



Editor's Introduction to this issue

Martin has been on my Arch Econ mail list for at least a dozen years. In October after friendly correspondences with Martin Geddes he asked me if i wanted to interview him as a sort of sketch our our mutual intellectual [journeys](#). Of Course I said yes! The result follows, Enjoy!

Gordon: I am very favourably flabbergasted by your ability to turn out these [beautifully written essays](#), and amazing quantity, with also top quality. I wish to God I could write as well as you!

Martin: Think of it as my therapy, my “care in the intellectual community”. I've had a dawning realization over a very long period of time about the relationship of us to our technology, and I have kept asking myself deep questions about *why am I doing this?* And *to what ends?*. I think what's interesting in this very conversation is your own background in Russian history, and its characters and narratives, the good and the bad, and all that's in-between.

Yes, amen.

I think separating technology from the arc of history, human civilization, and the human lived experience is very unhelpful. I have been very fortunate to meet many wise people who have helped me to see the world more clearly. I strongly believe that each and every one of us must deeply reflect on the nature of the ends toward which are working.

You've done that quite beautifully in emphasizing relations with family.

Yes, and the ultimate relationship with oneself, or one's source deity, or whatever “it” is. There have been a number of “aha!” moments for me, which have progressively “narrowed my aperture” and increased my conceptual “depth of field”, but it's...

I'm not a photographer, but I also like your photographs. They're really impressive!

I enjoy it! I'm a purely amateur photographer, in that for every really good one I've taken, there are 20 bad ones. I'm a hunter for beauty, and I like to spot those little vignettes in the world, and share them with people.

In doing so, I've come to understand how we really can't separate us from our technology, the seeing eye from the camera lens; we can't separate the techno *Logos* from the

Ethos and the *Pathos* and the *Topos* and the *Kairos*. You have to see all those things as a complete, integrated system.

To see where this understanding comes from, we have to go all the way back to my childhood, where a few things are formational for me. One is my mother's membership with the Jehovah's Witnesses cult, with all of my mother's family being in it, and my father's non-membership. Therefore, for me as a child to have to make sense of that, I had to build a bigger cosmology than either my mother's or my father's.

I had to do it pretty damn early as well, because otherwise, I might be forced to choose between them. I wouldn't wish this dilemma upon anyone, because really as a kid you should be doing playtime rather than philosophy. But by figuring out the role of science in the world, and its relationship to my mother's pseudo-religion, it made me very sensitized to crap belief systems. Indeed, I'm really quite good at spotting a shoddy belief system from a very large distance.

I believe you that you're very good at spotting crap belief systems.

Then I got a computer at a young age. I was born in 1971, so the timing of my life coincided with me being about 12-years old at the same time as 8-bit home computing hit. The moment I hit my teenage years, I was already into computers. Anyone who is a little bit older than me missed it. Anyone that came a bit later missed the first wave, and therefore, their baseline experience is different.

There is considerable difference in our ages. I also know very well I think what you're talking about. My first online experience was June of 1980. I've been online ever since.

I was nine-years old then, and so I was the first generation in any meaningful sense to grow up with computers. There may be a few people in the military industrial complex, or whose parents built computers, who were before me, but very few. I actually grew up with a computer in my bedroom — my parents bought me a BBC Micro at the age of around 12.

That was the last they ever saw of me! Bless them, it can't have been easy. My father, an aircraft mechanic with British Airways, left school at 15 with no qualifications and barely literate. My mother's just a shop assistant and court back office typist. So how they ever coped with me, I don't know. I've become much more forgiving of my parents over time.

I grew up with this new technology, and I experienced it in its very bare metal, minimalist form. It forced me to gain a total appreciation for its inner workings. Following a scholarship to a top private school, I went to Oxford and got a maths and computation degree. I worked my way through the 1990s IT industry. I progressed through the standard logical approach to computing. I became quite adept at it, and I made a good living.

I think from the very outset I've always held in mind that the human is part of this digital landscape. For example, when I interviewed as a 17-year-old to go to Oxford, I noted to

the interviewer that it was all very well having these wonderful formal methods of software development, but fallible humans still had to come up with a correct specification.

Even once at Oxford, I noticed basic AND/OR type predicate logic depended on the symbols you used. When we used unfamiliar semiotics, then certain transformations and certain operations were quite slow to do *as a mathematician*. When I used familiar symbols like 1s and 0s, as with “ $0 \oplus 0 = 0$ ” (instead of “ $\perp \wedge \perp = \perp$ ”), it was quick to do. It's not a mathematical observation, but a human one. It is ridiculously trivial as a mathematical observation.

Could I make an observation? Number one, I saw from a Farber email that Stephen Hawking's PhD thesis went online apparently for the first time. So many people went to grab it, that they crashed the computer website. Number two, my best Russian friend who heard Gorbachev's message and started an offshore software business. But before that he was coding in 1s and 0s for the Buran, the Russian space shuttle. There you go. It's a familiar landscape for I think both of us. Let me be quiet and let you talk.

Before I'd even left school, I had a friend at who was a brilliant mathematician who went on to be a senior industry member in processor design. We together designed a 12-bit computer with an instruction set in microcode, and tried to even build it using discrete ICs. I had written a CAD program for a BBC Micro to be able to do the masking to etch the circuit boards.

I came home from Oxford for my first holiday at Christmas. I'd been playing Tetris a bit too much. I immediately recreated a version of Tetris in 6502 assembler. Within three days, I was playing Tetris again at home. It took me many years to appreciate it might not be exactly normal for a teenager, and is not necessarily be what most people get up to.

Abnormal people can have more fun than the purely normal ones.

And the more wayward the fun, the better! But that's another story.

I'd been watching software engineering methodologies through in the 1990s. I was working at Banctec and Oracle, building enterprise IT systems. But I was always interested in how the human interfaces with the system — as defined by software development methodologies, and how to run development teams. The interesting stuff isn't in the human “box”, or in the technology “box”: it's at the interface between the two.

When I went to work for Sprint, I became interested in “over the top” services, and...

Telepocalypse!

Yes, my Telpocalypse era. I went to Sprint in 2001 thinking I was going to be just working on internal IT projects. I turned up in telcoland in Kansas City, and it was so disorientating! Hmm... telecoms, telecoms? I have no idea what I'm doing, but hey, let's make it up as we go along! (Which is basically the skill you get taught in Oxford tutorials.)

So I was trying to make sense of this telecoms thing. There was this strange concept called the “phone company”, and this “phone” thing was really interesting. On its surface, the phone call looks like so trivial. It's like... what is there to understand? Yet I have spent 15 years unpacking the phone call, and I still haven't got to the bottom of it! I feel like there's much to learn about the phone call.

It is a primitive form of virtual reality. It is also like a social chess game, with its opening gambits and middle games then end games. The phone call is the most fabulously complex and wonderful little universe to inhabit. And it's fundamentally about where the humans and the machine meet.

Virtual reality without humans is meaningless. We don't send androids off into play virtual reality games for us! It's intrinsically humanized activity.

Then I met Dr Neil Davies around 2008, and started to understand actually the real reason why I was confused about telecoms. The theoretical foundations of data communications were missing! The scientific foundations of wireless networks were set up in the 18th and 19th centuries. The theoretical foundations of computing were set up in the 1930s, with Turing and Church...

George Dyson's Turing's Cathedral.

Yes.

You've read it, I bet.

I read very few books. I find it very hard to concentrate on a book long enough. First, they're linearized text, and I like hypertext, and I like to be able to interact with text and do things to and with it.

I want to hear about Neil Davies... but George Dyson, having grown up at the Institute for Advanced Study, which I could get in the car and drive to in 25 minutes, is a fascinating character. He's been a member of my arch-econ mailing list for many years. He's still a member. I have a number of interesting people, like for example Carlota Perez.

I've met her! Yes, so it's interesting to consider the history of science, because as we know the history of science is full of zigzags, and strange characters who do strange things, often outside the mainstream, like the Teslas of the world. Actually, what I've discovered is trying to do anything truly innovative in the mainstream is hopeless.

Neil Davies had to leave academia in order to basically re-found packet networking on a solid mathematical basis. What Neil Davies has done is the equivalent of what Turing did. Neil Davies is a peer of Turing. He's too modest to say it himself — he blushes slightly when I say that. However, it's true. Turing's theory of computability is the counterpart to Davies's [theory of translocatability](#), and both belong alongside Shannon's information theory.

I was at the eComm conference with Sheldon and Davies in maybe 2011 near San Francisco airport. I think it was [your opening talk on Neil Davies' system](#), and I took a bunch of pictures of that. That was my introduction to Neil Davies.

My job is to act as an interlocutor and translator. I'm a terrible mathematician. I haven't got the concentration or the inclination. However, I'm quite a good “storyteller with a maths degree”. I was able to very quickly identify that Neil was addressing fundamental issues rather than surface ones.

However, it took me probably five years from first meeting Neil to be able to step far enough backwards — and you had to go a *long* way backwards, and walking backwards for a very long way is not very comfortable — to be able to see the full vista of what's happened, and where we took a wrong turn.

Indeed, what's happened is we've entered into a fundamentally incorrect understanding of the nature of networking. It's a fact that the current internet is built on a category error.

All science goes through three stages: classification, correlation, and causation. And because we've got classification wrong, everything we've built since is a bit screwed up. To be able to articulate the nature of the classification or category error is difficult, however.

For example, I stood on stage after Nick McKeown in The Hague week before last. He's the top man in software-defined networking. He's describing his latest and greatest breakthroughs, but he's locked into that current category error. I stood up afterwards and said you need to change your resource model.

Did he appreciate that?

I heard after that he did clap... eventually... and rather briefly. From his perspective: Who the hell is this guy on stage? He doesn't have a Stanford professorship! He hasn't got any published papers! He doesn't have all these corporate sponsor logos in his slides! He doesn't even have a PhD! Who the hell is he talking? He probably thinks the organizers have got a nutcase on after him.

I'm effectively saying *“Nice try, Nick! Really appreciate your effort. You're doing some good stuff, however, the conceptual box you're working in is a bit small. I suggest we need to look in the bigger box.”* Of course, it's not aimed at him personally. As a human being, I respect him enormously. In the brotherhood of human beings, he's a good man. I'm just making fun at the moment.

But in the terms of doing just network technology stuff, it's... *“You're lost in the category error. You're trying to do computer networking. That isn't the problem. The problem is distributed computing, and that's a different problem. You're trying to connect the computers. That doesn't result in the required application outcomes.”*

Connected computers is the wrong thing to do! The paradigm — the category error is to confuse the means and the ends. Currently, people believe that networks do “work”, focusing on the means. Net... *work*. This is a mistake, and it's the same mistake that turns

up in two different ways. One of which Neil Davies fixed with the ΔQ calculus to describe performance. Then, orthogonally to that, is the work of John Day with RINA architecture.

John Day and RINA!?!

John Day is another genius — and I'd say this to John's face because I think he wouldn't slap me. He's the most lovable, cantankerous old sod there is.

I remember the episode not too long ago where he yelled stuff at you.

We all bring our wounds and our past with us, and John has lots of wounds for being right for 40-odd years in a networking world that's going technically mad. I can understand where his curmudgeonly nature comes from.

Neil and John both spotted that networking really is inter-process communications. It isn't computer networking. The outcome that matters is whether the computation advances, not whether you do “work” by moving packets. The current work paradigm is we try to move as many packets as fast as possible.

This is like a 1920s car factory where you ingest as much rubber and steel as you can. And occasionally, you spit out a working car, but you also spit out a lot of nonworking cars, and cars that need fixing at the dealership.

We know in manufacturing that maximizing inventory and work-in-progress isn't a good idea. This is not a novel concept in the world of management theory and quality systems. However, in telecoms it's really new. Maybe we should manage the flows and *minimize* work-in-progress, because if there's 50 years of evidence that's a really good thing.

Applying all the well-established ideas of Lean, Theory of Constraints, and Six Sigma is a total novelty in our networking world, despite the fact we built a whole infrastructure for society based on the current Internet.

Indeed, the current internet is just a primitive prototype that does one thing well, which it abstracts away connectivity. We don't have to worry about whether you're connected to a dial-up modem or a super-fast fibre connection or satellite. There's one API that works for everything.

Great. Thank you very much! We've learned a lot from it. However, it's basically broken in every other way. Everything else you could possibly get wrong, is wrong. The current internet architecture is a Rubegoldbergesque pile of workarounds and hacks as a result.

TCP/IP, right?

Don't swear like that, please, Gordon. Yes, it's BGP and all those other things, yuck.

We lost an entire layer.

Absolutely. The history books will look back and think... how did they go for that long without realizing there was actually no proper engineering, no real science, and they hadn't even gotten the maths right? How is it they did that for 50 years without noticing?

What's missing? The architecture is fundamentally wrong, so it's divided into many layers, rather than scopes (with only two repeating layers). The first step is wrong!

Also, the ability to measure, model, and manage performance is missing. We left out the most basic bit of mathematics: we're missing the equivalent of complex numbers, but for probability. Therefore, it is a bit like in electromagnetism, if you don't have imaginary numbers, you can't build complex numbers, so you can't do complex analysis, which means you can't write Maxwell's wave equation, which means you can't design a MIMO antenna, which means you can't do spectrum policy.

Brough Turner and antennas, this is another guy on my mail list!

I know Brough, too. There are many bright people currently working in the troubled incumbent networking paradigm. However, you need to draw a bigger conceptual box. It means going back to the very foundations, as there are some things that Turing didn't address.

One of which was thinking about the time it took to transfer the symbols between the tickertapes. He did computing, but he didn't really do distributed computing. Hence the first step is to get the performance science and maths right, so as to properly model what we already have.

The second key thing Turing didn't really model is... where the heck do the symbols come from, and where do they go to? The contextualization model of information was missing. That means we've spent 50 years inducting, training, and rewarding logicians to program computers. That's a bit unfortunate.

Why so? Because the people who are — how do I put this in the most compassionate sense — most adept at the very dry and abstract world of computing aren't necessarily always those who are most empathetic and social. Yes, *some* are very empathetic and social. However, the world we're going into is one which is kind of the *Revenge of the Phone Call*.

We started off telecoms with social telegram messages and telephonic person-to-person virtual reality. The phone call *is* virtual reality. We've now had 150 years or so of building this one virtual reality application. Then we kind of veered off-course a bit and built the Internet. We'll get over it!

Now we need to come back and build the next generation of virtual reality. After all, what we humans really like doing are intercourses, social and otherwise. Virtual reality is the place to go and do them.

This means we need to re-contextualize and re-humanize the essential nature of computing. So the work of Neil Davies and his collaborators is only part of this re-founding

and refactoring process. ΔQ is putting in a theory to define what it means to copy information in a timely manner, and how we model that.

But actually, we need a bigger theory: how the heck does the computer relate to its context? What are these symbols, anyhow? And if these symbols represent information that was bio-sensed off a human (and voice is a form of intimate bio-sensed data) then... cripes, you can analyse the recording of this very call and do diagnostics for various mental-health conditions! You can analyse just how mad I am (I think 27 is my score... so I am very mad).

This recorded voice call is actually HIPAA-protected healthcare data! The recording of this phone call is healthcare information, but the current paradigm we have is it's treated the same as a music recording. It isn't seen as being essentially different.

We're moving away from a historical paradigm of computing, which is anchored in pure logic. The *Logos* is being addressed very strongly, but the *Ethos*, and *Pathos* have been left out. From, example, at university I studied formal software development methods. You start off with a specification, and say what is the *logical* outcome you require. But there isn't even a space on the page for what is the *ethical* outcome, or the *feeling state*. The size of the page or the engineering requirements book is too small to capture the contextual design specification! We need a bigger play space.

If we carry on down this old paradigm, we are going to be in deep, deep trouble. If we continue to build systems which amplify the power of some humans over other humans, and ignore the power relationships, wellbeing ethics and feeling states, then we are going to drive ourselves into a dystopian place, if we aren't there already.

How do you see Donald Trump as president in the U.S.

I see Trump as a symptom of a systematic problem. I think Trump as an individual is largely irrelevant. Trump as a phenomenon in a wider system is extremely interesting. We have to understand better at a deep level the relationship between our technology and our society.

In the world of computing, we are deities, very small deities... but still deities. And we create these little information universes. We need to create mini universes in a way that better reflects the societal outcomes we wish to have.

We need to come up with a "new logic" — we've followed the *Logos* path for a long time and come up with *artificial intelligence*. I strongly believe we also need *augmented conscience*. We need to be able to take our own concept of what is right and wrong, codify that in some way, and then bring it into our virtual world. Otherwise, there will be at best amoral place, and at worst highly immoral one.

Although going to an immoral place in a virtual world sounds like a fun weekend trip, it's probably not a healthy place to live. We're kind of there already, with what Google and Facebook do to you in terms of tracking you on the web.

If someone did what's happening to my kids at the moment online in the physical world, I would probably feel motivated towards violence. If someone was stalking my kids and sticking Post-It notes in their bag as they came in and out of every building and tracking them everywhere via binoculars, I would...

Privacy is gone?

Well, it's been eroded, but I think the whole "privacy is dead" thing is self-serving bull-shit. It is the words of those who are powerful persuading the powerless to accept their fate. Fuck off, I say. And I use such strong words knowingly. It's ABSOLUTE NO! I am NOT accepting and consenting to that. That's a psychopathic doctrine. *You* may believe it, and *I* am going to fight it with every ounce of my existence.

I believe that we need to consciously construct our world, and it's not a "virtual" world absent established codes of acceptable behaviour. The idea that virtual is separate from physical is nonsense. We need to construct a world which is moral. And if morality is not what's driving what we do, then at best you're amoral and worst you're immoral. We see the undesirable consequences of that already.

We need to go back to basics, and I think computer science needs abolishing. It is itself a category error! What is figural? It is not about the computer! What is figural is how this digital stuff interfaces with the rest of the world. The computer itself as a mechanism is not very interesting, sorry. I had lots of fun playing with them, but what matters is how these things impact us in the world.

We need to start from the *other* end: it is the *interface* ports on the computer which are interesting, not the processor. The keyboard, the video display, whatever. What goes through those interface ports? What happens *inside* the computer is *not* the interesting thing. We've got it backwards!

What is the impact of what goes on *inside* the box on the *outside* of the box? Critically, what is the ethical impact? One starting point is those classic five things of Plato's rhetoric: *Ethos*, *Pathos*, *Logos*, *Kairos*, and *Topos*. We need to re-conceptualize computing around those five aspects for it to be "rounded".

What Neil Davies has done is basically a *Theory of Kairos*, with timing. We've now got a form language which discusses *Kairos*. So great! We now have *Logos* and *Kairos* done. Where's *Pathos* and *Ethos* and *Topos*? We have an incomplete conceptualization of the discipline. As a result, we don't even ask the questions that are important. [MG: On reflection, the "semantic web" is the *Topos*.]

You've got a lot to say, and I want to make sure you get to say everything. I'm sitting here with rapt attention.

I published an article on this. ["Why I'm Optimistic About the Future"](#).

That was very good!

One has to think about how society is constructed, the nature of power, and how access to information flows provide power. It's not controversial to say that the internet has significantly changed our world, and it's significantly changed the balance of power between different parts of our world.

When it came to renew my domain name, cookreport.com, I managed to renew it for five years, which is what I've been doing all along. But my God, if I lost that domain name, it would almost rub out my existence!

Your virtual identity and your physical identity *cannot* be separated. The current identities we're building are *not* self-sovereign. We are now feudal subjects of ICANN or Google or whoever. This is a big problem, a serious problem.

Let me say one thing. I've been thinking about it. If I were to draw a cartoon of how I conceive it personally, I have two arms and two legs. There would be Apple and Google each have an arm. Amazon has my left leg, and Verizon, the freaking phone company has my right leg. All of them want all of me, but they only have a part of me.

Why can't get together as neighbours and build a street-level network? And the streets get together as a neighbourhood and build a neighbourhood network? And the neighbourhoods get together and build a town network, and the city network? We are fundamentally disempowered. It's partly a result of TCP/IP's stupid architecture, but there are other reasons too.

We need to start again, and we need to start again with the *human* as the centre. We need to re-found computer science around the human. To do otherwise is to empower a psychopathic world, where the humans are seen as peripherals to the machine. It's *Matrix*-like; we're batteries in the system. It's horrific!

I worked as a student for two summers at BUPA, the British United Providence Association, a private healthcare company. I was doing VDU data entry for insurance claims processing. I spent six months of my life typing in insurance claims. I've also spent time on the BP share privatisation entering 10-digit numbers for weeks. I've been in the dark satanic factory mill, as it were, of the IT world.

It's a hideous experience, as far as I'm concerned. I came out mentally ill and clinically depressed. By the time I went to university at 18, having just spent three months doing that, I was genuinely unwell. It's partly due to who I am, but it's also partly as a result of that environment. It's utterly dehumanizing. I will never forget it.

I believe that we need to have systems which are ethical by design. To give you an example at the moment, I'm working with a consulting client. We're rethinking how call centres work because at the moment it's all about how to extract as much labour value from those workers, so as to deliver a "better" customer experience at less cost. It doesn't work because the call centre agents are feeling abused, and as a result, they withdraw their love and care from the system. Then the customers get really pissed of; therefore, the whole thing falls apart.

Until you see the agents as humans, as well as the customers, you can't succeed. The question I'm asking now is: how do you *humanize* call centres? How do you inject gratitude? How do you make sure they take rests? How do you make sure there's fun? Dancing, music, jokes, whatever it is. How do you reconceptualise this around the human, not around the business process? I don't know the answers, but I've asked good questions!

What came out of the research I did with Kelly Fitzsimmons in the Hypervoice Consortium is that we're entering into a world of the metaverse: information blended with the physical as augmented reality. The current web is the "old thing". There's a new "web" coming up which is more of an AR/VR concept. And we need a new "browser" for it.

We propose the new browser for that world is the Guardian Avatar. It's a bit of software, but it's also a thinking tool to consider the nature of relationship between you and the "real" world. It is like how the "4th wall" in the theatre is not a physical wall: it is a way of talking about the space between the stage and the audience.

The Guardian Avatar is a system of human identity protection and projection, which looks after you in that world. It allows you to project your own ethics and morals into the world. When I turn up a free Wi-Fi hotspot, and there's a license agreement and terms, my lawyer bot reads through it, and checks it's okay with me. But those terms have to be presented in a machine-readable format.

We need to start to surface the underlying lack of choices we have. I think of Beisser's *Paradox of Change* — we only change when we fully internally identify with *what is*, not with *what could be* or *what should be*. We need to build systems that show us the lack of power we have over our environment, and forcefully surfaces the non-negotiability of these contracts. This should result in their non-enforceability in many cases.

Basically, the world we're building at the moment — the Google and Facebook world — is unethical. I couldn't work with Google or Facebook. I appreciate the people inside those organizations don't set out with the intention of doing wrong. They don't see themselves as digital equivalent of tobacco. However, I'm sorry, but that's what you're doing. It's damaging and disempowering, and it's not ethical.

I think we have a number of revolutions here. Yes, we first must have a revolution in network mathematics and science. Wouldn't it be nice if we could do science and engineering for application performance!

I found myself in a telco client two weeks ago, standing in front of them, and their brand identity is supposedly all about quality. I'm standing there trying to persuade them that maybe science and maths and engineering might be relevant to that problem. *Why am I doing this? Why am I even standing here in front of them? Something's very wrong here!*

So first let's get the basics right. We need to have a foundation of science and engineering on which networks are built, with known performance and reliability safety margins, and are fit for purpose, with us taking responsibility for the outcomes. But on top of that,

we need to have new kinds of applications and interfaces. The Guardian Avatar is just one.

We also need to destroy and reinvent money because money, I believe, is a psychopathic technology as currently conceived. It's become a way of laundering immoral activity, and denaturing human social relationships.

We're seeing with blockchain the ability to construct new value networks, and to embed ethically positive incentives – to engineer new behaviour incentive mechanisms, and to localize and contextualise these in appropriate ways. I think the technology we currently call “money” is end-of-life. We need to abolish it, and build something new.

There's also healthcare. What we have today is the “sickcare” model. We need to have a “wellcare” model. We need to completely invert the incentives of that system. What we have at the moment is corrupt, and almost every aspect of it is broken.

We can talk about transport, and energy, and other domains as well. There's a series of fundamental reconfigurations of our society that are needed. For those to happen, we need to have an appropriate information infrastructure underneath, and also an appropriate interface to the human on top. I believe the Guardian Avatar is a helpful way of expressing that need.

It is time for *“All change, please! Please alight from the present Internet, and wait at the platform for the next Internet to arrive!”* What is next will be personal: its fundamental scale will be human-scale small and grow upwards, not global-scale big and scale downwards. It will be secure, and performant by design. Morality will become a first class design object, as well as performance.

Our challenge now is collectively to dream. It's a massive challenge, and I believe that this is possible. It is not only possible but necessary, because the nature of the world we're currently living in is not a nice one for our grandchildren to inherit. I believe we can do much better.

Agree.

I grew up with the Jehovah's Witnesses cult. I know what it's like for people to be inside a box, and not even know the box is there. To have a system of manipulation and emotional control that keeps them forever looking outside the box. It's obvious that they are a cult to the rest of society; but if the whole of society becomes a cult, the outside becomes invisible.

Our current society feels like one giant cult of the ego. And we've been infected and infested with psychopathic doctrines everywhere, and we need to change. We need to spiritualize. We need to feminize some aspects, and masculinize others. We need to do something completely different. Paradigm change of the first order.

Definitely agreed. I'm not aware of a hell of a lot of what you do, but one is your work with Peter Cladingbowl. How about talking about him?

Pete's my partner in crime and co-founder of [Just Right Networks Ltd](#), and counterbalances my intellectual hooligan craziness with grounded adult supervision. How can we enact all this innovative novelty in the world, and actually make a living from it? After all, for the last seven years, I've been basically living off of minimum wage, doing fundamental science and philosophy, as people don't pay for it.

That's grim.

It is grim! Yet I feel deeply contented, and these financial situations can change quickly. I'm a very blessed man, and my outgoings are virtually nothing.

You have basic integrity, and you keep your mind alive.

My experience of corporate life is violent. It may not be physically violent, but it's emotionally violent. I cannot go there. I don't belong inside corporations. I'm gay, a blended chimera of male and female, warrior and nurturer. I find life inside dominator culture, alpha-male organizations just revolting. And they don't like me either!

I went to join BT. One of the executives there — I won't name names — she described me as “not fit for consumption”. Hmm... “not fit for human consumption”, which I thought was a beautiful projection of unspeakable inner desires, but never mind. I really don't belong inside the megacorp.

My work with Pete is about taking the crazy stuff we do forward — these wild new ideas. I have no bosses. I've taught myself to basically exist on nothing, so nobody can ever control me. There's nothing to withdraw, so I have total freedom. I can forage for myself. I know at any moment if I really am short of food, shelter, anything important, I can just mail my mailing list and say “help!”, and it will manifest. Seriously, I don't even have a pension. I've just got love. I mostly live in the love economy, not the money economy.

I was very touched by your essay on your homeless friend who fell through all the cracks.

Yes. Hold that thought for a moment. Just quickly let's do Just Right Networks and Pete, and then come back to that, because that's a life-changing thing for me, is standing next to someone ill and facing homelessness, day after day after day for two years.

Go with Just Right Networks again.

My longer-term vision is to build the Guardian Avatar, to help in a series of transformations in healthcare, transport, energy, infrastructure of life. Underneath that we need to have an information infrastructure which at least gets the basics right.

What we're doing is applying the breakthrough mathematics in science and philosophy to produce commercial quality-assured broadband, which is fit for purpose for cloud application access. So I'm working with Pete to deploy that Just Right Networks. We're making good progress, but it's slower than we would like.

We see a need to build a quality-systems revolution for telecoms and cloud. We need to apply all the well-established body of management theory, plus new science and mechanisms to deliver predictable, engineered experience for users. This ought not to be a controversial thing.

And of course for me, one of the most fascinating things was that he's been doing this a good deal in Russia.

Yes. Pete's originally from South Africa. He's got a long career as a senior executive working in building data centres and telecoms. He's done it in all kinds of different countries. I strongly believe that the interesting stuff that's going to happen in the next 10 to 15 years, the new architectures and new use models, are unlikely to come from Silicon Valley. We'll see this stuff happen in maybe the "Post-China Sixteen". It's Peru, Indonesia, Vietnam.

These tools and technologies will get to a certain point, but people who've got nothing to lose will apply them in new ways.

Forgive me for interrupting, but you said Peru. In the last three or four days on arch-econ there's some discussion of Google's Project Loon.

Even Google and Facebook sometimes do good things.

There's an infrastructure being built, but the infrastructure is still largely conceived around perpetuating current systems of control and power, and the dominator dynamic, and the current corporate-state alliance, which is not a healthy one.

With the stuff we're doing in Just Right Networks, I've turned from being a telco game-keeper into a cloud poacher. It was lovely working in telecoms, but now I work for the demand side. We are doing basically high-frequency trading against BT's network in order to extract the arbitrage between the underlying quality of the assets and the quality required by different applications.

That's fascinating.

Telecoms as a pipe-based business is finished. We still need the underlying physical infrastructure, just like if you're doing shipping around the world you still need the underlying ships and trains and trucks. But those are not the controlling platforms anymore. No, the controlling platforms are those in the physical logistics space are those that match supply to demand.

The same thing is happening in telecoms. Telecoms is about to become more like Uber, financial services derivatives, or option-trading platforms. And the people who control the platforms or are able to make the best "trades" will make lots of money. Those who don't even understand the problem will go out of business.

Most of the telecom industry doesn't even understand the problem, let alone the solution. What happened in devices with Nokia when Apple came along looks like it's being

readied in the distributed computing space. A new platform with a stronger philosophy wipes out the old one.

Everyone who thinks they're currently doing computer networking, rather than distributed computing, has a short and brutal life ahead, and they don't realize it yet. Those of us who can apply new architectures, and abstract away the underlying implementation of the resource, and can out-trade everyone else... we will win. There is no possible other future.

What we're doing with Just Right Networks is we're building quality systems to enable us to calibrate, coordinate, and control digital supply chains. We're building an initial exemplar which is an exemplar business which is to deliver *"I can't believe it's not ISDN!"* here in the UK, to show we can deliver the quality outcomes of traditional circuits with the cost structure of packets.

Once we've done that, it's merely a matter of execution! [MG: My tongue is in my cheek.] It takes about ten years until this new paradigm takes over the whole world. In the meantime, I believe there is an end game of this, which is that we're going to see the current internet be transcended, and replaced by new industrial and intimate internet. And it will have to be engineered to deliver performant outcomes with known safety margins.

In other words, we need to start to have network interface agreements — information exchange agreements — which reward better quality. Such things will inevitably encourage cheating, to take the money and not deliver the quality. And therefore, you'll need equivalent to the Visa network, but for telecoms. You'll need people who construct the trusted interchange agreements, which don't require everyone to audit everyone else.

In the world of retail banks, you don't need to go and audit every other bank in the Visa network to accept Visa cards. The Visa network manages the trust function. So the same thing will happen in the telecom world, is that we will create a new Visa network of trust, and trusted exchange agreements which reward better quality.

We also need to "de-reward" and "de-prioritise", where we make very cheap low quality available as well. For every higher quality, you must have a lower quality. So we need to also build new transport systems for very bulky, cost-sensitive data, which is time sensitive.

It's all going to happen. There are deep, profound reasons why the current Internet is not technically or economically sustainable. The current Internet is not a scale-free system: it has got scaling limits, and it is hitting those limits.

We're already seeing bad technical things happen on the present internet, as the present internet breaks basic control theory. The control loops are long, and the phenomena they're controlling are fast, and this doesn't end well. Every time we make the networks faster, the control loop stays the same length, but the rate of state change goes up

Therefore, the stability of the system goes backwards. As we throw bandwidth at all our problems, this is not pretty, and you don't want to see the results. Death by non-stationarity is the fate of the current internet. And it's already happening. We've had 25 years of the "rise of the stupid network": endlessly throwing bandwidth and capital at quality problems doesn't work. We've proven that, and now it's time to move on.

Just Right Networks is about building the new paradigm, based around *engineered* quality and *contracted* performance at all the boundaries in the supply chains. When you take that series of quality contracts, and compose them all together, you get a predictable outcome which is fit for the purpose of the application. Wouldn't that be a novelty?! [MG: Once we've done quality, we can move on to other things, like privacy.]

Yeah!

I'll take us back to something we touched on earlier. I've got an understanding of what we're doing and why we're really doing this quality transformation work. I was going to see one of my old Oxford undergraduate friends, who lives in a nice town in England. We had a lovely afternoon tea in a posh hotel, and I was walking back to the train station on a dark January evening in 2016. There was a woman on a cold street corner begging.

You think... empty street... cold night... woman in her thirties. This isn't good. She's doing that because she's desperate. I sat down next to her and started to understand a bit about her, and spent about half an hour with her. To cut a very long story short, I've spent the last two years supporting her. Basically, all the healthcare and social welfare systems have broken down, particularly for people who are mentally ill, as she is. She's very bright. She has a good heart.

But she's not well. She's had a traumatic life. The systems are designed for well people, if they work at all. The idea that if you are sick you may not be able to go to the benefits appointment, because you're too terrified and physically sick with anxiety, that doesn't occur to them. I'm what stands between her and an abyss of poverty and ill health.

About a year ago I ran out of money. I had to start employing other peoples' resources to help her. It's been a transformational experience. Even today, it's sort of brought me an enormous wealth of understanding about the nature of love. The Greeks have the six words for love: brotherly, conjugal, erotic, unconditional love for children, and so on. I've learned a lot about love.

Over time, I've also learned a lot about telecoms, heavens above, and these two worlds can touch. So even today, I was having a meeting with a telecoms regulator. I realized the reason why we need to have sender party pays data. It is not because there's a market for it. It's because there's no market for it! It's because she can't afford broadband

But she can't go to her MP's office because she's agoraphobic, and got a serious social-anxiety disorder. So going to her member of Parliament to a meeting is terrifying for her. However, she might be able to go as an attendee of a virtual conference. But she

can't afford broadband. Everybody in society needs to have access to core services like being able to attend virtually their MP's office and clinic.

Sixty readers from my newsletter got together and we bought her an iPad with 4G built in. She had no means of communicating with the world. She loved it, and then she left it at a neighbour's house. She has a neighbour, an old guy she looks after sometimes, and he looks after her. His relatives nicked it. They know, because of who she is, she's never going to go to the police. So they just took it.

You start to understand how, when she runs out of electricity, her phone doesn't charge. When the phone doesn't charge, she can't call people. Nobody. She doesn't have an alarm clock, so she can't wake up in time to go to appointments. If she doesn't go to the appointment there's not going to be benefits. You stop your benefits, then you lose your house. Not only do you lose your house, you start getting charged an extra 11 pounds a day by the council for the rent. Then you get your court fees. Her freezer defrosts and the food rots.

You start to see how if you've not got mental-health problems at the start, you've certainly have at the end! Now I understand at an embodied, profound level, her predicament, because I've also run out of money in this process. I've actually stood in the train station in London going home, looked at the chocolate bar machine, and not only did I not have a pound with me, but I didn't even have a pound anywhere. I'd even used up my coin jar. I totally ran out of money.

When everyone else has abandoned someone like her, and nobody else believes in her, then what kind of man am I if I don't stand up and act? Who am I really? Why am I here at all? Why am I bothering with this technology innovation in the first place? This experience has fundamentally transformed my sense of purpose of what I'm doing.

Neil's new ΔQ network maths, lovely. Great breakthrough. It'll happen because there's an external reality of the world that forces it upon us. I just need to wait. I know he's right. Ultimately, I just need to sit here, and wait for the incumbent system's collapse, because it's not aligned to reality.

However, if we're not building something that's moral by design, if we're not here to relieve suffering — if all we're here to do is to do cheaper 4K video — the I'm off to do something else. If 4K video is your highest aspiration for the internet, that's pathetic. We must all raise our game.

Figure out how to look after people like my struggling friend, who is smart, really bright, has a good heart, is a caring person. Her ending point is very different; but starting point is not different. I'm also from a work-class background. That could be me. I could've been the one on that street, and she could've been the one with the Oxford degree walking past after a nice afternoon tea.

There but for the grace of God am I.

Now I "get it". I didn't get it before, but now I do. There have been many other humbling experiences in life, and many screw-ups. I now have a sense of what I'm here doing this

for. The challenge I see is to link morality to the mathematics when we design information architectures. That's the "grand sweep" that I'm here to attempt.

Isn't "how do we stop building smart cities?" In fact, how do we stop that process? It's a disaster! I don't want to live in a "smart" city. It's awful, horrific. I want to live in a superhuman city.

To me a "smart" city is the dystopian nightmare. I don't want to empower all these sensors everywhere to be spying on me, all the time building artificial intelligence control systems which I have no control over.

I think you'd better start by building a smart neighbourhood.

Not "smart" at all. Smart is in the *Logos* category. I want *Ethos* and *Pathos* first. I want humanized qualities first. I don't want a computer-science lab sprayed all over the world. I don't want it! I want a humanized world. How are we going to have cities where we get together and sing and dance?

If you were in the Jehovah's Witnesses, like my mother, you have no concept of the world out of the box. The world outside the box is rejected, and they don't want it. If you've grown up in the box where computers exist to deliver logical outcomes, then the idea that you need to start off with an ethical outcome, or a feeling-state outcome, is just unthinkable.

The future we face is like Facebook, where they have the Year-End Review feature. Logically, it picks the most important picture from your year, and shows it to you. The fact that it was your kid that died, it was your apartment that burnt down, didn't occur to that person. The specification language doesn't include what is the feeling state you want to engineer, or what's the ethical outcome. It doesn't exist.

There's no concept of the human power relationship in the software engineering paradigm. And there should be. Yourself, Gordon, as a student of the Russian history and culture, will know that power relationships really matter!

Oh, yeah!

Don't they? And their abuse really matters, too. Lots of people die when we get it wrong. It might actually be quite important. If you're disturbed by how the world currently is, and you'd like to have a better future, then become aware of the paradigm you're currently working in.

The current paradigm of information technology is somewhere between asocial and antisocial. We need to re-found this, away from information technology, and towards human technology. That's the start. And HT, not IT, and it's about augmented identity, not artificial intelligence. It's about giving humans superhuman powers of empathy and understanding, and putting on a corrective lens to help us achieve our higher selves in the world.

At the moment, what we're doing is just gone off the rails, and doesn't take us to a happy place. I want to go somewhere different. I want a different ticket, please. I don't like the destination where this train is going.

I agree with all of that.

I'm currently sat here at the Institute of Directors here in London in this beautiful big room, with all these portraits of old people around me. I'm very privileged and very, very grateful for what I have. I've never had to miss a meal in my life.

Was this associated with the meeting you had this morning?

Indirectly, yes. I'm in London to have meetings and see friends. It's been a hard journey. The last seven years have been difficult; it's been totally rewarding, and I'd never do it in any different way.

***What we've covered is absolutely beautiful and enlightening.
on: I am very favourably flabbergasted by your ability to turn out these [beautifully written essays](#), and amazing quantity, with also top quality. I wish to God I could write as well as you!***

Martin: Think of it as my therapy, my "care in the intellectual community". I've had a dawning realization over a very long period of time about the relationship of us to our technology, and I have kept asking myself deep questions about *why am I doing this?* And *to what ends?* I think what's interesting in this very conversation is your own background in Russian history, and its characters and narratives, the good and the bad, and all that's in-between.

Yes, amen.

I think separating technology from the arc of history, human civilization, and the human lived experience is very unhelpful. I have been very fortunate to meet many wise people who have helped me to see the world more clearly. I strongly believe that each and every one of us must deeply reflect on the nature of the ends toward which are working.

You've done that quite beautifully in emphasizing relations with family.

Yes, and the ultimate relationship with oneself, or one's source deity, or whatever "it" is. There have been a number of "aha!" moments for me, which have progressively "narrowed my aperture" and increased my conceptual "depth of field", but it's...

I'm not a photographer, but I also like your photographs. They're really impressive!

I enjoy it! I'm a purely amateur photographer, in that for every really good one I've taken, there are 20 bad ones. I'm a hunter for beauty, and I like to spot those little vignettes in the world, and share them with people.

In doing so, I've come to understand how we really can't separate us from our technology, the seeing eye from the camera lens; we can't separate the techno *Logos* from the *Ethos* and the *Pathos* and the *Topos* and the *Kairos*. You have to see all those things as a complete, integrated system.

To see where this understanding comes from, we have to go all the way back to my childhood, where a few things are formational for me. One is my mother's membership with the Jehovah's Witnesses cult, with all of my mother's family being in it, and my father's non-membership. Therefore, for me as a child to have to make sense of that, I had to build a bigger cosmology than either my mother's or my father's.

I had to do it pretty damn early as well, because otherwise, I might be forced to choose between them. I wouldn't wish this dilemma upon anyone, because really as a kid you should be doing playtime rather than philosophy. But by figuring out the role of science in the world, and its relationship to my mother's pseudo-religion, it made me very sensitized to crap belief systems. Indeed, I'm really quite good at spotting a shoddy belief system from a very large distance.

I believe you that you're very good at spotting crap belief systems.

Then I got a computer at a young age. I was born in 1971, so the timing of my life coincided with me being about 12-years old at the same time as 8-bit home computing hit. The moment I hit my teenage years, I was already into computers. Anyone who is a little bit older than me missed it. Anyone that came a bit later missed the first wave, and therefore, their baseline experience is different.

There is considerable difference in our ages. I also know very well I think what you're talking about. My first online experience was June of 1980. I've been online ever since.

I was nine-years old then, and so I was the first generation in any meaningful sense to grow up with computers. There may be a few people in the military industrial complex, or whose parents built computers, who were before me, but very few. I actually grew up with a computer in my bedroom — my parents bought me a BBC Micro at the age of around 12.

That was the last they ever saw of me! Bless them, it can't have been easy. My father, an aircraft mechanic with British Airways, left school at 15 with no qualifications and barely literate. My mother's just a shop assistant and court back office typist. So how they ever coped with me, I don't know. I've become much more forgiving of my parents over time.

I grew up with this new technology, and I experienced it in its very bare metal, minimalist form. It forced me to gain a total appreciation for its inner workings. Following a scholarship to a top private school, I went to Oxford and got a maths and computation degree. I worked my way through the 1990s IT industry. I progressed through the standard logical approach to computing. I became quite adept at it, and I made a good living.

I think from the very outset I've always held in mind that the human is part of this digital landscape. For example, when I interviewed as a 17-year-old to go to Oxford, I noted to the interviewer that it was all very well having these wonderful formal methods of software development, but fallible humans still had to come up with a correct specification.

Even once at Oxford, I noticed basic AND/OR type predicate logic depended on the symbols you used. When we used unfamiliar semiotics, then certain transformations and certain operations were quite slow to do *as a mathematician*. When I used familiar symbols like 1s and 0s, as with " $0 \oplus 0 = 0$ " (instead of " $\perp \wedge \perp = \perp$ "), it was quick to do. It's not a mathematical observation, but a human one. It is ridiculously trivial as a mathematical observation.

Could I make an observation? Number one, I saw from a Farber email that Stephen Hawking's PhD thesis went online apparently for the first time. So many people went to grab it, that they crashed the computer website. Number two, my best Russian friend who heard Gorbachev's message and started an offshore software business. But before that he was coding in 1s and 0s for the Buran, the Russian space shuttle. There you go. It's a familiar landscape for I think both of us. Let me be quiet and let you talk.

Before I'd even left school, I had a friend at who was a brilliant mathematician who went on to be a senior industry member in processor design. We together designed a 12-bit computer with an instruction set in microcode, and tried to even build it using discrete ICs. I had written a CAD program for a BBC Micro to be able to do the masking to etch the circuit boards.

I came home from Oxford for my first holiday at Christmas. I'd been playing Tetris a bit too much. I immediately recreated a version of Tetris in 6502 assembler. Within three days, I was playing Tetris again at home. It took me many years to appreciate it might not be exactly normal for a teenager, and is not necessarily be what most people get up to.

Abnormal people can have more fun than the purely normal ones.

And the more wayward the fun, the better! But that's another story.

I'd been watching software engineering methodologies through in the 1990s. I was working at Banctec and Oracle, building enterprise IT systems. But I was always interested in how the human interfaces with the system — as defined by software development methodologies, and how to run development teams. The interesting stuff isn't in the human "box", or in the technology "box": it's at the interface between the two.

When I went to work for Sprint, I became interested in "over the top" services, and...

Telepocalypse!

Yes, my Telpocalypse era. I went to Sprint in 2001 thinking I was going to be just working on internal IT projects. I turned up in telcoland in Kansas City, and it was so disorien-

tating! Hmm... telecoms, telecoms? I have no idea what I'm doing, but hey, let's make it up as we go along! (Which is basically the skill you get taught in Oxford tutorials.)

So I was trying to make sense of this telecoms thing. There was this strange concept called the “phone company”, and this “phone” thing was really interesting. On its surface, the phone call looks like so trivial. It's like... what is there to understand? Yet I have spent 15 years unpacking the phone call, and I still haven't got to the bottom of it! I feel like there's much to learn about the phone call.

It is a primitive form of virtual reality. It is also like a social chess game, with its opening gambits and middle games then end games. The phone call is the most fabulously complex and wonderful little universe to inhabit. And it's fundamentally about where the humans and the machine meet.

Virtual reality without humans is meaningless. We don't send androids off into play virtual reality games for us! It's intrinsically humanized activity.

Then I met Dr Neil Davies around 2008, and started to understand actually the real reason why I was confused about telecoms. The theoretical foundations of data communications were missing! The scientific foundations of wireless networks were set up in the 18th and 19th centuries. The theoretical foundations of computing were set up in the 1930s, with Turing and Church...

George Dyson's Turing's Cathedral.

Yes.

You've read it, I bet.

I read very few books. I find it very hard to concentrate on a book long enough. First, they're linearized text, and I like hypertext, and I like to be able to interact with text and do things to and with it.

I want to hear about Neil Davies... but George Dyson, having grown up at the Institute for Advanced Study, which I could get in the car and drive to in 25 minutes, is a fascinating character. He's been a member of my arch-econ mailing list for many years. He's still a member. I have a number of interesting people, like for example Carlota Perez.

I've met her! Yes, so it's interesting to consider the history of science, because as we know the history of science is full of zigzags, and strange characters who do strange things, often outside the mainstream, like the Teslas of the world. Actually, what I've discovered is trying to do anything truly innovative in the mainstream is hopeless.

Neil Davies had to leave academia in order to basically re-found packet networking on a solid mathematical basis. What Neil Davies has done is the equivalent of what Turing did. Neil Davies is a peer of Turing. He's too modest to say it himself — he blushes slightly when I say that. However, it's true. Turing's theory of computability is the coun-

terpart to Davies's [theory of translocatability](#), and both belong alongside Shannon's information theory.

I was at the eComm conference with Sheldon and Davies in maybe 2011 near San Francisco airport. I think it was [your opening talk on Neil Davies' system](#), and I took a bunch of pictures of that. That was my introduction to Neil Davies.

My job is to act as an interlocutor and translator. I'm a terrible mathematician. I haven't got the concentration or the inclination. However, I'm quite a good "storyteller with a maths degree". I was able to very quickly identify that Neil was addressing fundamental issues rather than surface ones.

However, it took me probably five years from first meeting Neil to be able to step far enough backwards — and you had to go a *long* way backwards, and walking backwards for a very long way is not very comfortable — to be able to see the full vista of what's happened, and where we took a wrong turn.

Indeed, what's happened is we've entered into a fundamentally incorrect understanding of the nature of networking. It's a fact that the current internet is built on a category error.

All science goes through three stages: classification, correlation, and causation. And because we've got classification wrong, everything we've built since is a bit screwed up. To be able to articulate the nature of the classification or category error is difficult, however.

For example, I stood on stage after Nick McKeown in The Hague week before last. He's the top man in software-defined networking. He's describing his latest and greatest breakthroughs, but he's locked into that current category error. I stood up afterwards and said you need to change your resource model.

Did he appreciate that?

I heard after that he did clap... eventually... and rather briefly. From his perspective: Who the hell is this guy on stage? He doesn't have a Stanford professorship! He hasn't got any published papers! He doesn't have all these corporate sponsor logos in his slides! He doesn't even have a PhD! Who the hell is he talking? He probably thinks the organizers have got a nutcase on after him.

I'm effectively saying *"Nice try, Nick! Really appreciate your effort. You're doing some good stuff, however, the conceptual box you're working in is a bit small. I suggest we need to look in the bigger box."* Of course, it's not aimed at him personally. As a human being, I respect him enormously. In the brotherhood of human beings, he's a good man. I'm just making fun at the moment.

But in the terms of doing just network technology stuff, it's... *"You're lost in the category error. You're trying to do computer networking. That isn't the problem. The problem is distributed computing, and that's a different problem. You're trying to connect the computers. That doesn't result in the required application outcomes."*

Connected computers is the wrong thing to do! The paradigm — the category error is to confuse the means and the ends. Currently, people believe that networks do “work”, focusing on the means. Net...*work*. This is a mistake, and it's the same mistake that turns up in two different ways. One of which Neil Davies fixed with the ΔQ calculus to describe performance. Then, orthogonally to that, is the work of John Day with RINA architecture.

John Day and RINA!?!

John Day is another genius — and I'd say this to John's face because I think he wouldn't slap me. He's the most lovable, cantankerous old sod there is.

I remember the episode not too long ago where he yelled stuff at you.

We all bring our wounds and our past with us, and John has lots of wounds for being right for 40-odd years in a networking world that's going technically mad. I can understand where his curmudgeonly nature comes from.

Neil and John both spotted that networking really is inter-process communications. It isn't computer networking. The outcome that matters is whether the computation advances, not whether you do “work” by moving packets. The current work paradigm is we try to move as many packets as fast as possible.

This is like a 1920s car factory where you ingest as much rubber and steel as you can. And occasionally, you spit out a working car, but you also spit out a lot of nonworking cars, and cars that need fixing at the dealership.

We know in manufacturing that maximizing inventory and work-in-progress isn't a good idea. This is not a novel concept in the world of management theory and quality systems. However, in telecoms it's really new. Maybe we should manage the flows and *minimize* work-in-progress, because if there's 50 years of evidence that's a really good thing.

Applying all the well-established ideas of Lean, Theory of Constraints, and Six Sigma is a total novelty in our networking world, despite the fact we built a whole infrastructure for society based on the current Internet.

Indeed, the current internet is just a primitive prototype that does one thing well, which it abstracts away connectivity. We don't have to worry about whether you're connected to a dial-up modem or a super-fast fibre connection or satellite. There's one API that works for everything.

Great. Thank you very much! We've learned a lot from it. However, it's basically broken in every other way. Everything else you could possibly get wrong, is wrong. The current internet architecture is a Rubegoldbergesque pile of workarounds and hacks as a result.

TCP/IP, right?

Don't swear like that, please, Gordon. Yes, it's BGP and all those other things, yuck.

We lost an entire layer.

Absolutely. The history books will look back and think... how did they go for that long without realizing there was actually no proper engineering, no real science, and they hadn't even gotten the maths right? How is it they did that for 50 years without noticing?

What's missing? The architecture is fundamentally wrong, so it's divided into many layers, rather than scopes (with only two repeating layers). The first step is wrong!

Also, the ability to measure, model, and manage performance is missing. We left out the most basic bit of mathematics: we're missing the equivalent of complex numbers, but for probability. Therefore, it is a bit like in electromagnetism, if you don't have imaginary numbers, you can't build complex numbers, so you can't do complex analysis, which means you can't write Maxwell's wave equation, which means you can't design a MIMO antenna, which means you can't do spectrum policy.

Brough Turner and antennas, this is another guy on my mail list!

I know Brough, too. There are many bright people currently working in the troubled incumbent networking paradigm. However, you need to draw a bigger conceptual box. It means going back to the very foundations, as there are some things that Turing didn't address.

One of which was thinking about the time it took to transfer the symbols between the tickertapes. He did computing, but he didn't really do distributed computing. Hence the first step is to get the performance science and maths right, so as to properly model what we already have.

The second key thing Turing didn't really model is... where the heck do the symbols come from, and where do they go to? The contextualization model of information was missing. That means we've spent 50 years inducting, training, and rewarding logicians to program computers. That's a bit unfortunate.

Why so? Because the people who are — how do I put this in the most compassionate sense — most adept at the very dry and abstract world of computing aren't necessarily always those who are most empathetic and social. Yes, *some* are very empathetic and social. However, the world we're going into is one which is kind of the *Revenge of the Phone Call*.

We started off telecoms with social telegram messages and telephonic person-to-person virtual reality. The phone call *is* virtual reality. We've now had 150 years or so of building this one virtual reality application. Then we kind of veered off-course a bit and built the Internet. We'll get over it!

Now we need to come back and build the next generation of virtual reality. After all, what we humans really like doing are intercourses, social and otherwise. Virtual reality is the place to go and do them.

This means we need to re-contextualize and re-humanize the essential nature of computing. So the work of Neil Davies and his collaborators is only part of this re-founding and refactoring process. ΔQ is putting in a theory to define what it means to copy information in a timely manner, and how we model that.

But actually, we need a bigger theory: how the heck does the computer relate to its context? What are these symbols, anyhow? And if these symbols represent information that was bio-sensed off a human (and voice is a form of intimate bio-sensed data) then... cripes, you can analyse the recording of this very call and do diagnostics for various mental-health conditions! You can analyse just how mad I am (I think 27 is my score... so I am very mad).

This recorded voice call is actually HIPAA-protected healthcare data! The recording of this phone call is healthcare information, but the current paradigm we have is it's treated the same as a music recording. It isn't seen as being essentially different.

We're moving away from a historical paradigm of computing, which is anchored in pure logic. The *Logos* is being addressed very strongly, but the *Ethos*, and *Pathos* have been left out. From, example, at university I studied formal software development methods. You start off with a specification, and say what is the *logical* outcome you require. But there isn't even a space on the page for what is the *ethical* outcome, or the *feeling state*. The size of the page or the engineering requirements book is too small to capture the contextual design specification! We need a bigger play space.

If we carry on down this old paradigm, we are going to be in deep, deep trouble. If we continue to build systems which amplify the power of some humans over other humans, and ignore the power relationships, wellbeing ethics and feeling states, then we are going to drive ourselves into a dystopian place, if we aren't there already.

How do you see Donald Trump as president in the U.S.

I see Trump as a symptom of a systematic problem. I think Trump as an individual is largely irrelevant. Trump as a phenomenon in a wider system is extremely interesting. We have to understand better at a deep level the relationship between our technology and our society.

In the world of computing, we are deities, very small deities... but still deities. And we create these little information universes. We need to create mini universes in a way that better reflects the societal outcomes we wish to have.

We need to come up with a "new logic" — we've followed the *Logos* path for a long time and come up with *artificial intelligence*. I strongly believe we also need *augmented conscience*. We need to be able to take our own concept of what is right and wrong, codify that in some way, and then bring it into our virtual world. Otherwise, there will be at best amoral place, and at worst highly immoral one.

Although going to an immoral place in a virtual world sounds like a fun weekend trip, it's probably not a healthy place to live. We're kind of there already, with what Google and Facebook do to you in terms of tracking you on the web.

If someone did what's happening to my kids at the moment online in the physical world, I would probably feel motivated towards violence. If someone was stalking my kids and sticking Post-It notes in their bag as they came in and out of every building and tracking them everywhere via binoculars, I would...

Privacy is gone?

Well, it's been eroded, but I think the whole "privacy is dead" thing is self-serving bull-shit. It is the words of those who are powerful persuading the powerless to accept their fate. Fuck off, I say. And I use such strong words knowingly. It's ABSOLUTE NO! I am NOT accepting and consenting to that. That's a psychopathic doctrine. *You* may believe it, and *I* am going to fight it with every ounce of my existence.

I believe that we need to consciously construct our world, and it's not a "virtual" world absent established codes of acceptable behaviour. The idea that virtual is separate from physical is nonsense. We need to construct a world which is moral. And if morality is not what's driving what we do, then at best you're amoral and worst you're immoral. We see the undesirable consequences of that already.

We need to go back to basics, and I think computer science needs abolishing. It is itself a category error! What is figural? It is not about the computer! What is figural is how this digital stuff interfaces with the rest of the world. The computer itself as a mechanism is not very interesting, sorry. I had lots of fun playing with them, but what matters is how these things impact us in the world.

We need to start from the *other* end: it is the *interface* ports on the computer which are interesting, not the processor. The keyboard, the video display, whatever. What goes through those interface ports? What happens *inside* the computer is *not* the interesting thing. We've got it backwards!

What is the impact of what goes on *inside* the box on the *outside* of the box? Critically, what is the ethical impact? One starting point is those classic five things of Plato's rhetoric: *Ethos*, *Pathos*, *Logos*, *Kairos*, and *Topos*. We need to re-conceptualize computing around those five aspects for it to be "rounded".

What Neil Davies has done is basically a *Theory of Kairos*, with timing. We've now got a form language which discusses *Kairos*. So great! We now have *Logos* and *Kairos* done. Where's *Pathos* and *Ethos* and *Topos*? We have an incomplete conceptualization of the discipline. As a result, we don't even ask the questions that are important. [MG: On reflection, the "semantic web" is the *Topos*.]

You've got a lot to say, and I want to make sure you get to say everything. I'm sitting here with rapt attention.

I published an article on this. ["Why I'm Optimistic About the Future"](#).

That was very good!

One has to think about how society is constructed, the nature of power, and how access to information flows provide power. It's not controversial to say that the internet has significantly changed our world, and it's significantly changed the balance of power between different parts of our world.

When it came to renew my domain name, cookreport.com, I managed to renew it for five years, which is what I've been doing all along. But my God, if I lost that domain name, it would almost rub out my existence!

Your virtual identity and your physical identity *cannot* be separated. The current identities we're building are *not* self-sovereign. We are now feudal subjects of ICANN or Google or whoever. This is a big problem, a serious problem.

Let me say one thing. I've been thinking about it. If I were to draw a cartoon of how I conceive it personally, I have two arms and two legs. There would be Apple and Google each have an arm. Amazon has my left leg, and Verizon, the freaking phone company has my right leg. All of them want all of me, but they only have a part of me.

Why can't get together as neighbours and build a street-level network? And the streets get together as a neighbourhood and build a neighbourhood network? And the neighbourhoods get together and build a town network, and the city network? We are fundamentally disempowered. It's partly a result of TCP/IP's stupid architecture, but there are other reasons too.

We need to start again, and we need to start again with the *human* as the centre. We need to re-found computer science around the human. To do otherwise is to empower a psychopathic world, where the humans are seen as peripherals to the machine. It's *Matrix*-like; we're batteries in the system. It's horrific!

I worked as a student for two summers at BUPA, the British United Providence Association, a private healthcare company. I was doing VDU data entry for insurance claims processing. I spent six months of my life typing in insurance claims. I've also spent time on the BP share privatisation entering 10-digit numbers for weeks. I've been in the dark satanic factory mill, as it were, of the IT world.

It's a hideous experience, as far as I'm concerned. I came out mentally ill and clinically depressed. By the time I went to university at 18, having just spent three months doing that, I was genuinely unwell. It's partly due to who I am, but it's also partly as a result of that environment. It's utterly dehumanizing. I will never forget it.

I believe that we need to have systems which are ethical by design. To give you an example at the moment, I'm working with a consulting client. We're rethinking how call centres work because at the moment it's all about how to extract as much labour value from those workers, so as to deliver a "better" customer experience at less cost. It doesn't work because the call centre agents are feeling abused, and as a result, they withdraw their love and care from the system. Then the customers get really pissed of; therefore, the whole thing falls apart.

Until you see the agents as humans, as well as the customers, you can't succeed. The question I'm asking now is: how do you *humanize* call centres? How do you inject gratitude? How do you make sure they take rests? How do you make sure there's fun? Dancing, music, jokes, whatever it is. How do you reconceptualise this around the human, not around the business process? I don't know the answers, but I've asked good questions!

What came out of the research I did with Kelly Fitzsimmons in the Hypervoice Consortium is that we're entering into a world of the metaverse: information blended with the physical as augmented reality. The current web is the "old thing". There's a new "web" coming up which is more of an AR/VR concept. And we need a new "browser" for it.

We propose the new browser for that world is the Guardian Avatar. It's a bit of software, but it's also a thinking tool to consider the nature of relationship between you and the "real" world. It is like how the "4th wall" in the theatre is not a physical wall: it is a way of talking about the space between the stage and the audience.

The Guardian Avatar is a system of human identity protection and projection, which looks after you in that world. It allows you to project your own ethics and morals into the world. When I turn up a free Wi-Fi hotspot, and there's a license agreement and terms, my lawyer bot reads through it, and checks it's okay with me. But those terms have to be presented in a machine-readable format.

We need to start to surface the underlying lack of choices we have. I think of Beisser's *Paradox of Change* — we only change when we fully internally identify with *what is*, not with *what could be* or *what should be*. We need to build systems that show us the lack of power we have over our environment, and forcefully surfaces the non-negotiability of these contracts. This should result in their non-enforceability in many cases.

Basically, the world we're building at the moment — the Google and Facebook world — is unethical. I couldn't work with Google or Facebook. I appreciate the people inside those organizations don't set out with the intention of doing wrong. They don't see themselves as digital equivalent of tobacco. However, I'm sorry, but that's what you're doing. It's damaging and disempowering, and it's not ethical.

I think we have a number of revolutions here. Yes, we first must have a revolution in network mathematics and science. Wouldn't it be nice if we could do science and engineering for application performance!

I found myself in a telco client two weeks ago, standing in front of them, and their brand identity is supposedly all about quality. I'm standing there trying to persuade them that maybe science and maths and engineering might be relevant to that problem. *Why am I doing this? Why am I even standing here in front of them? Something's very wrong here!*

So first let's get the basics right. We need to have a foundation of science and engineering on which networks are built, with known performance and reliability safety margins, and are fit for purpose, with us taking responsibility for the outcomes. But on top of that,

we need to have new kinds of applications and interfaces. The Guardian Avatar is just one.

We also need to destroy and reinvent money because money, I believe, is a psychopathic technology as currently conceived. It's become a way of laundering immoral activity, and denaturing human social relationships.

We're seeing with blockchain the ability to construct new value networks, and to embed ethically positive incentives – to engineer new behaviour incentive mechanisms, and to localize and contextualise these in appropriate ways. I think the technology we currently call “money” is end-of-life. We need to abolish it, and build something new.

There's also healthcare. What we have today is the “sickcare” model. We need to have a “wellcare” model. We need to completely invert the incentives of that system. What we have at the moment is corrupt, and almost every aspect of it is broken.

We can talk about transport, and energy, and other domains as well. There's a series of fundamental reconfigurations of our society that are needed. For those to happen, we need to have an appropriate information infrastructure underneath, and also an appropriate interface to the human on top. I believe the Guardian Avatar is a helpful way of expressing that need.

It is time for *“All change, please! Please alight from the present Internet, and wait at the platform for the next Internet to arrive!”* What is next will be personal: its fundamental scale will be human-scale small and grow upwards, not global-scale big and scale downwards. It will be secure, and performant by design. Morality will become a first class design object, as well as performance.

Our challenge now is collectively to dream. It's a massive challenge, and I believe that this is possible. It is not only possible but necessary, because the nature of the world we're currently living in is not a nice one for our grandchildren to inherit. I believe we can do much better.

Agree.

I grew up with the Jehovah's Witnesses cult. I know what it's like for people to be inside a box, and not even know the box is there. To have a system of manipulation and emotional control that keeps them forever looking outside the box. It's obvious that they are a cult to the rest of society; but if the whole of society becomes a cult, the outside becomes invisible.

Our current society feels like one giant cult of the ego. And we've been infected and infested with psychopathic doctrines everywhere, and we need to change. We need to spiritualize. We need to feminize some aspects, and masculinize others. We need to do something completely different. Paradigm change of the first order.

Definitely agreed. I'm not aware of a hell of a lot of what you do, but one is your work with Peter Cladingbowl. How about talking about him?

Pete's my partner in crime and co-founder of [Just Right Networks Ltd](#), and counterbalances my intellectual hooligan craziness with grounded adult supervision. How can we enact all this innovative novelty in the world, and actually make a living from it? After all, for the last seven years, I've been basically living off of minimum wage, doing fundamental science and philosophy, as people don't pay for it.

That's grim.

It is grim! Yet I feel deeply contented, and these financial situations can change quickly. I'm a very blessed man, and my outgoings are virtually nothing.

You have basic integrity, and you keep your mind alive.

My experience of corporate life is violent. It may not be physically violent, but it's emotionally violent. I cannot go there. I don't belong inside corporations. I'm gay, a blended chimera of male and female, warrior and nurturer. I find life inside dominator culture, alpha-male organizations just revolting. And they don't like me either!

I went to join BT. One of the executives there — I won't name names — she described me as “not fit for consumption”. Hmm... “not fit for human consumption”, which I thought was a beautiful projection of unspeakable inner desires, but never mind. I really don't belong inside the megacorp.

My work with Pete is about taking the crazy stuff we do forward — these wild new ideas. I have no bosses. I've taught myself to basically exist on nothing, so nobody can ever control me. There's nothing to withdraw, so I have total freedom. I can forage for myself. I know at any moment if I really am short of food, shelter, anything important, I can just mail my mailing list and say “help!”, and it will manifest. Seriously, I don't even have a pension. I've just got love. I mostly live in the love economy, not the money economy.

I was very touched by your essay on your homeless friend who fell through all the cracks.

Yes. Hold that thought for a moment. Just quickly let's do Just Right Networks and Pete, and then come back to that, because that's a life-changing thing for me, is standing next to someone ill and facing homelessness, day after day after day for two years.

Go with Just Right Networks again.

My longer-term vision is to build the Guardian Avatar, to help in a series of transformations in healthcare, transport, energy, infrastructure of life. Underneath that we need to have an information infrastructure which at least gets the basics right.

What we're doing is applying the breakthrough mathematics in science and philosophy to produce commercial quality-assured broadband, which is fit for purpose for cloud application access. So I'm working with Pete to deploy that Just Right Networks. We're making good progress, but it's slower than we would like.

We see a need to build a quality-systems revolution for telecoms and cloud. We need to apply all the well-established body of management theory, plus new science and mechanisms to deliver predictable, engineered experience for users. This ought not to be a controversial thing.

And of course for me, one of the most fascinating things was that he's been doing this a good deal in Russia.

Yes. Pete's originally from South Africa. He's got a long career as a senior executive working in building data centres and telecoms. He's done it in all kinds of different countries. I strongly believe that the interesting stuff that's going to happen in the next 10 to 15 years, the new architectures and new use models, are unlikely to come from Silicon Valley. We'll see this stuff happen in maybe the "Post-China Sixteen". It's Peru, Indonesia, Vietnam.

These tools and technologies will get to a certain point, but people who've got nothing to lose will apply them in new ways.

Forgive me for interrupting, but you said Peru. In the last three or four days on arch-econ there's some discussion of Google's Project Loon.

Even Google and Facebook sometimes do good things.

There's an infrastructure being built, but the infrastructure is still largely conceived around perpetuating current systems of control and power, and the dominator dynamic, and the current corporate-state alliance, which is not a healthy one.

With the stuff we're doing in Just Right Networks, I've turned from being a telco game-keeper into a cloud poacher. It was lovely working in telecoms, but now I work for the demand side. We are doing basically high-frequency trading against BT's network in order to extract the arbitrage between the underlying quality of the assets and the quality required by different applications.

That's fascinating.

Telecoms as a pipe-based business is finished. We still need the underlying physical infrastructure, just like if you're doing shipping around the world you still need the underlying ships and trains and trucks. But those are not the controlling platforms anymore. No, the controlling platforms are those in the physical logistics space are those that match supply to demand.

The same thing is happening in telecoms. Telecoms is about to become more like Uber, financial services derivatives, or option-trading platforms. And the people who control the platforms or are able to make the best "trades" will make lots of money. Those who don't even understand the problem will go out of business.

Most of the telecom industry doesn't even understand the problem, let alone the solution. What happened in devices with Nokia when Apple came along looks like it's being

readied in the distributed computing space. A new platform with a stronger philosophy wipes out the old one.

Everyone who thinks they're currently doing computer networking, rather than distributed computing, has a short and brutal life ahead, and they don't realize it yet. Those of us who can apply new architectures, and abstract away the underlying implementation of the resource, and can out-trade everyone else... we will win. There is no possible other future.

What we're doing with Just Right Networks is we're building quality systems to enable us to calibrate, coordinate, and control digital supply chains. We're building an initial exemplar which is an exemplar business which is to deliver "*I can't believe it's not ISDN!*" here in the UK, to show we can deliver the quality outcomes of traditional circuits with the cost structure of packets.

Once we've done that, it's merely a matter of execution! [MG: My tongue is in my cheek.] It takes about ten years until this new paradigm takes over the whole world. In the meantime, I believe there is an end game of this, which is that we're going to see the current internet be transcended, and replaced by new industrial and intimate internet. And it will have to be engineered to deliver performant outcomes with known safety margins.

In other words, we need to start to have network interface agreements — information exchange agreements — which reward better quality. Such things will inevitably encourage cheating, to take the money and not deliver the quality. And therefore, you'll need equivalent to the Visa network, but for telecoms. You'll need people who construct the trusted interchange agreements, which don't require everyone to audit everyone else.

In the world of retail banks, you don't need to go and audit every other bank in the Visa network to accept Visa cards. The Visa network manages the trust function. So the same thing will happen in the telecom world, is that we will create a new Visa network of trust, and trusted exchange agreements which reward better quality.

We also need to "de-reward" and "de-prioritise", where we make very cheap low quality available as well. For every higher quality, you must have a lower quality. So we need to also build new transport systems for very bulky, cost-sensitive data, which is time sensitive.

It's all going to happen. There are deep, profound reasons why the current Internet is not technically or economically sustainable. The current Internet is not a scale-free system: it has got scaling limits, and it is hitting those limits.

We're already seeing bad technical things happen on the present internet, as the present internet breaks basic control theory. The control loops are long, and the phenomena they're controlling are fast, and this doesn't end well. Every time we make the networks faster, the control loop stays the same length, but the rate of state change goes up

Therefore, the stability of the system goes backwards. As we throw bandwidth at all our problems, this is not pretty, and you don't want to see the results. Death by non-stationarity is the fate of the current internet. And it's already happening. We've had 25 years of the "rise of the stupid network": endlessly throwing bandwidth and capital at quality problems doesn't work. We've proven that, and now it's time to move on.

Just Right Networks is about building the new paradigm, based around *engineered* quality and *contracted* performance at all the boundaries in the supply chains. When you take that series of quality contracts, and compose them all together, you get a predictable outcome which is fit for the purpose of the application. Wouldn't that be a novelty?! [MG: Once we've done quality, we can move on to other things, like privacy.]

Yeah!

I'll take us back to something we touched on earlier. I've got an understanding of what we're doing and why we're really doing this quality transformation work. I was going to see one of my old Oxford undergraduate friends, who lives in a nice town in England. We had a lovely afternoon tea in a posh hotel, and I was walking back to the train station on a dark January evening in 2016. There was a woman on a cold street corner begging.

You think... empty street... cold night... woman in her thirties. This isn't good. She's doing that because she's desperate. I sat down next to her and started to understand a bit about her, and spent about half an hour with her. To cut a very long story short, I've spent the last two years supporting her. Basically, all the healthcare and social welfare systems have broken down, particularly for people who are mentally ill, as she is. She's very bright. She has a good heart.

But she's not well. She's had a traumatic life. The systems are designed for well people, if they work at all. The idea that if you are sick you may not be able to go to the benefits appointment, because you're too terrified and physically sick with anxiety, that doesn't occur to them. I'm what stands between her and an abyss of poverty and ill health.

About a year ago I ran out of money. I had to start employing other peoples' resources to help her. It's been a transformational experience. Even today, it's sort of brought me an enormous wealth of understanding about the nature of love. The Greeks have the six words for love: brotherly, conjugal, erotic, unconditional love for children, and so on. I've learned a lot about love.

Over time, I've also learned a lot about telecoms, heavens above, and these two worlds can touch. So even today, I was having a meeting with a telecoms regulator. I realized the reason why we need to have sender party pays data. It is not because there's a market for it. It's because there's no market for it! It's because she can't afford broadband

But she can't go to her MP's office because she's agoraphobic, and got a serious social-anxiety disorder. So going to her member of Parliament to a meeting is terrifying for her. However, she might be able to go as an attendee of a virtual conference. But she

can't afford broadband. Everybody in society needs to have access to core services like being able to attend virtually their MP's office and clinic.

Sixty readers from my newsletter got together and we bought her an iPad with 4G built in. She had no means of communicating with the world. She loved it, and then she left it at a neighbour's house. She has a neighbour, an old guy she looks after sometimes, and he looks after her. His relatives nicked it. They know, because of who she is, she's never going to go to the police. So they just took it.

You start to understand how, when she runs out of electricity, her phone doesn't charge. When the phone doesn't charge, she can't call people. Nobody. She doesn't have an alarm clock, so she can't wake up in time to go to appointments. If she doesn't go to the appointment there's not going to be benefits. You stop your benefits, then you lose your house. Not only do you lose your house, you start getting charged an extra 11 pounds a day by the council for the rent. Then you get your court fees. Her freezer defrosts and the food rots.

You start to see how if you've not got mental-health problems at the start, you've certainly have at the end! Now I understand at an embodied, profound level, her predicament, because I've also run out of money in this process. I've actually stood in the train station in London going home, looked at the chocolate bar machine, and not only did I not have a pound with me, but I didn't even have a pound anywhere. I'd even used up my coin jar. I totally ran out of money.

When everyone else has abandoned someone like her, and nobody else believes in her, then what kind of man am I if I don't stand up and act? Who am I really? Why am I here at all? Why am I bothering with this technology innovation in the first place? This experience has fundamentally transformed my sense of purpose of what I'm doing.

Neil's new ΔQ network maths, lovely. Great breakthrough. It'll happen because there's an external reality of the world that forces it upon us. I just need to wait. I know he's right. Ultimately, I just need to sit here, and wait for the incumbent system's collapse, because it's not aligned to reality.

However, if we're not building something that's moral by design, if we're not here to relieve suffering — if all we're here to do is to do cheaper 4K video — the I'm off to do something else. If 4K video is your highest aspiration for the internet, that's pathetic. We must all raise our game.

Figure out how to look after people like my struggling friend, who is smart, really bright, has a good heart, is a caring person. Her ending point is very different; but starting point is not different. I'm also from a work-class background. That could be me. I could've been the one on that street, and she could've been the one with the Oxford degree walking past after a nice afternoon tea.

There but for the grace of God am I.

Now I "get it". I didn't get it before, but now I do. There have been many other humbling experiences in life, and many screw-ups. I now have a sense of what I'm here doing this

for. The challenge I see is to link morality to the mathematics when we design information architectures. That's the "grand sweep" that I'm here to attempt.

Isn't "how do we stop building smart cities?" In fact, how do we stop that process? It's a disaster! I don't want to live in a "smart" city. It's awful, horrific. I want to live in a superhuman city.

To me a "smart" city is the dystopian nightmare. I don't want to empower all these sensors everywhere to be spying on me, all the time building artificial intelligence control systems which I have no control over.

I think you'd better start by building a smart neighbourhood.

Not "smart" at all. Smart is in the *Logos* category. I want *Ethos* and *Pathos* first. I want humanized qualities first. I don't want a computer-science lab sprayed all over the world. I don't want it! I want a humanized world. How are we going to have cities where we get together and sing and dance?

If you were in the Jehovah's Witnesses, like my mother, you have no concept of the world out of the box. The world outside the box is rejected, and they don't want it. If you've grown up in the box where computers exist to deliver logical outcomes, then the idea that you need to start off with an ethical outcome, or a feeling-state outcome, is just unthinkable.

The future we face is like Facebook, where they have the Year-End Review feature. Logically, it picks the most important picture from your year, and shows it to you. The fact that it was your kid that died, it was your apartment that burnt down, didn't occur to that person. The specification language doesn't include what is the feeling state you want to engineer, or what's the ethical outcome. It doesn't exist.

There's no concept of the human power relationship in the software engineering paradigm. And there should be. Yourself, Gordon, as a student of the Russian history and culture, will know that power relationships really matter!

Oh, yeah!

Don't they? And their abuse really matters, too. Lots of people die when we get it wrong. It might actually be quite important. If you're disturbed by how the world currently is, and you'd like to have a better future, then become aware of the paradigm you're currently working in.

The current paradigm of information technology is somewhere between asocial and antisocial. We need to re-found this, away from information technology, and towards human technology. That's the start. And HT, not IT, and it's about augmented identity, not artificial intelligence. It's about giving humans superhuman powers of empathy and understanding, and putting on a corrective lens to help us achieve our higher selves in the world.

At the moment, what we're doing is just gone off the rails, and doesn't take us to a happy place. I want to go somewhere different. I want a different ticket, please. I don't like the destination where this train is going.

I agree with all of that.

I'm currently sat here at the Institute of Directors here in London in this beautiful big room, with all these portraits of old people around me. I'm very privileged and very, very grateful for what I have. I've never had to miss a meal in my life.

Was this associated with the meeting you had this morning?

Indirectly, yes. I'm in London to have meetings and see friends. It's been a hard journey. The last seven years have been difficult; it's been totally rewarding, and I'd never do it in any different way.

What we've covered is absolutely beautiful and enlightening.