TH: So I mean it's not exactly J. K. Rowling's story of constant rejection but it took a while.

BH: Yeah?

TH: Uh… yeah so it's all pre-Youtube. So, yeah I mean people do, you know, email me and say, oh, um, could you tell me how you got into writing because I wanna get into writing…

BH: Yeah?

TH: And I try to be encouraging but I also say, I don't think what I did is necessarily what I would advise someone to do now because everything about the world has changed and people do have ways through blogging platforms, through Youtube, podcasting, there are so many ways to get your ideas out there. I mean there's no guarantee, it's a very noisy world, but…

BH: So, you've obviously, you know, written this book, you've written a new book which we'll talk about later. You've obviously got this really successful radio show and you do all these other bits and pieces… do you have… have you had a full-time job as an economist or have you kind of since… since becoming an economist have you never actually been an economist?

TH: Have I never been an economist? So, I mean, I do have a day job which is actually being a columnist for the Financial Times. That is my day job.

BH: Right.

TH: But that but of course that is not being an economist either.

BH: No. [laughs]

TH: So… yes… so… I was…

BH: [laughs]

TH: …for one year, a lecturer in economics at University College Cork.

BH: Yeah.

TH: That is definitely a proper economist.

BH: Okay.

TH: I was for about three months a management consultant, that did not go very well.

BH: Right? [laughs]

TH: One of my colleagues said… all you need to be able to do to be good at this job, Tim, is talk crap and wear a suit.

BH: Yeah? [chuckles]

TH: You can't do either of those things.

BH: Right [laughs]

TH: So. [laughs]

BH: [laughs]

TH: Now that was a bad job. But I guess the work I was doing for Shell which was kind of on and off but for a while it was… for a year or more was nearly full-time…

BH: Yeah?

TH: I would say that was… I was an economist and my boss was the Chief Economist of Shell. Now I don't have a PhD in economics, I've never been a proper academic economist.

BH: Hmm.

TH: And I have a lot of respect for academics and for other economic professionals who really take their skills to the next level.

[gentle piano etude music]

BH: A lot of what you do in your writing, your books, including your new book, your radio show, is about creating a more numerate society. [chuckles] A society in which we all understand numbers better. How important is that? 'Cause I… I kind of do it to, right? So I'm not like… attacking the idea but… how important is it that people have a really good understanding of numbers? I drove here today to your house in a car.

TH: Yeah?

BH: I don't know how cars work.

TH: No.

BH: And when the car stops working I get someone who understands cars to fix it. You know, I can only hold so much in my head, why does society as a

whole have to be, numerate?

TH: There's a certain minimal level of numeracy that is, it's just important for people's quality of life. Just not being ripped off by, say a credit card company or somebody selling you a car or a, you know, a financial product attached to a car.

BH: Hmm.

TH: So there's that. You need that… a certain degree of numeracy. But beyond that I think as with anything… what I'm really arguing for is for people to… be curious about the world. Ask good questions. Have a little bit of confidence in themselves to apply some common sense. And to just sort of stop and ask themselves what is really going on here. What is the story? What's happening? Because the more mathematical nouse you have the better. But you can have all the technical mathematical skills in the world and that's not gonna save you from making mistakes. Actually one of the opening stories in the new book is actually about one of the world's leading art experts being fooled by a forger with a bad forgery.

BH: Right?

TH: And it's like a multi-million dollar fiasco. I mean it's a terrible terrible mistake and this guy is the top man on the work of Rembrandt and Vermeer and it has nothing to do with statistics, the point I'm making is, he is the world's best expert and he made this mistake and he made this mistake because of his emotional reaction to the forgery that he was being shown and how he felt about it and how that kind of justified the stories he told himself about, Johannes Vermeer and what Johannes Vermeer had done and my point is, you can have the technical statistical and mathematical expertise you like, you're still gonna fall foul of tricksters, you're still gonna fool yourself if you want to. If you're, you know, if you're politically motivated or if you're emotionally motivated in the way you're reaching conclusions. So the argument I'm making both in my

economics books and in the writing about statistics and the broadcasting is, you can think for yourself, if you're willing to be reasonably disciplined and if you're willing to play it fairly cool and not be motivated by some anger and self righteousness.

BH: So… we have like an education system in this country, which, I dunno, you could argue is good or bad, I think it's probably pretty good, most people go through it, we have a big and vibrant media in the country, the BBC and other organizations, what is wrong with those systems that results in you being able to sustain such a successful career? [chuckles] Like what… why…

TH: [laughs]

BH: …why are there so many people out there that need to be… to read these books and be listen to More or Less to figure things out? Is something broken? Or is it just…

TH: So If I'm the symptom, what's the disease? Is what you're saying? [chuckles]

BH: Yeah! Yeah! Yeah.

TH: [laughs] So… umm…

BH: You're… no you can be the cure.

TH: Yeah?

BH: [laughs]

TH: So, well I try to be the cure.

BH: [laughs]

TH: But… it's not always totally straightforward. A lot of the conclusions we reach, we reach because we're social animals. So we believe things because people we like or trust or want to be in with believe them. So you can see it right now with mask wearing. We wear masks because people like us wear masks or we refuse to wear masks because people like us are refusing to wear masks. Not many people are really sitting down with the randomized trials of masks, by the way there aren't very many randomized trials of masks, it's a social thing, and… that's true for a lot of what we believe. And to be honest if you're gonna get all evolutionary psychology about it, it kinda makes sense, it's… your views on Climate Change, are not actually going to change the climate. 'Cause you're just one person out of seven and half billion people. It doesn't matter what you think about Climate Change, the climate's changing. But what you think about Climate Change is really going to affect, you know, who will be friends with you, who will take your seriously, who will shout at you on the internet, and whether you live in, say, Nebraska or sort of Brighton in the south of England, the kind of people around you are gonna have very different views on these things. So we're guided by the social world around us and so it's natural that people will leap to conclusions that may be fallacious and that's why a lot of what I'm arguing is about, you know, emotional literacy and understanding your own reaction as much as it is about technical skills.

BH: So it's not like, you know, we could improve the school curriculum or journalists could do a better job. It's really you're saying, look everyone, you just need to take a deep breath and have a bit more of think about this?

TH: We could improve the school curriculum and journalists could do a better job, but also, it's never a bad idea to take a deep breath [chuckles] so… let me give you an example, so there's some research on fake news and there's a big moral panic about fake news that I think is not necessarily very productive where I'm just trying to recall the gist of the research but they'd basically would

show people claims like, five hundred people were just interdicted on the US-Mexican border all wearing suicide vests. Which is your sort of classic kind of far right fake news story. And you show this to… you show it to Democrats, like that's nonsense, show it to Trump supporters, and you get asked, do you think this is true? And they would say, no that's probably not true. And you say, do you think it's important not to share stuff on the internet that's false, and they would say, yeah, you know, I don't wanna just share lies on the internet. But that's when you're getting them to stop and think. What actually happens is… Trump supporters see that claim and they retweet it, 'cause it just fits in the story. If you've got them to stop and think, oh yeah, that's nonsense isn't it? I don't wanna share that with my friends, and I don't wanna pick out Trump supporters, this is true… we're all… we all got our biases, we've all got our sort of social groupings and we've all got our emotional reactions, but we just need to sort of slow down and when people slow down they're smarter than we think. Let me give you a quick example from my own experience. So I remember seeing a graph on Twitter years ago now, that was showing rapid liberalization of people's view on gay marriage. I'm very much in favor of people's right to marry regardless of the sexual orientation, so for me, this is really good news. And I just retweeted it, boom! Great news, look, people are thinking the right things like I think. And then the first reply underneath it was, Tim, have you looked at the axes on that graph? And I just though, oh no… [sighs]

BH: [laughs]

TH: And the graph, it was from the Washington Post so it wasn't like it was… some nonsense but the axes were really dodgy. They basically sort of compressed together, you know, sometimes it was decades between the question being asked and then sometimes it was just a few years and it was all… it wasn't a good graph. I should've clipped it and kept it for my bad data visualization folder.

BH: Right.

TH: But instead I was retweeting it to tens of thousands of people. Oh everyone have a look at this! And that's just an example of that emotional reaction.

BH: Do you often find yourself… not practicing what you preach, like in you know in the heat of the moment or… do you see yourself as a human in that way also?

TH: [laughs] Yeah, yeah, yeah. Do I see myself as a human? [laughs]

BH: [laughs]

TH: Uh. Yeah. So look the more I've… thought about it, the more conscious I think I've become of my own behavior and the more I'm able to police my own biases, but it's, you know… you're never gonna be a hundred percent successful. It's about damage control. I'm just trying to behave in a better way, trying to think more clearly, trying to be more calm and that comes with time but of course I make loads of mistakes. And hopefully I make interesting mistakes. I love making interesting mistakes on the radio, but mistakes like like just retweeting something that's nonsense… you know, I'd rather not make that kind of mistake.

BH: I can imagine the sort of audience and community that congregates around a person like you is not the sort of audience that it's fun to make a mistake in front of. Or you don't get away with many mistakes. [laughs]

TH: No you don't get away with a lot.

BH: No. [laughs]

TH: And… but yeah, I mean… mistakes can be really instructive and useful and then sometimes it's just like, oh yeah, we talked to somebody and… she said something that wasn't right and that was a month ago and that's gonna… [sighs]

now we're off air and someone wants a correction and what are we gonna… you know, sometimes it's just… you don't wanna make mistakes but some mistakes are really fun.

BH: Have you ever had one where your blood's just run cold and it's like, oh that was a bad mistake? And you've just watched it go out into the universe?

TH: Oh well that's actually… the one… the worst one for me, the beginning of one of my books, Messy, tells a story about a jazz concert performed by Keith Jarret and then I gave a TED talk about that idea and what that idea teaches us and what that incident teaches us and I think six million… no it must four million… four million, anyway, a lot of people'd seen the TED talk, and then it went out on NPR and then someone emailed me and said… I used to believe your stuff, I used to like your stuff, but you got that story completely wrong, and now I can't… trust what you say anymore. And I just, oh, what have I done? You know, I'm sure… [sighs] but it was years ago that I first researched that story and I just went and I dug all the way through all my sources and dug through the sources of the person who'd sent me this…

BH: Hmm.

TH: And I listened and I was, no, no, no, I got it right, I got it right, I got it right. And I listened to she had sent me and what she had sent me was also completely in support of what I'd said, and I wrote back and I said, I think I was right if you listen to thing you just sent me, I think it completely backs up what I said.

BH: Right.

TH: And about two days later she wrote back and said, oh yeah you're right… I just thought, oh, thanks!

BH: Yeah. [laughs]

TH: This is a way to ruin someone's day.

BH: [laughs]

TH: Sometimes I should just be more like, I don't care.

BH: [laughs]

TH: But I could tell you a fun one about… so that was a mistake that wasn't a mistake.

BH: No, that's fun. That's good. [laughs]

TH: But let me tell you about a…

BH: [laughs]

TH: The thing about being a journalist is you say a lot of stuff all the time with hundreds of thousands of eyes on you…

BH: Yeah.

TH: And so of course you make mistakes.

BH: Hmm.

TH: But a fun one was, fans of Kate Bush may know that Kate Bush has a song, I think called Pi. It's certainly bout pi. And in the background of the song she sings the first… hundred and fifty digits of the decimal expansion of pi. And it turns out that one them's wrong. In fact to be more precise one of them's

missing. And I'm pretty sure that some producer at some stage just edited it out because she… hit a bum note, I'm guessing.

BH: Yeah.

TH: Anyway the wrong number's in there. So we had a whole item on More or Less about mathematical mistakes in music… like Paul Simon, two times two is twenty-two, four times four is forty-four, when numbers get serious they leave a mark on your door. We had lots of fun and then I said, well, since the decimal expansion of pi is infinite, at some stage, that sequence of numbers that Kate Bush sang, is in there.

BH: Right.

TH: And then a mathematician wrote and said, ah, no that's not true. [sighs] Or it's not necessarily true.

BH: It's not proven. [chuckles]

TH: Yeah and this was completely news to me. He said, pi needs to be a normal number, not in the sort of the statistical sense I usually think of a normal distribution but it needs to be a normal number and a normal number as listeners may know is… well, every digit is equally likely to be in the decimal expansion, every digit is equally likely to be zero to nine, every pair of digits is equally likely to be zero to ninety-nine, every trio is equally likely to be zero to a hundred and ninety-nine, et cetera. That's the definitely of a normal number. And it turns out that a hundred percent of all numbers are normal, you can prove that. Like if you just drop a point on the number line anywhere, the real numbers, a hundred percent of them are normal, but that doesn't mean all of them are normal it just means…

BH: No? [chuckles]

TH: …that if you randomly choose one it'll be normal.

BH: Yeah.

TH: We know that some are not normal, we don't know whether pi's normal or not and so this is an unproven conjecture but we now have a corollary. A corollary is the Kate Bush conjecture which is that the numbers that she sings on are in fact in the decimal expansion of pi and if anybody ever proves that pi is normal then that corollary will be proven. None of that I knew the slightest bit about…

BH: Yeah?

TH: …when I just offhandedly made the statement and so that's the kind of mistake that's really really fun.

BH: Yeah.

TH: Because… coming back to the point I was making about politics. There's no political axe to grind there. No one's trying to prove anybody wrong.

BH: Hmm.

TH: It's just we're all exploring this wonderful world of mathematics together and having fun and learning stuff and that's why I think that was an interesting and illustrative and fun mistake to make.

BH: You should have pulled a Fermat and said I've actually proven that pi is normal I just can't fit the proof in this email. [laughs]

TH: Totally shoulda done.

[gentle piano etude]

BH: So tell me about the book, then.

TH: [chuckles]

BH: If I read this book, what am I gonna find out that I didn't know before?

TH: The book is called How to Make the World Add Up.

BH: Hmm.

TH: Ten Rules for Thinking Differently about Numbers.

BH: Hmm.

TH: And the basic message of the book is statistics can help you think more clearly about the world. They can help you understand what's going on, what's going on when you read the news. What's going on around you, the claims that your friends are making on social media, you can understand the world better, but that's not just about the technical skills of understanding how statistics work, it's also about the psychological and emotional skills of being able to change your mind. Not having your conclusions predetermined by your political biases so it's as much psychology as it is statistics. Those two things together, I think are what you need to see the world more clearly and the book's got ten chapters. Ten kind of rules of thumb that I've picked up over the years. I wouldn't say they were ten commandments but they're ten things that I found useful, working on More or Less. And then there's finally the golden rule, and the golden rule is, be curious. Be willing to ask the extra question. Be willing to be open minded to entertain the possibility that you're wrong. To entertain the possibility that there's some thing about the world that you don't know. And it has a wonderful

effect, and a proven effect at neutralizing to some extent, political biases, so you're thinking as a Tory or a Labor, or you're thinking as a Republican or Democrat, you'll just reject certain things out of hand. But it's been demonstrated that naturally curious people are just more… they go like, oh! That's something I didn't expect to see, tell me more, rather than, that's something I didn't expect to see, it can't be right. So curiosity is this solvent that dissolves political tribalism but of course it's a great way to motivate yourself to find out more and that the great communicators, we've talked a lot about communication in our conversation… the great scientific communicators, the great communicators you talk to on Numberphile, it's not about just explaining stuff really clearly, or not using jargon. It's about creating that sense that the world is a wonderful place and wouldn't it be nice to find out more about it. And that's what the great communicators have in common and that's what I'm trying to instill in listeners to my radio show and in readers of the book.

BH: How much can we rely on numbers and statistics and mathematics to sort of… save us and be this kind of underpinning of all the decisions and things we make. You listen to a podcasts and organizations like Five Thirty-Eight and that, and they've got this sort… people like yourself to your extent as well… this wave of communicators who are like really rational and think, let's stop, let's look at the numbers and make our decisions based on that. But surely there's gotta be a whole swathe of thing that can't be decided in that way and in the end it is like… instinct or… your heart or morals and things like that. You talked about, you know, your support that everyone should be able to get married. No number or statistics ever going to tell us whether that's right or wrong.

TH: Yeah.

BH: That's just something you believe, 'cause you believe.

TH: Yeah. I mean… one could gather data for example on say the… the life chances of children of gay couples for example… you can do that…

BH: Hmm.

TH: People have done that, that would provide information. But I think you're right, it ties into what I was saying about curiosity. So there are certain things that, in the numbers will only take you so far, so what happens? Is the number, is the data, the algorithm, the equation, is that the point at which you stop asking questions? Or is that the tool that helps you keep asking better questions? If it's the point at which you stop asking questions, you look at the New York Times prediction that Hilary Clinton is ninety-nine percent likely to win the 2016 election. Yeah if that's the point at which you go, alright, I don't need to think about this anymore, then… you know… you've got a problem. But if the whole process is going well what is it that we don't know? What is it that we don't understand? What's really going on here? If that's what the numbers are doing for you, if they're feeding into that process of curiosity, I think they're tremendously powerful.

BH: Your book is here next to me. The hardcopy of it. You've only just got it, haven't you, in print? Only just in the last few days or something, isn't it?

TH: Yeah, we're talking in August a few weeks before…

BH: Yeah.

TH: …publication on the 17th of September and it literally arrived on my door yesterday.

BH: What's that like, when it's… you can't change it anymore. It's like a hardcopy. It could have a mistake in there? People could not like it?

TH: Yeah it will have a mistake in there, you know?

BH: Yeah. Like… what does that feel like?

TH: Um… it's nerve racking. I tell you… something I haven't done with any book before but I'm doing for this one is I'm doing an audiobook. We're speaking on Wednesday, so in two days time I begin recording the audiobook and I'm terrified of that because I know that when I actually sit down and read every single word of this book out loud, I am gonna find something. Maybe not a mistake… there probably will be mistakes, but there'll certainly be something I just think, oh I can't believe I wrote that clunky sentence. I can't believe I expressed it like that. But at a certain point you've gotta… you can't be working and reworking and reworking the book, you gotta put it out there and take it on the chin. One thing I did do. The book was just about to go to the publishers and then lockdown hit.

BH: Hmm.

TH: Due date was end of March, and I said [chuckles] on about the 25th of March, I said to my publishers… hang on a minute, we can't stop here.

BH: Right.

TH: I've gotta say something about what's going on. And the suggestion was, oh why don't we add a preface later? We'll add like a four page preface or an eight page preface where you reflect on the pandemic and we can put that in really late.

BH: Hmm.

TH: I said, no, I don't wanna do that. I want to rewrite the book, not completely rewrite the book but I wanna go through the book and I wanna talk about what's happening with the pandemic because there are so many examples in the book where the pandemic is absolutely the best, the very best example of

what it was I was saying all along.

BH: Hmm.

TH: So actually the book is full of references to the pandemic that are just… it was actually so easy to rewrite because I thought, yes! This is… I'm sad to say… but everything I was arguing all along, the pandemic has really underlined it and put it into sharp relief. I mean it completely turned my views of the world upside-down in many ways but one thing it did not do was change my views about statistics and statistical communication. I thought to myself, I'm afraid, sadly, that I was right about that.

BH: Being someone who's so aware and immersed in statistics and reading about medical trials and numbers and probabilities and that, do you think it makes it easier or more difficult being someone who's, you know, going shopping at Tesco and going to the pub and walking around with all this knowledge in your head about R numbers and spread and risk and safety and that? Do you think it makes it nicer walking around the world with that in your head or it makes you more paranoid or…?

TH: So as we speak fortunately there isn't a lot of infection in the community in the UK. It's not quite clear exactly how much there is, but there's not that much. So we gotta be really careful to keep it that way. So I personally am careful not to spread the virus when I go around but I'm not worried that I'm gonna catch it. 'Cause that is not very likely, I'm just… you know, I just wanna make sure that like everybody else we all do our bit. What I really remember very clearly is a few days before lockdown I realized just what was coming. And I was kicking myself 'cause I felt I should've known in mid-February because I was talking to the epidemiologists in mid-February, I had all the technical information I needed in mid-February to see that this was gonna be awful but as I argue in the book it's… can be hard to emotionally register the facts. And so it took me a little while and I think I should've been a month ahead of most people

and I think I was about three days ahead of most people.

BH: [laughs]

TH: But in that three days, I remember walking down the street and I was shaking. I was physically shaking. And it was not out of fear of the virus… I'm forty-seven it's… the risk to me is not that high. But because I knew what was gonna happen to the country, what was gonna happen to the economy… I knew it was gonna be awful. I remember walking down the street and thinking, I don't think you all realize what's happening. And it really was two or three days and then everyone else was like, oh [laughs] and then there was no more toilet paper.

BH: [laughs]

TH: So… that was one brief moment where I thought, yeah, that knowing the numbers changed my… changed the experience of walking around my hometown. It really should've changed with the experience a month previously. It was so interesting that it was so… I was emotionally so slow to register the facts that I had at my disposal but that… that is precisely the argument that I'm making in the book.

BH: When we come out the other side of this, hopefully [chuckles] there is another side of this.

TH: Yeah. Well, Oxford where we're sitting, they're working hard on a vaccine.

BH: Yes.

TH: You know, fingers crossed.

BH: Good, please, please. Do you think we're gonna come out with a more

numerate society as a result? A society that now can read a graph?

TH: I think we are actually. I think people have become much more interested in the numbers and the most popular page on the Financial Times, in Financial Times' history, is the coronavirus tracker put together by my colleagues, led by John Byrne Murdoch. Really good, clear, free to read, tracking of all kinds of things that you might wanna know and there's never been a page on the FT website that has got so much interest and of course there are many other examples out there. So… yeah I think, it… is… generating a renewed respect… not a universal respect but a renewed respect for expertise, a renewed respect for science, a renewed respect for numbers. Sadly, it's a very high price to pay but I think that is what's happening.

BH: Alright, well finally, what's next for you? After you've publicizing this book and trying to get every man, woman, and they're dog to buy it, and that finally is over. There will be a link in the show notes, people, to go and buy it. What are you gonna do after this? You gotta another book? TV show? Youtube channel? Movie?

TH: So… [laughs]

BH: Real economics job? [chuckles]

TH: Oh who knows, maybe you get back on Numberphile, that would be nice.

BH: Yeah, you're welcome anytime.

TH: Thank you.

BH: And lastly… last question, maybe last question. Do you still play games?

TH: Oh yeah. One of the… fun things about lockdown. One of the few… silver lining to this terrible cloud has been playing more games, realizing that you can do theater of the mind brilliantly over Discord. Playing really great games with people I don't see often enough, and also that there are websites like Dominion.games and Boardgame Arena, where you can play boardgames online… they've existed for ages but I've only just stubbled upon them.

BH: What's your real gamer choice at the moment then?

TH: Uh. So… I've made up my own… roleplaying game, for the roleplaying game… so it's a really super stripped down of GURPS. This is gonna mean nothing to ninety-nine percent of the people who listen to this. But it's like a two page version of GURPS and it's inspired by Ursula Le Guin's Earthsea trilogy. And for boardgames at the moment I can't get enough of Dominion, which is a very very varied game. Lots and lots of different combinations, lots of different possibilities. [music fades in]

BH: Alright, well, I'll let you get back to it then. [laughs]

TH: Thank you very much, Brady.

BH: [laughs]

[music continues]

BH: Our thanks to Tim for taking the time to chat, you can also see him in a recent video on the Numberphile Youtube channel. [music continues] His latest book, How to Make the World Add Up, is available to order and I'm also gonna include a special link for signed copies. Check out the show notes for that as well as links to Tim's other work. [music continues] My name's Brady Haran and you've been listening to the Numberphile podcast. We'll be back again soon.

[music fades up and out]