

**BRIDGING  
OPEN  
BORDERS**

as part of V&A Digital Design Weekend 2017

# Bridging Open Borders

as part of V&A Digital Design Weekend 2017

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**Edited by**

Irini Papadimitriou, Andrew Prescott, Jon Rogers

**Design by**

uniform.net

**Cover design by**

Nicolas Naveau, Ars Electronica Linz

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## Bridging Open Borders

When Jon and his family are not in Berlin, working to create an open Internet of Things with the Mozilla Foundation, they live in the town of Anstruther on the coast of Fife. Just up the road from Jon's house is the old fishing harbour of Cellardyke. Most of the fishermen have now disappeared, but the harbour remains a focal point of local life – a vital public space. The residents still hang their washing out on the harbour walls. On summer evenings, everyone will bring out beer, wine, food, some music, and there will be a spontaneous barbecue and party around the harbour. Anyone who's around is welcome to drop by and contribute whatever they like to the gathering.

The Cellardyke barbecues are spontaneous, open and inclusive events, building bridges between neighbours and anyone else who just happens to be around. And that's the spirit of the Digital Design Weekend at the Victoria and Albert Museum: an opportunity to drop by, see what's cooking, hear some news, find out what's exciting or worrying us. And we try to capture something of that in these books. Welcome to our digital barbecue.

We like having such a beautifully designed book by our friends at Uniform because it reflects our interests in artefacts and in the intersection between data and objects. But we also like to explore the possibilities of extending, remixing and interacting with these texts, digitally. We have a special Github repository where you can learn about previous Digital Design Weekends, contribute your thoughts and suggest some answers to the questions we pose here. Just go to: [digitransglasgow.github.io/bridgingopenborders](https://digitransglasgow.github.io/bridgingopenborders)



## Why is working on the Internet of Things so important?

What is the Internet of Things (or IoT, as we affectionately call it)? How is it different from other forms of computing and what is the state of play right now? There are so many questions around IoT, and so many are skewed by a very narrow band of people. I wanted to write something that reflected my experience of IoT that was set against the collective questioning of society. So rather than pose directions myself, I let Google do the work for me...

Is IoT real, safe, secure, a good investment, a very recent paradigm? Yes. No. No. Depends on what you mean by investment. No.

### Is it real?

Well, if you do a Google image search of 'internet of things', we know it looks like a proposal. A proposal comprising lots of nice big blue systems diagrams which very carefully tell us what the future of our homes, transport, agriculture, entertainment, cities and every aspect of our connected world will look like. The big three tech trends forecasters – Gartner,<sup>1</sup> Deloitte<sup>2</sup> and McKinsey<sup>3</sup> – all say IoT is real and that it's worth a lot of real cash. Billions of dollars. Interesting that it's always dollars. But I digress. Is IoT real? Until around six months ago, I would have said that the predictions of IoT are very real, but the product isn't. However, that changed this Christmas. It changed because of voice control. IoT has found its first proper foothold into our homes. Exact figures are hard to come by, but it's in the millions of devices. According to the BBC,<sup>4</sup> Alexa-enabled products (Echo and Bit) have reached sales of eight million in the US (and it's also on sale in the UK, Germany and Austria), whereas the Guardian puts it at more like 18 million.<sup>5</sup> This, though, is the consumer-facing window on the IoT that the tech trends forecasters want us to see. You could argue that these are self-serving prophecies, where the forecasters stand to gain by stimulating the consumption of things by the prediction of things; that if they had not predicted it, it might not have happened. A tautology that perhaps I should leave for another day.

What I want to talk about is the reality of the IoT on our culture. It's one thing for something to be real because it's in our homes. But it's another when the reality hits home in painful ways. This is where, for me, the interesting answers to 'Is it real?' start to come into play. The murder case of the Arkansas resident James Andrew Bates<sup>6</sup> is a reality check for how IoT will play out in the future. He has been accused of murder. The US police requested Amazon to release the data from his Amazon Alexa account. They refused. However, the accused has now given permission for the police to use his data.<sup>7</sup> What is interesting is not just the use of the voice data, but also the use of his 'smart' home devices

<sup>1</sup> [www.gartner.com/technology/research/top-10-technology-trends/](http://www.gartner.com/technology/research/top-10-technology-trends/)

<sup>2</sup> [www.deloitte.com/us/en/pages/technology/articles/technology-consulting-tech-trends-collection.html](http://www.deloitte.com/us/en/pages/technology/articles/technology-consulting-tech-trends-collection.html)

<sup>3</sup> [www.mckinsey.com/industries/high-tech/our-insights/ten-it-enabled-business-trends-for-the-decade-ahead](http://www.mckinsey.com/industries/high-tech/our-insights/ten-it-enabled-business-trends-for-the-decade-ahead)

<sup>4</sup> [www.bbc.com/news/technology-39589233](http://www.bbc.com/news/technology-39589233)

<sup>5</sup> [www.theguardian.com/technology/2017/jan/22/home-battleground-amazon-google-voice-technology](http://www.theguardian.com/technology/2017/jan/22/home-battleground-amazon-google-voice-technology)

<sup>6</sup> [www.theguardian.com/technology/2016/dec/28/amazon-refuses-to-let-police-access-suspects-echo-recordings](http://www.theguardian.com/technology/2016/dec/28/amazon-refuses-to-let-police-access-suspects-echo-recordings)

<sup>7</sup> [www.theguardian.com/technology/2017/mar/07/murder-james-bates-defendant-echo-recordings-amazon](http://www.theguardian.com/technology/2017/mar/07/murder-james-bates-defendant-echo-recordings-amazon)

in general. Much less detail is given, but surely the smoking gun of the case is the exceptional use of water between the hours of 1am and 3am that police were able to ascertain from his smart water meter? It reads like a narrative from a CSI or Black Mirror episode. But it's not fiction. IoT is real. But is it safe?

### Is the Internet of Things safe? (and the next question: Is the Internet of Things secure?)

Safety is contextual. The answer is complicated and contextual. There are increasing examples of the potential for insecure IoT to cause serious harm or even death, as was recently shown by researchers who proved that the ten leading brands of pacemaker could be hacked remotely to cause loss of life.<sup>8</sup> Driverless cars have similarly been shown to be able to be remotely controlled – the most recent example is from an ex-Uber, ex-NSA security expert who states, "Autonomous vehicles are at the apex of all the terrible things that can go wrong".<sup>9</sup> These are currently theoretical problems. They've not become practical problems yet; problems that are being faced by other commercial IoT products.

Children's toys have started to get a lot of attention from security leaks. Cloud Pets ("A message you can hug") sell an internet-connected toy for enabling children to send each other voice messages through a soft toy. The Guardian revealed, in February 2017, that from its database containing more than 800,000 children's messages, their emails and passwords had been hacked.<sup>10</sup> This is something that Cloud Pets continues to deny: "Contrary to the claims being made by some articles and blog posts, the affected database contained no Cloud Pets recordings or messages".<sup>11</sup> All clear? Good. Er, hold on. If you read down two lines, you'll see this further clarification: "The exception would be accounts owned by a small minority of users who used very simple passwords, easily-guessed passwords, or who may have re-used passwords that could have been stolen as part of a data breach from another application or website". So they have been hacked, but it's all the fault of the users.

This sense that it is not their responsibility is echoed in Facebook's response to the posting of a video of the horrific murder of a seventy-four-year-old man in the US by the murderer: "We need to do better", said Justin Osofsky, Facebook's VP of global operations. "We need to do better" is akin to the ubiquitous school report "must try harder".<sup>12</sup> As if it's a trivial matter. There's an arrogance coming from Silicon Valley right now that's no different from cigarette companies denying responsibility for smoking and for gun companies denying gun crime. The blame lies somewhere, but not

<sup>8</sup> Marin, E., Singelée, Garcia, F., Chothia, T., Willems, R. and Preneel, B. (2016) On the (in)security of the Latest Generation Implantable, Cardiac Defibrillators and How to Secure Them, ACSAC '16 Proceedings of the 32nd Annual Conference on Computer Security Applications, P226-236

<sup>9</sup> [www.wired.com/2017/04/ubers-former-top-hacker-securing-autonomous-cars-really-hard-problem/](http://www.wired.com/2017/04/ubers-former-top-hacker-securing-autonomous-cars-really-hard-problem/)

<sup>10</sup> [www.theguardian.com/technology/2017/feb/28/cloudpets-data-breach-leaks-details-of-500000-children-and-adults](http://www.theguardian.com/technology/2017/feb/28/cloudpets-data-breach-leaks-details-of-500000-children-and-adults)

<sup>11</sup> [www.cloudpets.zendesk.com/hc/en-us/articles/115003696948-CloudPets-Data-Breach-FAQs](http://www.cloudpets.zendesk.com/hc/en-us/articles/115003696948-CloudPets-Data-Breach-FAQs)

<sup>12</sup> [www.theguardian.com/commentisfree/2017/apr/19/facebook-cleveland-killing-media-host-legal-protections](http://www.theguardian.com/commentisfree/2017/apr/19/facebook-cleveland-killing-media-host-legal-protections)

with them. Perhaps it's the user's fault. My university (rightly) doesn't trust its staff to make the necessary security updates to protect its students from lost laptops and hacked systems. It makes sure they do it for us. That's the responsible approach of a responsible IT department. Can the same be said for tech companies that sell us the insecure IoT which enables our children to connect? And it's not just about kids' toys. If you want to get really up close and personal, then look no further than sex toys. So it seems that the IoT could be safe, if only people used it safely...and understood the complexities of global internet security protocols, as well as how to routinely process the necessary updates and security administration. We all need to become system administrators of our household items – can you be bothered with that? I know I can't.

### Is the Internet of Things a good investment?

What does it mean to invest in something? The Google search will reveal a long list of search responses that provide you with insights on whether IoT is a good financial investment. You'll be able to read about patents, about its expected value in 2020, about the top five companies to watch. But it's hard to find investment beyond financial. What about it being a positive thing for society? Is it good to have computation amplified and empowered in this way? Should we invest time in learning about this emerging technology? If so, how would we do this? I've never been very good with money, but I'm pretty sure that I am with people. It's people that I care about. So will IoT be a good investment? I think that we've got it wrong. Compare the work that Vlado Joler is doing to expose the real cost behind our digital products and services to the work that Babitha George has uncovered with a village that is attempting to live a 'Gandhian dream'. Valdan exposes some truly awful effects which highlight the lack of responsibility from tech companies. Babitha discovers a village that builds a sustainable business by asking its people what it would take for them to stay and work there; that if you follow a Gandhian approach, you will be building an investment in people. If you invest only in the financial elements, the consequences of the investment for the majority of people are potentially dire. I think there needs to be a radical re-think in the way we view investment. We should be investing time in raising the skill and understanding of the IoT in our cities before we launch the Smart City programmes; we should be investing in ways to incentivise the repair of IoT in a way which is akin to Sweden incentivising the repair of household items;<sup>13</sup> we should be investing in the skills to do this.

### Is the Internet of Things a very recent paradigm?

Well, that's a great question, Googlebots! Not such great answers, though. I've been talking about how it's not a new concept. Certainly, science fiction authors have been exploring it for over a century. My first encounter with the notion of IoT was during my English Literature classes of the '80s. We were given E.M. Forster's short story, 'The Machine Stops', and I was hooked!

<sup>13</sup> [www.theguardian.com/world/2016/sep/19/waste-not-want-not-sweden-tax-breaks-repairs](http://www.theguardian.com/world/2016/sep/19/waste-not-want-not-sweden-tax-breaks-repairs)

It remains a powerful prophecy of humankind's reliance on technologies – on the wonder it can produce but also the dangers of what happens when it stops. I recently closed all of my social media accounts<sup>14</sup> (for me that meant closing LinkedIn and Twitter) and created my own little version of 'The Machine Stops'. Thankfully, it was all rather undramatic!

"Cannot you see, cannot all you lecturers see, that it is we that are dying, and that down here the only thing that really lives is the Machine? We created the Machine, to do our will, but we cannot make it do our will now. It has robbed us of the sense of space and of the sense of touch, it has blurred every human relation and narrowed down love to a carnal act, it has paralyzed our bodies and our wills, and now it compels us to worship it. The Machine develops – but not on our lines. The Machine proceeds – but not to our goal. We only exist as the blood corpuscles that course through its arteries, and if it could work without us, it would let us die." (E. M. Forster, *The Machine Stops*)

It was the only science fiction that E. M. Forster wrote, yet it gives a haunting, writer's viewpoint on the future we're potentially walking into. Historians will, of course, give much earlier examples. Tom Standage's *The Victorian Internet*<sup>15</sup> is a vivid new lens on old technologies and their remarkable similarity to today's tech. Later in this publication, our dear friend and digital humanities professor, Andrew Prescott, suggests parallels with medieval society. So is it a very recent paradigm? Absolutely not! Not even close.

### Is the Internet of Things good?

I've saved this one for last. Is the Internet of Things good? Good for what? Good for whom? I'm just back from an event in NYC where I heard Matt Mitchell<sup>16</sup> – one of Mozilla's Open Web Fellows<sup>17</sup> – say that if he could go back in time and eradicate anything, he would eradicate IoT; he would like to feed it to a monster; that it was of no use to anyone and dangerous to all. He's an expert in crypto technologies and talked about how people have no interest in learning the skills required to make your IoT secure. "People can't be trusted to eat healthily, so how can they be trusted to make their IoT secure? If we shut people out of their router if they didn't do the necessary updates, then we might stand a chance."

In 2016, James Clapper, the US Director of National Intelligence, said:

"In the future, intelligence services might use the [Internet of Things] for identification, surveillance, monitoring, location tracking, and targeting for recruitment, or to gain access to networks or user credentials."<sup>18</sup>

<sup>14</sup> [www.productresearch.dundee.ac.uk/?p=1664](http://www.productresearch.dundee.ac.uk/?p=1664)

<sup>15</sup> Standage, T. (2014) *The Victorian Internet: The Remarkable Story of the Telegraph and the Nineteenth Century's On-Line Pioneers*, 2nd edition, Bloomsbury.

<sup>16</sup> [www.about.me/geminiimatt](http://www.about.me/geminiimatt)

<sup>17</sup> [www.advocacy.mozilla.org/en-US/open-web-fellows/fellows2016](http://www.advocacy.mozilla.org/en-US/open-web-fellows/fellows2016)

<sup>18</sup> [www.theguardian.com/technology/2016/feb/09/internet-of-things-smart-home-devices-government-surveillance-james-clapper](http://www.theguardian.com/technology/2016/feb/09/internet-of-things-smart-home-devices-government-surveillance-james-clapper)

It now looks like that was a false statement. As the Vault 7 WikiLeaks in March 2017 now shows the extent to which the CIA and British intelligence agencies engineered ways to use IoT as mass surveillance devices in people's homes.<sup>19</sup> This included Samsung Smart TVs, iOS and Android smartphones, Windows and Linux PCs, and also the potential for onboard computers in cars.<sup>20</sup>

This makes Matt's statement about going back in time and eradicating the idea of the IoT ever more convincing! But I also think there is the potential for good, and this is something I want to advocate. It's all too easy to say we should turn back the technological clock or move to the hills. But this is neither practical nor possible. Instead, we need to pursue the goal of responsible IoT that fosters a healthy internet. SafeMast [20], the open-source hardware project which enabled people to make their own Geiger counters, was hugely empowering to residents of Fukushima in 2011. Projects such as Smart Citizen from the IAAC<sup>21</sup> in Spain are exploring citizen empowerment with communities through grassroots IoT. Public Lab<sup>22</sup> in the US is harnessing IoT to investigate environmental concerns. The Good Home project<sup>23</sup> is prototyping and researching how responsible and open IoT can show up in our homes. There are many more potentially incredible applications that will use data science to amplify healthcare, connecting lonely people, finding lost pets, learning languages, protecting endangered animals and providing community resilience. When I look at these as applications, I don't feel that any of the big IoT developers (Google, Amazon and Apple) are, in any way, doing anything to support this space. They are looking to capitalise purely on consumerism and entertainment. Things are not looking good when we look at the responsibility of US corporations and their approach to the IoT. So...is the Internet of Things good? Yes, it could be. But there's a serious danger of it being another tool for mass surveillance, consumerism and corporate control.

<sup>19</sup> [www.theguardian.com/media/2017/mar/07/wikileaks-publishes-biggest-ever-leak-of-secret-cia-documents-hacking-surveillance](http://www.theguardian.com/media/2017/mar/07/wikileaks-publishes-biggest-ever-leak-of-secret-cia-documents-hacking-surveillance)

<sup>20</sup> [www.theguardian.com/technology/2017/mar/08/wikileaks-vault-7-cia-documents-hacked-what-you-need-to-know](http://www.theguardian.com/technology/2017/mar/08/wikileaks-vault-7-cia-documents-hacked-what-you-need-to-know)

<sup>21</sup> [www.blog.safecast.org/](http://www.blog.safecast.org/)

<sup>22</sup> [www.smartcitizen.me/](http://www.smartcitizen.me/)

<sup>23</sup> [www.publiclab.org/](http://www.publiclab.org/)

## Rethinking decentralisation

Late in 2016, I was invited by Mozilla's Open IoT Studio to think about decentralisation, particularly in rural environments. But first, let's start from the basics...

### Who I am and what I'm interested in

I'm a creative technologist. I come from an arts background. I'm a self-taught techie who has always been interested in how things work. I'm a really good Google-until-I-find-the-solution maker. I believe anyone can make things with the right guides and enough confidence.

I worked with the technology charity Raspberry Pi for over three years. Within this role, I got to travel the world, attending conferences and festivals where people discussed new technology and the power of making. I also designed and ran workshops, outreach and longer-form educational programmes. I returned to the freelance world in 2016 to have the opportunity to take part in projects like this. I also make tech with The Pi Hut, particularly focusing on making add-on boards for people new to making. Our aim is for our boards to do one thing well. Before all this, I ran an arts and tech venue in Norwich called Soup Lab.

Some things I'm generally interested in right now:

- A friendly framework/language to talk about IoT with non-techies
- Making IoT things with non-techies
- Why, how and if the internet is important to people with low or no connectivity
- Does IoT widen the divide between those with good connectivity and those without (if so, how do we deal with this?)

Why? Because if we want to make tech for everyone, then we need to include them in the progress.

### Talking about IoT and decentralisation

Within this project, I will be discussing IoT and decentralisation with people who have no experience of making technology and perhaps little experience in using it.

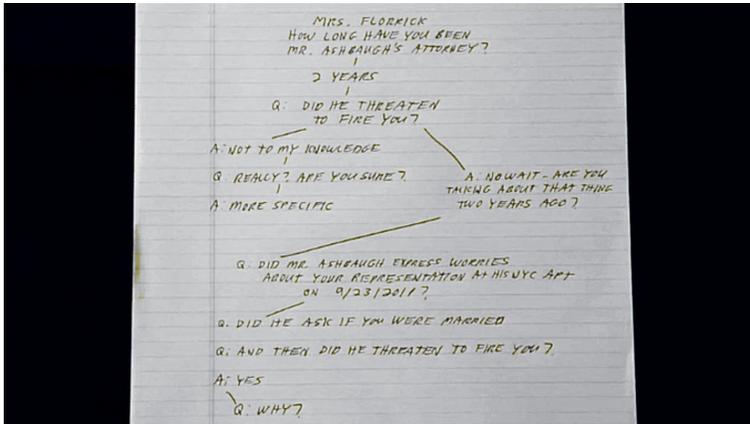
Before embarking on any project that involves participants of different skills and backgrounds, it's useful to reflect on the language we use. Using too much technical jargon in the initial stages of the discussion is a sure-fire way of alienating half your new team. We want to build confidence and skills, so don't want to dumb down the discussion; but with a little time and effort,

we can develop a narrative which leaves everyone feeling like they know what's actually being discussed.

*Sidenote: it can also help the technically-skilled members of your team to be reminded that we are talking about how the technology affects people, rather than the technology itself. Impact rather than solutions.*

### How I develop a narrative within a workshop/discussion

Have you watched the The Good Wife? Check out Decision Tree (S05E10). The characters are trying to predict how their opponent (each other) will question/answer in court. No-one is trying to trick the other into admitting something in our situation, but running which questions might be asked and how you answer them.



A balance of giving enough information and context whilst staying on-topic and within time constraints is an important skill in managing the narrative in a workshop. I also think a nice, big, mental bank of examples is really useful. Try and tailor your examples to the crowd you are talking to – children and teenagers don't care much about saving money on their central heating. So let's give it a go with IoT. First, to introduce what the Internet of Things is...

The Internet of Things (IoT) is the inter-networking of physical devices... embedded with electronics, software, sensors, actuators and network connectivity which enable these objects to collect and exchange data.<sup>1</sup> It makes sense to me, but would be difficult to explain to my grandma. How about we start with...

**Me** IoT is made up of computers that talk to each other.  
**Group** Why would they need to?

<sup>1</sup> Internet of things, [https://en.wikipedia.org/w/index.php?title=Internet\\_of\\_things&oldid=781813467](https://en.wikipedia.org/w/index.php?title=Internet_of_things&oldid=781813467) (last visited May 23, 2017).

**M** They can exchange information. They can use that information to make better decisions in whatever they are doing, e.g. if my central heating knows I'm on holiday or late at the office, it can save energy by not turning on until I return.  
**G** How does the computer know I'm on holiday or late?  
**M** These computers generally have inputs and outputs.

An input might be a sensor (it might be able to sense the temperature, light levels or pollution in the air); or an input might be information from the internet (like the weather forecast) or information on your phone (like your GPS co-ordinates). An output can be almost anything. It can control relays (which act as an on/off switch for any device – like a boiler, fan or smoke machine!). The output might be light (a display panel or an LED light) or sound (an annoying buzzer or a song).

So in this example, your phone uses its GPS sensor to collect your location data, then sends this information through your data plan to a computer in your home on the wi-fi. That computer takes the information and runs some code that says, "I expect Rachel to be home by 6.00, but her phone says she is in Hawaii, so I won't turn on my relay controlling the boiler until her phone tells me she is close by". This is usually when participants feel confident enough to start to think about useful inputs and outputs for themselves. This is a very simple example, but I hope it goes some way in showing how we can start discussions about what IoT is with absolutely anyone.

So, the tech-savvy among you will notice I left out part of the data's journey in the example above. Rather than my phone talking directly to the computer in my home, it actually talks to a central server in the cloud, owned by a company that made my boiler's relay.\* This is described as a centralised system because, rather than data going from one device directly to another, it all gets beamed up to a central system to be processed and either collected or acted upon. I'll talk a bit more about why this is important in the next section.

### Decentralisation

When we discuss decentralisation within IoT, we're often talking about:

- Advocating for an alternative to all IoT services being managed by a few big companies
- Security and data ownership
- Local networks

These concerns interweave, but I attempt to tease them out. It's worth noting that these are issues which are still hotly debated about the world wide web, let alone IoT (a much younger technology). I certainly don't claim to have any definitive solutions, but let's examine these issues a little closer.

\*In fact the software system may be owned by a different company, the data might pass through several companies servers before it reaches the hardware.

## All IoT services run by a few big companies

So, why would this be a problem? Well...

- Lack of transparency. Everyone has experienced (i.e. ignored and accepted) the terms and conditions on services we use. Even when you do read them, it's often technical and legal jargon, making it unclear what these companies actually do with your information
- If the service is down, you may be left without the use of vital services in your home
- Redundant hardware. If the company goes out of business or is sold, or even just the product is discontinued, you may end up with hardware that no longer functions correctly
- Brand lock-in. These companies may make hardware that will only talk with other products made by them
- You need to be connected to the world wide web

For balance, some advantages that big companies have:

- Security. You would hope they would have the money and expertise to make sure your data is safe. More on this later
- Money for product innovation
- Money for advertising and public education

Often, people will understandably feel that they have no choice but to choose products made by the big companies. However, when we spend money or time, we are not only buying a product, but are also supporting a company. We can ask companies to change products and practices, and we can stop buying from them if they don't.

I invite people to think about seed banks (bear with me). In the last 50 years, crop diversity has massively diminished, reducing genetic diversity within each crop (fewer strains) and the number of different species grown. All over the globe, we have facilities where every strain of seed is carefully stored. We store them because if a virus, disease or climate change were to wipe out a particular species of crop, we then have an alternative strain we can try. But in the meantime, we would face unimaginable food shortages. We should promote diversity in our crops, because circumstances do change.

Within the IoT ecosystem, we may head towards a similar situation; where a few major companies control the majority of the IoT in our homes and cities. Unfortunately, there is no seed bank equivalent for IoT services – we can't just germinate another if ours catastrophically fail (e.g. through virus, human error, natural disaster). So we must make sure we support a wide range of companies now. Diversity is important. To push the analogy a little further, decentralised systems quarantine themselves from some of these threats. If you are not online, then someone would have to come and physically interfere with your system, which is much less likely.

## Security

I will be brief, because there is so much information out there on the web about IoT security failures. Imagine, for a moment, if every minute detail of your daily life – when you turned the light out to go to bed, when you woke up, when you turned the heating on, what you watched on TV, etc. – was owned by a company, and that data was breached. If we built primarily decentralised systems, not as much of our data would need to be stored on servers out of our control. I will share two links, which should be enough to freak you out:

- [haveibeenpwned.com](http://haveibeenpwned.com) – to see if any of your accounts have been compromised in any major security breach
- [insecam.org](http://insecam.org) – a large directory of insecure public webcams. These haven't been hacked, they have been left insecure by the manufacturers

## Data ownership

Do you own the data your device creates from you? Probably not. Who does? The manufacturers. Do you have access to it? Probably in a dashboard format. You may have to pay additional subscription fees to see more detailed data or historical data. Can you download the raw data and do your own analysis with it? Unusual. What is your data being used for? Research, personalised advertising, stored until the company figures out how it might be useful.

## Local networks

A local network is a closed network of computers. AN internet, not THE internet. You may also know them by intranet. In the context of IoT, you can imagine a network within your home. The devices do not have access to the web and data collected does not get sent to the manufacturer servers. Does my IoT lightbulb really need to be connected to the internet? Or would it be as effective when able to be controlled through my phone, only if it's connected to the home wi-fi?

Local networks mean that you know data does not leave your network. It won't be able to receive automatic updates from the manufacturer, but this also means it can't be terminated by the manufacturer either.

## My internet use and lack of connectivity

Since the start of the project I have taken a good look at my own internet use. I no longer visit my local library – I have an e-reader and access to more books than any library network could hold. I no longer go to the cinema or record shops – there's more TV, movies and music on my live streaming subscriptions that I could ever consume. I rarely go shopping at all – I have a delivery pass which means groceries, gadgets, clothes and even gifts arrive the next day, sometimes with a single button press.

This is unhealthy for me and not the future I want for others. Since this project started I have been making changes to become more decentralised. I use local shops and local public services. I'm still not a purist, I use some services and products made by big companies. It doesn't have to be all or nothing. Small conscious changes add up. Of course, I'm privileged enough to have a choice whether I use services or not. I have access to these delivery/online services because I live within range of distribution hubs and broadband junction boxes. This wasn't the case growing up in rural Norfolk, UK ~15 years ago. We had a dial-up connection through our telephone line (rendering our home phone useless) and limited to 6pm - 6am. I would play on Neopets, chat on MSN Messenger with school friends and if I was lucky, I could download up to 3 songs a night! I thought it was amazing.

The connectivity infrastructure didn't improve much in the following 15 years, and up until 2015 we still had to deal with broadband speeds close to dial up (and it still sometimes knocked out the home phone line). Forget about streaming any media, it was difficult to load image-heavy webpages. There was no phone coverage of any kind for around 4 miles in any direction.

The majority (but not all) of the UK is now within range; broadband in their homes, data signal on their mobile devices, couriers and supermarkets cater for their postcode. Even if all populated areas had the infrastructure to deliver services (and this is definitely not the case), this does not mean everyone has the economic means. It's incredibly easy to forget about those out of range. Some examples of lack of connectivity I've encountered in workshops:

- zero connectivity - Lack of equipment, technical expertise or economic situation. It could be that there's no infrastructure; no mobile data signal, no broadband
- limited connectivity - slow speeds, school blocking website, high cost of data
- intermittent connectivity - no internet at home, so must be accessed via a school, library or internet cafe. Connection effected by weather

## ATLIN

I was given the opportunity to work with the Open IoT Studio in Anstruther, Scotland. We were invited to a local school to talk about how IoT could solve their problems or make something interesting for them. I heard issues familiar from my own teenage years. They experienced zero mobile coverage and limited or intermittent broadband which caused particular problems with:

- carrying out web-based schoolwork/research at home (limited or intermittent broadband)
- social - staying in contact with each other when not at home (no phone coverage)
- not being able to check bus services or communicate with parents on travel arrangements

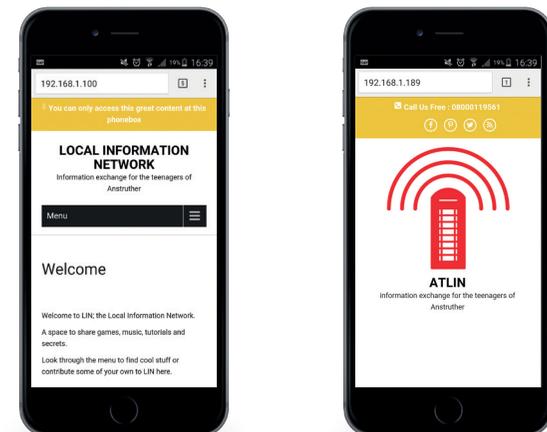
The group were interested in improving their situation; but rather than requesting better infrastructure, they wanted to build their own systems and use IoT in a fun, playful way. They wanted reasons to get out of the house and to do interesting things with others.

I enjoy working with teenagers. They always want to push against whatever is the current norm; not reinventing the wheel, but hacking and building on it to make it their own. It's an exciting attitude to be around, particularly when we have the ability to prototype their ideas so quickly.

With a couple of days to prototype, I worked with three teenagers to produce ATLIN - Anstruther Teenage Local Information Network - a local network housed within a red BT telephone box. You don't need any mobile data coverage or credit to access ATLIN, you simply connect to the wi-fi to access games, news, maps, timetables posted by teenagers of Anstruther. A simple Wordpress site means it can either be open to anyone to post new content, or users may have to be invited or request access.

We worked out how ATLIN would be powered (deciding on solar), built an enclosure together and embedded it in a local phone box. It was then loaded with content - including a downloadable zombie game modelled on the harbour where ATLIN is based, and music and poems about Anstruther - designed to be experienced in that spot.

Once tested, we discussed how this might be useful across the whole of the small town. What if ATLIN could be part of a mesh network? Although still not connected to the internet, each module could share ATLIN content. Could the ATLIN hardware have inputs: sensors, buttons, cameras? What are the pros and cons of an approval process for content? What if ATLIN has intermittent internet access - say, if someone took ATLIN home once a week to download an update from their home broadband, would that change how it could be used?



## Decentralising access to information through IoT

To explore some of these questions, we are looking to expand on this work by developing resources alongside small communities, enabling them to build resilient and decentralised services that are meaningful for their community. We are focusing on building technology which brings people together in a place, rather than making it easier for them to stay home. An important part of this process is providing simple educational resources, so that any changes or maintenance can be carried out by the community.

### Lewis and Harris

With this in mind, I visited Lewis and Harris, a Scottish island in the Outer Hebrides. Lewis and Harris is one of the least connected areas in the UK in terms of phone and data coverage. My aim was to find some people to talk to about perhaps developing something like ATLIN – a local network where people could leave content to share with others.

Although we had a contact on the island, the lack of connectivity made it impossible to reach them. We were also there during Storm Doris, and the high winds were apparently making the already poor signal much worse. We were on our own.

However, the upside of the weather being off-season was that every shopkeeper, Harris Tweed maker and whomever was taking shelter near us was more than happy to chat with us whilst waiting for a break in the rain.

Each time I began explaining IoT, decentralisation and ATLIN, I was directly or indirectly told that it wouldn't be of much interest here. Why would they travel to a phone box or whatever to look up things on their phone when they could talk and exchange ideas when they met at various other occasions? I felt I'd made a fundamental mistake. This community is a small population on a small island, and they are good at communicating without the internet – they have been doing it for a very long time. They didn't feel like they were missing out on news from each other, but they did want new information. Feeling disheartened, and worried this might have been a wasted trip, at first I hadn't noticed that every conversation found its way to my DIY techie campervan we were travelling in. We would talk about how the solar-powered battery was monitored; how power-hungry particular appliances were; how I kept track of water storage and use. I had a sensor, monitoring temperature and humidity, hooked up to the heater so it would regulate itself whilst being aware of the status of the battery.

Without realising, we were discussing how useful a decentralised network of sensors was in a (temporary) home. This happened again and again. This campervan was a perfect collection of prompts and examples. People began to imagine what useful things they could have in their home.

This wasn't the trip I had expected, but it ended up being full of great conversations about decentralised DIY IoT. After some more reflection, I realised having a tiny home on wheels was a great framework and physical prop to think about decentralisation – this is a home which, by definition, is off-grid. All those sensors that may feel irrelevant or self-indulgent in a 'real' house are really important in a rolling home. You need to keep track of your power usage and your water supply. If you run out of gas, you won't have any heat or cooking facilities. You must monitor your resources; and anyway, to make that easier is really welcome.

An additional benefit is obvious – it moves! We could visit all kinds of communities that don't normally get included in the discussion about IoT.

### #Vanlife and prototypes

The #Vanlife hashtag was not on my radar. It turns out that there is a massive community of people travelling and living in DIY campervans. As a side project, I built some tiny, cheap IoT modules that monitored temperature, humidity, battery voltage and GPS co-ordinates. The cheap wi-fi chip acted as an access point (you could connect to it as a wi-fi network). I've sent these out to various #Vanlifers and am now waiting to hear what we can do next.

### Rethinking decentralisation

I've started to think differently about decentralising access to information through IoT. Touring exhibitions are not a new idea. Neither are library buses (or bookmobiles). They have been touring rural areas in the UK since 1857!



Image: The Campervan used by Rachel Rayns to bridge open borders in the Hebrides.

# Making voice visible

## Or why we should investigate the anatomy of AI and networked devices

We, as the human particle of networked society, are visible in almost every moment of interaction with technology. We are constantly being tracked, quantified, analysed and commodified. But in contrast to our hypervisibility, many of the phases of birth, life and death of networked devices are covered with a cloak of invisibility. With emerging popular devices relying on a centralised AI infrastructure and invisible interfaces such as voice, for example, it seems that the cloak of invisibility is growing even bigger.

We have reached a point where the smooth and shiny aluminium surface of our devices is screwless, without visible entrance. We have lost the keyboards allowing us to code and create new worlds, and now we are losing visible interfaces that will be replaced with voice or gesture interfaces. With the so called 'cloud' and machine-learning technologies, computing and processing does not happen within our devices anymore, but in some big, grey building thousands of kilometres away. The actual devices, processing software and algorithms are somewhere else, or possibly in many places at the same time, but rarely within our reach. What we have, for example, in devices such as Amazon Echo, is just a few sensors and speakers. Not a lot to own on the user's side; not a lot to open, break, fix or remix.

### Many layers of invisibility

As is the case with networked devices, we can also speak about various other layers of invisibility:

- Invisibility of the network infrastructure and the so-called 'cloud' infrastructure;
- Invisibility of the production process, supply chains and materials being used in production;
- Invisibility of human labour related to many processes in the production of devices;
- Invisibility of the code hidden behind proprietary software;
- Invisibility of the overall energy consumption of the whole system;

And many other obvious or more subtle forms of invisibility that we have already related to networked devices. There are some forms of invisibility that are specific and emerging when we speak about voice interfaces as an extension to AI and machine learning infrastructures in comparison to the network infrastructure that we have investigated in our previous work.

On one hand, at the front we have basically invisible interfaces; but then, deeper at the level of the heart of the process, in the darkness of neural networks and machine learning, we are seeing new forms of invisibility –

invisibility of the process of machine deduction itself. In previous years, in academic, policy and activist circles, there was a discourse related to the importance of algorithmic transparency. We can't say that some clear solution emerged from those discussions; and the problem of algorithmic transparency is still very much on the table. But, if we speak about machine-learning algorithms that are responsible for models behind voice interfaces, for example, we are facing a potentially even deeper problem.

By its nature, deep learning is a particularly dark black box<sup>1</sup> and it is hard to believe that we will be able to audit why one neural network deducted something – or, let's say, discriminated someone – by looking into the hidden layers or nodes of the neural network. Those processes will probably stay hidden within hidden layers of the neural network. This phenomenon has a name: The Black Box of AI. Once one neural network is trained, it is really hard to understand why it gives a particular result to a set of data inputs. This can be a critical point or obstacle in building trust in AI judgement and a handful of research institutions and academic researchers are exploring this topic.<sup>2</sup>

But probably our attention in the process of revealing layers of invisibility should not be just on the layer of neural networks and deep learning itself, but equally on the input layer, or let's say schoolbooks, datasets or feeds of information that one AI reads. It looks like it has never been easier to build AI or machine learning-based systems than it is today. Availability of open-source tools for doing that in combination with easy, accessible computation power through cloud oligarchs such as Amazon (AWS) or Google (Google Cloud) is giving a fake idea of accessibility, openness and decentralisation of AI revolution.

We can say that having your own neural network is becoming more and more accessible from the point of setting up your own system; but when it comes to datasets needed for teaching those systems, we are facing many new problems. Training datasets became the ultimate resource for development of future machine learning or AI and they are heavily protected behind the proprietary walls of a handful of usual suspects. Here we are seeing the same concentration of power, accumulated through surveillance economy and massive data hoarding practices in the last decade, becoming a crucial resource for development of new, even more asymmetric power and the creation of an even bigger gap between the big five and the rest. In their system of immaterial labour exploitation, our new task is to feed their neural networks with our behavioural data, voice, tagged pictures and videos or medical data.

Another interesting angle on this issue is bringing us back to the old but never resolved and slightly forgotten issue of ownership and copyright over content. In 1989, Microsoft's founder Bill Gates started a company, Interactive Home

<sup>1</sup> [www.technologyreview.com/s/604087/the-dark-secret-at-the-heart-of-ai/](http://www.technologyreview.com/s/604087/the-dark-secret-at-the-heart-of-ai/)

<sup>2</sup> Such as Jeff Clune at the University of Wyoming and Carlos Guestrin at the University of Washington, Tommi Jaakola and Regina Barzilay at MIT and Explainable Artificial Intelligence (XAI) at DARPA



*Image: Lunch atop of Skyscraper. The glass negative of this picture is now owned by Corbis, who acquired it from the Acme Newspictures archive in 1995. The negative at some point long ago was broken into five pieces.*

Systems that would later become Corbis,<sup>3</sup> one of the “big four” of digital image archives. The collection owned by this company contains the world’s biggest archive of historical photos from the 19th and beginning of the 20th century.<sup>4</sup> It is not hard to believe that such an archive, that is essentially a private property, with millions of historical photos can be an interesting dataset for training of future AI. This brings us to the issue of ownership over the archives of digitised media from the past and new forms of power and wealth that can be created on privatised recordings of our history.

Even further, development of AI and big data analysis can create new asymmetrical power between quantified societies that have developed culture and practice of archiving and quantifying their heritage, history and present and on the other hand societies and cultures, usually in developing countries, without such practices. This can potentially enhance the gap between the first world and developing world, empower old and create new forms of hegemony and digital imperialism.

The personality of future AIs will be based on publicly available and proprietary datasets. Oddly enough, two popular publicly available datasets nowadays are a collection of 1,495 TED Talks audio recordings with full text transcriptions of those recordings and a database of half a million emails

<sup>3</sup> Sold in 2016 to Visual China Group

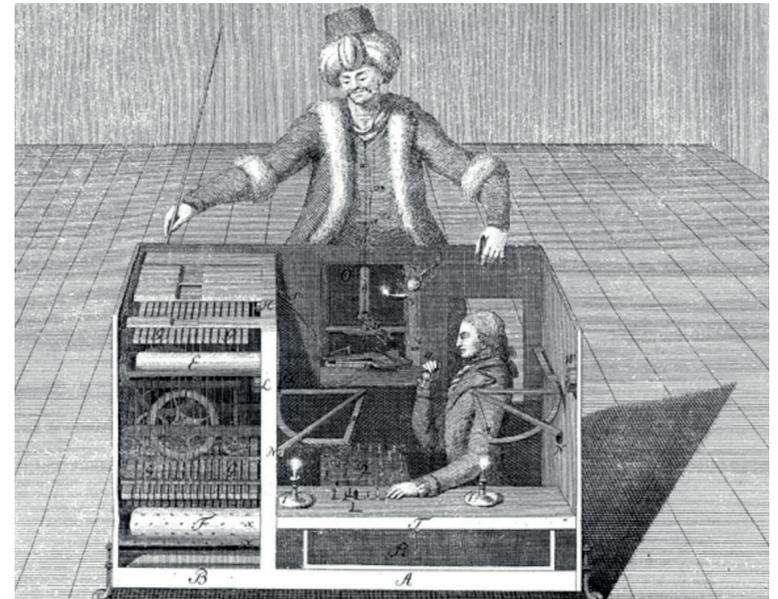
<sup>4</sup> Including most of the iconic photos such as Lunch atop a Skyscraper, photo of Einstein with thong or photos from Tiananmen Square protest

that once belonged to senior management of Enron Corporation. Even deep learning does not work exactly that way – I found it extremely funny, and at the same time frightening, to think about an artificial person that could combine the personality of an Enron manager and ‘how to save the world’ TED-Talks-presentation-on-steroids narrative.

Our potential hypothesis here is that, if we are speaking about the transparency of one device or product based on machine learning and neural networks, we should ask for transparency of the datasets and feeds that were used in the process of teaching the said network.

It seems that the hardest part of this game is not just massive data collection and ownership over content, but tagging and labelling the collected content. This process potentially can reveal another interesting aspect – thousands of hours of hidden, low-paid human labour.

In 1770, Wolfgang von Kempelen constructed an automaton known as the Mechanical Turk chess-playing machine with the goal to impress Empress Maria Theresa of Austria. This device was capable of playing chess against a human opponent and had great success in winning most of the games played during its demonstrations around Europe and the Americas for almost nine decades. But, apparently, the Mechanical Turk was, in fact, a mechanical illusion which allowed a human chess master, hiding inside, to operate the machine.



*Image: [upload.wikimedia.org/wikipedia/commons/2/22/Tuerkischer\\_schachspieler\\_racknitz3.jpg](https://upload.wikimedia.org/wikipedia/commons/2/22/Tuerkischer_schachspieler_racknitz3.jpg)*

Some 160 years later, Amazon.com branded its micropayment-based crowdsourcing platform with the same name. According to Ayhan Aytes,<sup>5</sup> Amazon.com's initial motivation to build Amazon Mechanical Turk emerged after the failure of its artificial intelligence programmes in the task of finding duplicate product pages on its retail website (Pontin, 2007). After a series of futile and expensive attempts, the project engineers turned to humans to work behind computers within a streamlined web-based system. Amazon Mechanical Turk digital workshop emulates artificial intelligence systems by replacing computing with human brainpower. As explained by Amazon: With Amazon Mechanical Turk, it may seem to your customers that your application is somehow using advanced artificial intelligence to accomplish tasks, but in reality it is the 'Artificial Intelligence' of the Mechanical Turk workforce that is helping you effectively achieve your business objectives.

As observed by Aytes, in both cases (the Mechanical Turk from 1770 and the contemporary version of Amazon's service), the performance of the workers who animate the artifice is obscured by the spectacle of the machine.

This kind of invisible, hidden labour, outsourced or crowdsourced, hidden behind an interface and camouflaged within algorithmic artificial processes, is not so rare, especially in the process of tagging and labelling thousands of hours of digital archives for the sake of feeding the neural networks.

The Californian dream of liberated superhumans enchanted by AI powers in a global networked society tends to spotlight and glorify the shiny top of the pyramidal, knowledge-based aristocracy working in great and corner offices illuminated by year-long spring sunlight, ignoring many hidden invisible layers of human labour outsourced and located on the other side of the planet. Writing about the definition of digital labour, Christian Fuchs<sup>6</sup> is arguing that the creation of digital content (similar can be claimed for the production and maintenance of machine learning and AI systems) requires a technological infrastructure which is produced and maintained by labour processes that include diverse activities such as slave-labour extracting minerals that form the physical foundation of information technologies, the labour of militarily-controlled and highly-exploited hardware assemblers who work under conditions of Taylorist industrialism, a highly-paid knowledge labour aristocracy, precarious digital service workers, as well as imperialistically-exploited knowledge workers in developing countries, workers conducting the industrial recycling and management of e-waste, or highly hazardous informal physical e-waste labour (Fuchs, 2014, 2015).

In order to have a complete picture, it is important not to neglect the materiality of AI systems and networked devices or what Jussi Parikka describes as the geology of media. From thousands of burning cores of NVidia GPUs within gigantic data centres around the globe to hundreds of thousands

<sup>5</sup> *Digital Labour, Chapter 5: Return of the Crowds*

<sup>6</sup> Fuchs, Christian. 2016. *Critical Theory of Communication*. Pp. 47–73. London: University of Westminster Press. DOI: [dx.doi.org/10.16997/book1.b](https://doi.org/10.16997/book1.b). License: CC-BY-NC-ND 4.0

of nodes of internet infrastructure needed for transmission, the materiality of services such as Amazon Alexa, for example, is not something that we should forget. Each of these components has its own history starting with millions of years' deep time of geological processes followed by dynamic periods of metal extraction from the Earth's crust in deep mines, traded by the shady guilds of the metal merchants, millions of kilometres of cargo transportation, complex fractal production chains, sophisticated and long processes of chip production, long assembly lines of Chinese megafactories, and long journeys of international product flows.

Here, invisibility is achieved through the complexity of the production process. The fractal supply chains of one sophisticated technological device – either one that is hidden within the walls of data centres or the interface in our homes – are comprised of thousands of suppliers providing different components that, in turn, have their own supply chains. The complexity of this system is so vast that the microchip manufacturer Intel,<sup>7</sup> for example, took two years to identify whether there were any materials from Congo in their chips. As stated by the researchers from the Oxford Internet Institute in their project, Wikichain:<sup>8</sup>

“Contemporary capitalism conceals the histories and geographies of most commodities from consumers. Consumers are usually only able to see commodities in the here and now of time and space, and rarely have any opportunities to gaze backwards through the chains of production in order to gain knowledge about the sites of production, transformation and distribution”.

One can say that there is nothing new compared to the already known discourse on sweatshop practices related to, for example, shoe or apparel production existing since the early 1970s, or basically any other colonial or neocolonial practice in past centuries. And that is probably true. But one important difference is that production of contemporary technological devices is, in most cases, much more complex and even more difficult to trace, investigate and audit.

We propose to map and create a visual representation, an exploded view of the deep anatomy of existing devices, based on voice interfaces and machine learning technologies, showing how their extended bodies consist of user interface devices, network topologies, architecture of data centres and core natural language processing and deep learning systems. The idea is to map and potentially spot new black boxes and different forms of invisible surroundings of the development of AI and voice enabled interfaces, so we can try to create new methodologies for future investigations and potential audit of such systems.

<sup>7</sup> [www.intel.com/content/www/us/en/corporate-responsibility/conflict-free-minerals.html](https://www.intel.com/content/www/us/en/corporate-responsibility/conflict-free-minerals.html)

<sup>8</sup> [www.oii.ox.ac.uk/research/projects/wikichain/](https://www.oii.ox.ac.uk/research/projects/wikichain/)



## Making bridges

Image: Paul Sandby, *The Welch Bridge at Shrewsbury* (1798)

**Andrew:** I'm a medieval historian, and I'm fascinated as to whether there are any lessons from the Middle Ages which might be relevant to us in our connected digital society. It's not as unlikely as it seems: Eric Raymond, in his powerful manifesto for open source methods, *The Cathedral and the Bazaar*, which was an important influence in the creation of Mozilla, drew a comparison between cathedral building and proprietary software (top down, directed by a few gurus, highly structured, slow) and medieval marketplaces and open source (bottom up, growing haphazardly and organically, non-hierarchical). I'm not completely convinced about Raymond's analogies – cathedral building was more organic than he suggests and medieval bazaars were more tightly controlled – but it's a powerful vision and has been a major influence on the open source movement.

But there's a third medieval achievement that Raymond doesn't mention and also seems to suggest perspectives on our current concerns, and that is the medieval bridge. David Harrison, in his fascinating study of *The Bridges of Medieval England: Transport and Society 400-1800* (Oxford, 2004), has shown how one of the amazing achievements of the Anglo-Saxons was to establish the shape of much of the modern road network by about the time of the Norman Conquest. From the eighth century onwards, medieval carpenters and masons put in place the shape of the modern road bridge network, first in wood and afterwards in stone. The medieval network provided the framework for land communication in Britain until the late eighteenth century, when increased traffic and reduced costs led to a second great age of bridge building.

What is fascinating is the way in which the building and maintenance of these bridges was integrated into medieval society. Anglo-Saxon tenants were obliged to help look after the bridges as a condition of their landholding. The church offered remission of sins to anyone leaving money for the upkeep of bridges. Chapels were built on the bridges to encourage bequests and gifts for the bridge. Hermits collected money for the bridge and helped with running repairs. The London Bridge Trust, which manages land left in the middle ages for the upkeep of London Bridge, is still a very wealthy charity today.

How do we achieve a similar public engagement with our digital infrastructure? The cables and routers that define the internet constitute a network which is just as remarkable as the bridge network described by Harrison. But we hear much less about keeping this network open than we do about the creation of the software and operating systems which run the computers. Just as bridges were as important as cathedrals and bazaars in the middle ages, so it is just as important that our digital infrastructure is open and that there is a public stake and involvement in it.

We can all contribute to creating open software and content, but how do we contribute to open networks. What is the infrastructural equivalent of the medieval chapel on the bridge, engaging the community in maintaining an open network in which the community has a stake?

**Jon:** This is fascinating, Andrew – what a wonderful brief history of bridges. I am always amazed at the way you reach across human history to remind us that, as a society, we have recurring challenges. It reminds me of the famous phrase by another remarkable author of brief histories, Stephen Hawking, where he describes the predictability of the universe: “Thus it seems Einstein was doubly wrong when he said, God does not play dice. Not only does God definitely play dice, but He sometimes confuses us by throwing them where they can’t be seen.”<sup>1</sup> It seems that despite the laws of physics giving us an indeterministic universe, we seem entirely bereft of these laws as we play out societal behaviour on a human scale, where we choose to throw the same numbers time and time again.

When we think about the bridges that digital infrastructure provides, for me it’s less one of cables and routers, or even of open software movements, and more one of an abstracted bridge between those who are in power and their effect on human lives – because I’m not even sure we know what this looks like. We can very keenly feel the positive effect of communication. Skyping my father for the first time was a powerful reminder of emotional connections between people that the internet can bring. We were in a log cabin in a trout farm, close to the medieval Slovenian town of Kamnic, en route to our camping holiday in Croatia (a location we found on Google maps and booked through booking.com); my dad was in his greenhouse and using his new tablet. He never quite got the usefulness of digital until now – perhaps that’s my fault as the bleeping pixels of my early (and last) attempts at creating video games on my ZX Spectrum in 1983 might have put him off! Thankfully for him, the science fiction I was reading at the time has become a reality in his lifetime. I’m not on social media, but the social bridging capacity of Facebook is remarkable. And with new bridges comes new power. I guess that’s obvious in the way that bridge destruction is one of the first acts of warfare.

With the Internet of Things comes a new design in the bridge-building between humans and remote control. I have already discussed this elsewhere in this book in an essay with my colleague, Michelle Thorne, in Mozilla’s Open IoT Studio, where we talk about the ways in which IoT is amplifying the social power of computation at a level I don’t think we’ve seen since the industrial ages.

So, with these new social and economic bridges brought by the IoT, I’m really interested in learning about the economic, social and cultural power that actual bridges gave in medieval times. What shifts did they make to previously unconnected places? What impact did this have on the people at the receiving end of a new bridge? Was it a celebration at both sides? Bridge-building now seems to be a highly collaborative act. Wall-building is the opposite, but was it always that way? As you’ve pointed out, Andrew, we need to find ways to have medieval levels of public engagement with our digital infrastructure. I’m worried that we’re becoming a society of consumers, not of contributors; that there is no public appetite to first of all see the invisible bridges being built by computation and, secondly, that if they do that, there’s

<sup>1</sup> [www.hawking.org.uk/does-god-play-dice.html](http://www.hawking.org.uk/does-god-play-dice.html)

an enormous societal shoulder shrug of “why should we care?”. After all, in medieval times, if a bridge was taken down, then social connections, trade and societal welfare were at stake. Since Facebook, Google and Amazon are doing such a great job, why should anyone care?

**Andrew:** A bridge was a very visible expression of a community’s wealth and power. Some of the structures illustrated in David Harrison’s book are amazing. The Dee Bridge, in Chester, was built in the mid-fourteenth century and some of the spans are as big as sixty foot across. The bridge looks asymmetrical, because the stonemasons took care to site the bridge piers on the firmest parts of the river bed. Or there is the Framwellgate Bridge, in Durham, dating from the twelfth century with ninety-foot spans. Almost nothing as big was built again until the reign of Queen Victoria. And, of course, people lived on bridges. There is a terrifying description of the collapse of the 500-year-old bridge at Newcastle during floods in 1771, and the families who lived in the houses on the bridge huddling for safety on small slabs of stone on the collapsed piers.

The visibility of medieval bridges was an expression of the way in which they were an integral part of community life. Part of the problem about our modern infrastructure is that it is invisible. We simply switch on our wi-fi and don’t think much about the cables that cross the Atlantic, the switching stations at Cornwall where the internet comes ashore, the green street cabinets that are necessary for our home internet connections. We think of the cloud as something ineffable and incorporeal, and forget about the huge and environmentally damaging data centres operated by companies like Google and Amazon. So long as we think of the web as an immaterial magic presence, we won’t feel much sense of a bridge with those companies and governments who exercise power through the web. If our engagement with the web is as a dematerialised entity, then it is not surprising that we start to think it is natural that our guide to the web should be a disembodied voice.

So, I think part of the answer to Jon’s concerns is to make the materiality of the web more visible. We need to think we can take ownership and control of the web, and that’s easier when it looks like something we can control. That’s why I love some of the work Jon and Michelle have done with Mozilla Foundation’s Open IoT Studio. Rachel has already described how, during an event in Anstruther in Fife last year, they used IoT methods to turn a redundant phone box into a local community information centre. That’s making the web visible and putting it in the heart of the community, like a medieval bridge. I also love the way that Helen Manchester and the Tangible Memories team at the University of Bristol have been using IoT methods to work with primary school children and the elderly to improve the sense of identity and happiness of those in residential care. By making the IoT as visible in our community as a medieval bridge, we can use it to build bridges between ourselves and to resist corporate brainwashing. Alexa is not a goddess. She gets her information from us. Look up ‘London Bridge’

on Google – you will see a panel that gives you all the essential data on the bridge, telling you that it is, for example, 269 metres long and that it is a box girder bridge. This is the sort of information that Alexa and Siri might use in answering your questions. It is derived by Google from resources like Wikidata. But the process of squeezing a lot of information into Wikidata creates distortions. The Google panel states that construction of London Bridge started in 1824, when Rennie’s now-demolished bridge was begun, not the present bridge which was started in 1967.

But we can take ownership of this information. We can suggest a Google edit, and we can edit the Wikidata information. We can help keep the data on the internet in good repair, just as medieval people regarded it as a communal task to keep a bridge in good repair.

Of course, medieval people did not always work willingly on bridges. Bridges are also about power. At the entrance of London Bridge, they used to put the heads of traitors on spikes; a grisly reminder of royal power. It seems that a lot of Anglo-Saxon bridge-building was connected with the growth of defensive networks against the Vikings. But there was an engagement between the community and this power, because everyone recognised the value of the bridge. Likewise, we all recognise the value of the internet and we need to act together as a community to keep it healthy.

**Jon:** I’m glad you mentioned Alexa, because this is where we come to the most powerful bridge of all – the human voice. From before we are born, we start to become attuned to the voice of our mother; our neural pathways are being formed so that, by the time we reach early childhood, we can all speak our native language. As Chomsky puts it: “It is unimaginable that a highly specific abstract and tightly organised language comes by accident into the mind of every four year old child”.<sup>2</sup> Our use of ‘mother tongue’ shows the bridge to our closest relationships and our use of language. And now we have highly sophisticated natural language processors that are able to connect us to centralised computation. If we throw in another of Chomsky’s principles, decentralised power: “Classical liberalism – as developed, for example, by Humboldt – or much of Enlightenment thought was opposed to the church and the state and the feudal system, but for a reason: because those were the striking examples of centralised power. What it was really opposed to was centralised power that’s not under popular control. Nineteenth century corporations are another form of centralised power completely out of public control, and by the same reasoning we should be opposed to them”,<sup>3</sup> then we should be hugely concerned about what the voice can do for bridging between power and computation. My view is that the route to understanding power is to reveal it. I was introduced to the Serbian media activist Vladan Joler on our first Caravan<sup>4</sup> event that we ran with Quicksand at the National Institute of Design in India.

<sup>2</sup> [www.hawking.org.uk/does-god-play-dice.html](http://www.hawking.org.uk/does-god-play-dice.html)

<sup>3</sup> [chomsky.info/1991\\_01/](http://chomsky.info/1991_01/)

<sup>4</sup> [issuu.com/helloqs/docs/unbox\\_caravan\\_v4\\_web](http://issuu.com/helloqs/docs/unbox_caravan_v4_web)

The work of his Share Lab<sup>5</sup> that exposes the true nature of how we are all working for corporations such as Facebook and the extent to the power that they have over us. Which is why I love that you’re talking about people taking things into their own hands, yet this is a huge task. So few people understand this. It’s terrifying to see Facebook’s chief lobbyist, Richard Allen, having such a deep and long role in advising UK government policy.<sup>6</sup> We can only hope that the recent appointment of Nigel Shadbolt, chair of the Open Data Institute, will have a strength of voice to help the UK become a force for an informed, independent and leading role in an alternative narrative to Silicon Valley. I think it’s time we listened to people such as Bruce Sterling, who talk openly about a line in the sand between what Silicon Valley stands for and what a decentralised alternative could stand for.<sup>7</sup> This is something we picked up on with our friends Babitha George and Romit Raj at Quicksand, where we were inspired by their work exploring decentralised ways of working in India. In their open workbook, *Salvage: Decentralising the Internet of Things*,<sup>8</sup> they present a series of case studies which show how India has always had a decentralised narrative. At the heart of this is the Gandhian dream that places the welfare of people ahead of centralised profits. For me, the way in which Gandhi re-empowered a nation to overthrow a brutally oppressive regime (the British) using a simple homemade spinning wheel is an incredible example of power that comes from decentralised making: “Machinery, in the past, has made us dependent on England, and the only way we can rid ourselves of the dependence is to boycott all goods made by machinery. This is why we have made it the patriotic duty of every Indian to spin his own cotton and weave his own cloth.”<sup>9</sup>

The reason why I’m collaborating with Mozilla in forming the Open IoT studio is that I believe that the narrative towards a decentralised, open and more human internet is being led through their Internet Health<sup>10</sup> movement. It’s the start of something that places human value in the web first. For me, the framing of the health of a system is a start towards making the invisible bridges much more visible.

**Andrew:** Which brings us back to the medieval bridges. The eighth and ninth centuries saw the construction of a bridge network whose scale remained unmatched until the growth of the canals and railways. But a lot of that network was the result of local initiative, admittedly encouraged by the crown. It is a big task to confront the power of the giant corporations. Mark Zuckerberg and Jeff Bezos can’t be as easily headed off by legislation as the oil and steel barons of the last century. We need to look to other times and other cultures for inspiration. The kind of exciting creativity we have here at the Digital Design Weekend sums up precisely the spirit we need to keep the internet healthy.

<sup>5</sup> [labs.rs/en/](http://labs.rs/en/)

<sup>6</sup> [www.gov.uk/government/groups/digital-advisory-board](http://www.gov.uk/government/groups/digital-advisory-board), [www.gov.uk/government/groups/gds-advisory-board](http://www.gov.uk/government/groups/gds-advisory-board)

<sup>7</sup> [www.youtube.com/watch?v=6vtwoUugXrQ](http://www.youtube.com/watch?v=6vtwoUugXrQ)

<sup>8</sup> [superworkbook.com/loT/](http://superworkbook.com/loT/)

<sup>9</sup> Brown, T., and Fee, E. (2008), *Spinning for India’s Independence*, *American Journal of Public Health*, 98(1), p. 39

<sup>10</sup> [internethealthreport.org/v01/](http://internethealthreport.org/v01/)



## Endangered languages go digital: a matter of urgency

*Image: Waiting for the Imam (recording of sermon\_002). Koukouba 2011. Photo by F. Seidel.*

Imagine for a second that the way you think and talk about your favourite topics, the way you joke or create poetry, the lullabies and prayers you grew up with or that particular word that embodies your system of values is on the verge of oblivion. And it is on the verge because there is no one who speaks your language. That is what happens when a language vanishes.

That is the reality millions of people around the world are facing and will be facing for the next century. Languages fall silent, speakers give up their languages because their ways of life are changing so fast. Globalisation, urbanisation and climate change are having a profound effect on peoples; to make sure that they and their children have a future they move to cities and they speak the language that gives them access to education and jobs. In many cases, they stop speaking their own language altogether.

The extinction of languages around the world advances at a rate equivalent to the loss of the 5th mass extinction of dinosaurs. We are losing our linguistic diversity at a dramatic speed, with little record of its depth and breadth. The Endangered Languages Documentation Programme tackles this reality by providing funding for research and a digital platform, the Endangered Languages Archive, for these languages and the people who speak them.

We strive to give visibility to these speakers and their languages and to ensure that their cultural heritage isn't lost in the Information Age. What we are facing is a humanitarian crisis whose true extent cannot be grasped by listing simple facts and figures:

### **How many languages are spoken in the world today?**

We estimate that there are between 6,000 and 7,000 languages spoken in the world today, and these are only the spoken languages, not including sign languages or whistled languages. The human capacity for language is our unique trait and sets us apart from all other species. Humans have developed this rich linguistic diversity and this is what we are losing today. They are vanishing without a trace because they do not have a writing system and they have never been recorded or described. What are we losing? We lose the knowledge about the ways of life, about our cosmologies, about how to make things and how to relate to each other. All of this is encoded in our languages in unique and specific ways, shaped over centuries of language use.

### **Who speaks all those languages?**

Roughly speaking, 50% of the world's population speak 50 languages, while the other half speaks the remaining 6,950 or so languages. Of course, these are just estimations, because languages are in fact very difficult to count. Sometimes they are used only in certain rituals, other times they are hiding as a 'dialect.' This means there are languages that are spoken by 300 people and others that are spoken by 200,000 and these are all small languages.

### Then, what exactly do you do?

We train linguists and speakers to create a digital record of their language as it is spoken today before it falls silent, before the last speaker dies. We give grants to go to places such as Papua New Guinea or to Brazil or to the USA to work with the remaining speakers and to record their knowledge. We preserve their recordings in our digital archive and make it available to speakers, researchers, artists and the public. For the future, we will have a record, in digital form, of human linguistic diversity as it is today.

### How do you document a language?

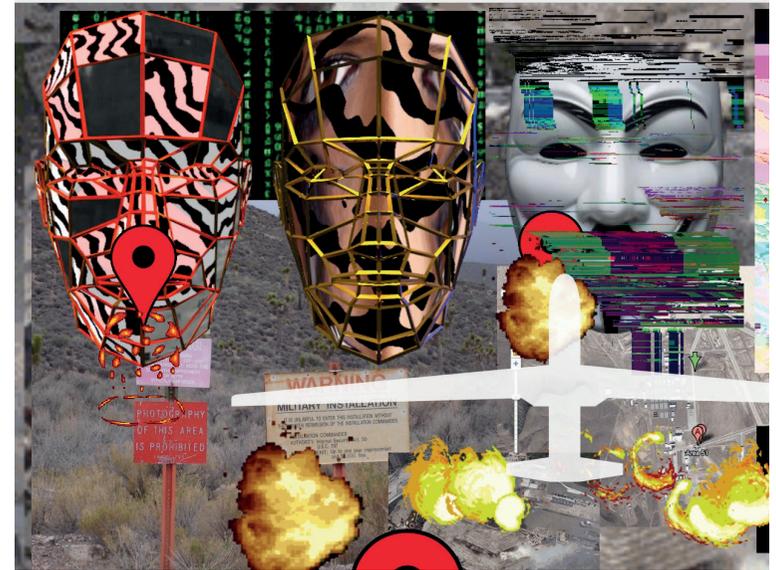
You go and live with the community and begin to learn from them about their ways of life and about how they say things. You record their conversations and their stories and their histories and everything they want to be preserved. Together, you and the speakers transcribe and translate the recordings and the linguist will analyse them and write a grammar. And often they compile a dictionary of the words of the language. For the children, they create story books and primers so they actually can teach the language to the children that do not speak the language anymore.

### For example?

Between 2003 and 2016, ELDP has helped document 468 languages across 77 countries. These are just a few of them: Blablanga (Solomon Islands), Zorostrian Dari (Iran), Chimane (Bolivia), Ikaan (Nigeria), Tarahumara (Mexico), Tundra Nenets (Russia), Great Andamanese (India), Zaghawa (Sudan), Chulym (Russia), Sri Lanka Portuguese, Jul'hoan (Namibia), Nkami (Ghana), Lakota (USA), Duoxu (China), Enets (Russia) and many more. Some of these languages are now extinct but, in other cases, the communities are working actively to reverse the process and keep passing the language on to younger generations.

### And why are you exhibiting at the V&A?

When our fieldworkers come back after months of work, often in very remote areas and/or in politically and socially very difficult situations, they bring back an SD card. One SD card which contains the only record of a universe of knowledge encoded in an intricate system we call language. An SD card which contains the images of speakers who have never seen a computer or a webpage but whose grandchildren and great-grandchildren will be able to see their roots and their heritage in 20, 30 or 100 years. Our grantees spend months in the field, and when they come back and plug in their SD cards, a world view becomes part of our shared digital world, enriching and diversifying it with its unique take on the human condition.



## Copyright, culture and creativity

I am a child of the mid-eighties – born in the last year of being a Digital Native but somehow still a Millennial – so the punk, lo-fi indie, grunge and all other ‘underground’ movements of the ‘90s and earlier largely passed me by the first time around. These movements were celebrated for going against the mainstream, led by visionaries who would, the media proclaimed, eventually give us the tools for free thought and bring an end to bland pop culture.

But a strange thing happened. They were absorbed by the mainstream media and what they had achieved – an aesthetic, a music genre, a fashion – was sold back to us at a premium as a way for us to buy into the culture. Take, for example, urban culture. In her 1999 book, *No Logo*, Naomi Klein highlights how brands would “search out pockets of cutting-edge lifestyle, capture them on videotape and return to clients like Reebok, Absolut Vodka and Levi”.

Over the past decade, young black men in American inner cities have been the market most aggressively mined by the brandmasters as a source of borrowed ‘meaning’ and identity. This was the key to the success of Nike and Tommy Hilfiger, both of which were catapulted to brand superstardom in no small part by poor kids who incorporated Nike and Hilfiger into hip-hop style at the very moment when rap was being thrust into the expanding youth-culture limelight by MTV and *Vibe* (the first mass-market hip-hop magazine, founded in 1992). “The hip-hop nation”, wrote Lopiano-Misdorn and De Luca in *Street Trends*, is “the first to embrace a designer or a major label, they make that label ‘big concept’ fashion. Or, in their words, they ‘blow it up’”. Which is why the cool hunters’ first stop was the basketball courts of America’s poorest neighbourhoods.

As we have seen since hip-hop came into the public eye since the 1980s, this urban culture has been appropriated and sold back to us at a premium, directly targeting the poor neighbourhoods from where it came. But who from these poor neighbourhood estates can readily afford to buy back the culture they created at such a premium?

This trend of cool hunting is still with us now, but in a somewhat accelerated way. Niche communities, which in pre-internet days may have had a handful of members, are now connected in large numbers over geographically diverse locations. Look for any interest and you can find a vibrant internet community surrounding it. Sites like 4chan, Tumblr, Reddit and Twitter are full of people celebrating their niche interests over hashtags, forums and Tweets. These sites can act as fertile ground for brand developers to go about their cool hunting with little effort. They don’t need to send people out to physical locations to film people going about their activities. They can simply browse a website, observe communications between its users, build statistics on its activities and assess whether what they are doing is worthy of being a target to extract from.

Such a community target by the cool hunters may feel the positive effects of this – a feature on *Vice*, increased activity, financial investment, etc.

But the effects of this can be detrimental to the community and its identity. Take, for example, the case of Rihanna and her brief foray into Seapunk aesthetics. In 2012, she performed her song *Diamonds* live against a green screen on *Saturday Night Live*. What we saw on our screens were the lo-fi ‘net’ aesthetics of Seapunk that could have easily been lifted from the many Tumblrs of prominent Seapunk artists and musicians.

Seapunk, for the uninitiated, and according to the ever-reliable Wikipedia: is a subculture that originated on Tumblr in 2011. It is often associated with an aquatic-themed style of fashion, 3D net art, iconography, and allusions to popular culture of the 1990s.

Spend five minutes on the Seapunk Tumblr tag and you’ll have enough information to understand its appeal. Whilst it’s true that no one person or community can lay claim to an idea or aesthetic, to many it felt like this was an appropriation and exploitation of an aesthetic that they helped create. Worse still, there was no reference to the culture from where it came and no involvement from the community. This was the internet equivalent of the cool hunters scouring the streets of America’s poorest neighbourhoods.

This is by no means the only instance of the corporate appropriation of niche ‘underground’ internet cultures. Brands *Saying Bae*, a now-defunct Twitter account, would document these cringeworthy attempts at using internet culture to relate to its customers and, as always, sell more products. From a marketing standpoint, it’s not hard to understand why this approach would be taken. Memes are a widely-used method for people of all ages to quickly communicate an idea.

The rational amongst us note that, really, no one person can dictate how a popular idea is used. Once an idea is there, it’s up for the taking. Nick Briz, in response to the Rihanna performance and inspired by *Touch My Body* by Oliver Laric, started the *Diamonds (Green Screen Version)* project. He re-green-screened a section of the performance and gifted it back to the internet with the intention that they remix it and add their own aesthetic.

However, Nick Briz, quoting Jacob Ciocci, reiterates the rational argument of cultural appropriation being inevitable:

“But to claim that we, all of us, are not a part of this mutation process ourselves is the kind of lie that is unproductive, different than the creative, productive lie I mentioned before. We have to embrace mutation in all its forms if we embrace it at all. From net kids giving new meaning to the emptiness of commercial space, to art directors getting it wrong but thus getting it right. This is an exciting cycle that is also painful, like life.”

For the most part, this idea of culture being cyclical is rational. Whilst it would have been commendable for Rihanna’s art directors to acknowledge and thank the Seapunk community that it borrowed from, Seapunk in itself

borrowed from early '90s aesthetics and even early-day MTV. However, where I feel Ciocci's argument falls short is that it does not necessarily take into account the uneven distribution of power in these incidents. For this, we need to briefly look at copyright.

Copyright is, very broadly speaking, the right for a piece of artwork to be copied. The law varies in different territories, but it is something that is automatically granted to an artist upon creating their artwork (no © required). For it to be deemed an artwork, it requires that it be in a fixed tangible medium (file, video, paper, etc.) for more than a transitory period – i.e. not fleeting and somewhat reproducible, and using a modicum of creativity. So, no, you can't copyright a dot on a page! You also can't copyright an idea just an expression of that idea. So the idea of Seapunk can't be copyrighted, but a Seapunk artwork can.

I can talk confidently about what I know about copyright – as a result of supporting the Free Culture and Open Source movements for nearly 10 years and undertaking the CopyrightX course in 2015, I have done extensive research and reading. However, what I know is still very, very little. Copyright is a highly complex, subjective law where everything is up for debate. Where one artist can claim that an artwork is merely inspired by another, another can claim that their work is plagiarism (see Tuymans vs Van Giel). Beginning to understand copyright on even a basic level can be a career in itself and take years of study. Just as no users of technology read the terms of service, no artist spends their time studying the Statute of Anne in order to understand copyright. And why should they? We're in the business of creating art, not law.

It is this naivety and lack of understanding which corporations, with their teams of copyright lawyers, can exploit in order to push the boundaries of what is acceptable. Artists – which includes anyone creating anything (yes, even a Tweet is your work of art) – do not have the luxury of being able to call upon the advice of expensive legal teams every time they create an artwork.

One such example of this exploitation is Left Shark. This high-profile case centres around a meme born out of Katy Perry's performance at the 2015 Superbowl. The performance featured Perry performing with dancers in costumes, including two sharks positioned either side of her. Viewers noticed that the shark on the left appeared out of sync with the other one, appearing even slightly drunk. The internet loved this and quickly Left Shark was born, with the memes appearing almost immediately.

One internet user, Fernando Sosa, took it upon himself to create a 3D-printable model of the shark and upload it to Shapeways, a popular site for hosting 3D models. Perry's lawyers, shortly afterwards, sent a cease-and-desist letter and ordered that the model be taken down, citing that they owned the image of Left Shark. This preposterous claim was fought against, with the file going back online. In an even more ridiculous move, Perry's lawyers then tried to trademark 'Left Shark' and also 'Right Shark', 'Drunk

Shark' and 'Basking Shark'. This attempt, which was thankfully unsuccessful, is dangerous as is it an attempt at owning an idea and an expression of an idea that was not created by them. This is different from Nike going into the poorest areas of America to create a brand that is symbolically synonymous with urban culture. This would have legally allowed them to own everything.

Thankfully, the high profile of this case was enough to get involvement from lawyers and funds to support a legal challenge. But this will not always be the case. Cultural production might be the cyclical processes of artists borrowing from popular culture and corporations, remixing it, producing new artworks, only to then go on to be borrowed from by corporations. But without expensive, highly-skilled lawyers, who will intervene when our creative process is under threat? Can we be reassured that we won't be exploited?



## The life and death of anatomy

*Image: Nina Sellars working on adipose tissue culture for her project, 'Fat Culture', while artist in residence at Symbiotica, UWA, 2017. Photographers: Nina Sellars & Ionat Zurr. This project has been assisted by the Australian Government through the Australia Council, its arts funding and advisory body.*

### Life

In an era when virtual anatomies circulate on the internet and bioengineered human organs are being printed from volumetric images, it can appear that the various new modes in which we engage with anatomical images of the body are effectively redefining what it means to be human. A way of seeing becomes a way of being, whereby images no longer depict reality but can be thought of as actively determining the flesh of our reality. The images also seem to reveal a desire to design the human anew. Yet, irrespective of the technological sophistication experienced in our engagement with contemporary anatomical images, there appears to be a certain recycling of what is essentially a 16th century vision. Indeed, the fundamental propositions of Humanism that serve as the foundation of anatomy have remained relatively intact since the Renaissance. For example, evidenced in the visualisations of anatomy, which describe composite bodies of hylomorphic bounded volumes, ordered in Cartesian space. In other words, the body imagined as a machine-like assemblage of organ-ised parts. Arguably, life in the 21st century calls for a far more complex understanding of the human body, to bring into question the certainty of its boundaries and its movements in and with the world more generally.

If we want to take the idea of redesigning the human seriously, do we need to call for the death of anatomy as our normative frame of reference? And, if so, what approach would we need to take to engage in such a project, and what would these new humans look like? Could we even begin to imagine ourselves otherwise? Every breach of a perceived classification requires a renegotiation of relationships and understandings, which takes time, care and consideration, regardless of whether this act occurs at the level of the microscopic or at the level of social concerns. Indeed, it appears easier for us to imagine the disintegration of an individual (anatomical) body through death than to imagine the end of anatomy as the definitive framework of our being.

### Death

Life moves through us and, at some point, lets us go. Matter scatters. The loosely bounded identity of the individuated human departs in a process of becoming-absence, and of becoming-other. Life flows on, taking with it the prior assemblage of matter that we and our loved ones had grown fond of, the 'us' of our particular being. Now, as before, and into the future, new alliances of matter are to be forged through happenstance in the life-death continuum. In this way, life consists of mattering and scattering, loss and continuance, seen not as isolated occurrences but as 'waves of becoming'.<sup>1</sup>

If we view this realisation as an affirmative statement, and as a way of providing us with an opening onto what is possible, we can begin to

<sup>1</sup> Rosi Braidotti, *The Posthuman* (Cambridge: Polity Press, 2013), 136.

question the boundaries of Humanist anatomy and go beyond – to explore notions of the posthuman. Though it should be noted, the volition and agency being expressed in our desire to redesign the human seemingly announces we are once again embarking on a Humanist project. But for now, holding onto the idea of us existing as incidental matter helps to release us from the certainty of anatomy's bounded forms; it also presents the body as evolving with the world, i.e. all other matter, in each and every moment.

### Anatomy

Do we need to overturn the project of Humanism to rethink anatomy? Ultimately, Humanism does have its charms. Here, I have to admit I have been somewhat invested in the project of anatomy and its Humanist conventions, in my previous employment as a body dissector and anatomical illustrator in a university medical school. Indeed, my aim is not to abandon Humanism, but rather to challenge it from within. In doing so, I adopt a critical posthumanist stance toward the science of anatomy, not only as a way to de-naturalise the Humanist framework of anatomy, through which we humans see and understand ourselves, but also to seek out the omissions and assumptions that occur in the enactment of anatomical knowledge. Here, I want to put forward adipose tissue (aka fat) as a matter of interest, and as a way of thinking of anatomy, differently. Indeed, I consider fat as a critical organ of posthumanism.

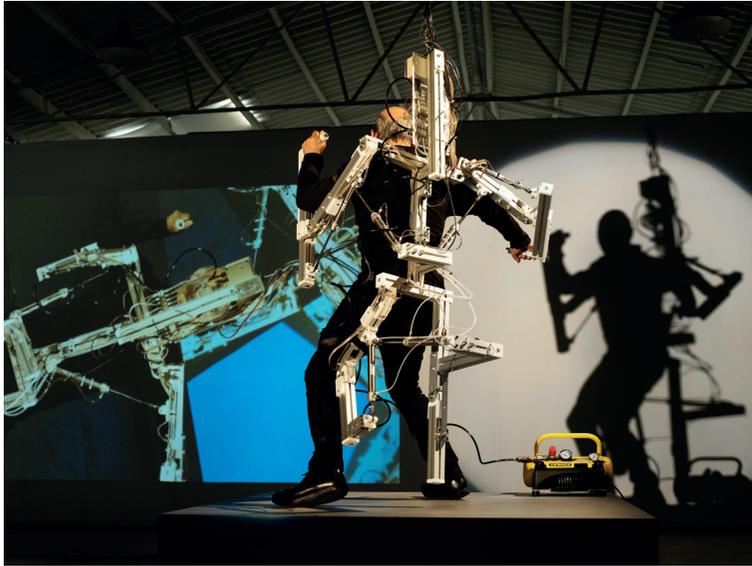
In the contemporary study of anatomy, fat is being reclassified as a complex distributed organ of the endocrine system, yet historically fat in anatomical imaging has been subject to systematic erasure. There are no chapters dedicated to fat in any standard text of anatomy. Even illustrations in classical anatomy atlases, for instance in Gray's Anatomy, which is currently in its 41st edition, are characterised by a relative absence of fat. It appears that the apparent plasticity and adaptability of fat exceeds the anatomical convention that unifies organs into objects with a clearly discernible boundary, structure and function. The reclassification of fat as an organ thus challenges the certainty of anatomy's bounded forms.

Further, the act of reclassifying fat as an organ raises questions about the ways in which fat was previously perceived. For if we consider it a given that the anatomical body is made up of organs, how then did this formerly considered 'non-organ' of the body exist in an environment in which it was seen to operate as an almost, but not quite yet, accepted part of the anatomical body? Complicating the situation even further is the recent finding that fat contains significantly higher pluripotent stem cell yields than bone marrow.<sup>2</sup> These adipose-derived stem cells can be

differentiated towards adipogenic, osteogenic, chondrogenic, myogenic and neurogenic lineages, i.e. to grow fat, bone, cartilage, muscle and neuronal cells, which means that fat has gone from its position as a non-organ, to that of an organ, to now being an organ that has the capacity to make all other organs (i.e. ADSCs have the potential to become any of the body's cells). In a sense, we are witnessing fat's transgression of the boundaries that work to define our understanding of anatomy. Indeed, the capacity of fat to go beyond – to test, trouble and deeply complicate – the paradigms of anatomy, remains a relatively underappreciated quality of this organ.

*Nina Sellars is an artist who works across the disciplines of art, science, and humanities. Currently, Sellars is Artist in Residence at SymbioticA, The University of Western Australia – for the research and development of tissue culture techniques for her arts project – Fat Culture. This project has been assisted by the Australian Government through the Australia Council, its arts funding and advisory body.*

<sup>2</sup> Sahil K. Kapur and Adam J. Katz, "Multipotential Aspects of Adipose-Derived Stem Cells and Their Spheroids," in *Stem Cells in Aesthetic Procedures: Art Science, and Critical Techniques*, ed. Franco Bassetto, Alberto Di Giuseppe and Melvin A. Shiffman (Berlin: Springer, 2014), 181.



## Inadequate / ambivalent / indifferent – complicit and contestable bodies

*Image: StickMan, Daedalus Project, Chrissie Parrot Arts, Fringe World, Perth 2017;  
Photographer: Toni Wilkinson*

### **Circulating flesh / neither birth nor death**

We live in an age of circulating flesh. Body fluids and body parts have been preserved and are accessible. Organs can be extracted from dead bodies and inserted into living ones. Hands can be transplanted and reanimated. The face from the donor body, stitched to the recipient skull, becomes a third face resembling neither. Stem cells replicated in-vitro are re-injected and repair tissue in-vivo. Stem cells can become skin and muscle cells – in fact, any cell. A skin cell from an impotent male can be re-engineered into a sperm cell. More interestingly, a skin cell from a female can be recoded into a sperm cell. Wombs from a deceased donor that would last the full term of a pregnancy will soon be able to be implanted into a patient. And further, if a foetus can be sustained in an artificial and external womb, then a body's life would not begin with birth – nor necessarily end in death, given the replacement of the malfunctioning parts. Birth and death, the evolutionary means for shuffling genetic material to create diversity in our species and for population control, will no longer be the bounding of our existence. Our analogue development, deterioration and death is unnecessary.

### **The cadaver, the comatose and the cryogenic**

We can preserve a cadaver indefinitely with plastination while we can simultaneously sustain a comatose body on life-support systems. Dead bodies need not decompose, and near-dead bodies need not die. The brain-dead have beating hearts. The right to die becomes as important as the right to live. To live is often the result of being connected to instruments and machines. Death now for many, means that which happens when the body is disconnected from its technological life-support systems. The dead, the near-dead, the not-yet born and the partially-living exist simultaneously. And cryogenically-preserved bodies await reanimation at some imagined future. We engineer chimeras in the lab, transgenic entities of human, animal and plant genes. And as parts of bodies are replicated artificially, as we can 3D-print organs and when we can stem cell engineer organs, there will be an excess of organs, of organs awaiting bodies, of organs without bodies.

### **Smart bombs / dumb bodies**

Autonomous, interactive and increasingly intelligent technologies perform with exacting precision and lethal power; and with a speed that far exceeds our metabolic and muscular capabilities. Computational systems calculate immense and complex data. Machines are generally more robust and reliable than the soft, vulnerable and fatigue-ridden bodies. It's apparent that, as our machines are becoming more sophisticated, they expose our bodies not only as defective, but also dumb. In fact, as technology becomes more connected, it becomes more collaborative and consequently more intelligent. The body, as a consequence, becomes increasingly pacified and more powerless to compete, and can only become complicit with these extended and amplified operational systems. The ballistics of the body to determine its trajectory,

position/orientation and velocity are the ballistics of its technology. The body's sensory and cognitive capabilities are hard-wired to its instruments and computational systems. Bodies become end-effectors for other bodies in other places and for machines elsewhere, generating interactive loops and recursive choreographies. Fractal Flesh proliferates, Phantom Flesh soon becomes potent.

### **Skins / selves / extrusion**

As soft and unstable bodies, we are increasingly operating in spaces of extended scale and abstract information, beyond subjective experience. We caress our skin, our heart beats persistently, we inflate our lungs with air incessantly and we erratically glance at others. But the body now experiences itself as part physical, part phantom; grounded by gravity but dislocated from any one particular place. To others elsewhere, we increasingly flicker on and off, connecting and disconnecting, appearing here and there, as phantom bodies – as glitches in biological time. Skins collapse onto screens, becoming seductive and interactive surfaces. Skins are stretched, selves are extruded. Electronic surfaces that have both optical and haptic thickness. Images generate vocabularies of aliveness that animate our phantoms. Our bodies are now dissolving into circulating data streams of detached and distributed bio-data. Embedded in vast machine systems of artificial cognition and computational calculation. The monster is no longer the outmoded stitched-up meat body, but the system that sucks the self into virtuality. In the liminal spaces of proliferating Prosthetic Bodies, Partial Life and Artificial Life, the body has become a floating signifier.

### **Mixed, augmented and remote realities**

We now navigate from physical nano-scales to virtual non-places. And we are increasingly expected to perform in Mixed and Augmented Realities. To operate effectively, we need to seamlessly slide between the actual, the instrumental and the virtual. We are rewired physically, relocated to remote spaces and have become mere disembodied, mobile eyes and a circulating cacophony of whispers. Although still primarily biological bodies, we are now accelerated by our machines, extended by our instruments and increasingly have to manage data streams in virtual systems. So the body becomes this contemporary chimera of Meat, Metal and Code. The body is neither all here nor all there; but partly here (as this body) and partly elsewhere (as other bodies); sometimes and at other times. It performs beyond the boundary of its skin and beyond the local space that it inhabits. Being a single agent, located in only one place, performing purely as a biological body, is an outmoded and inadequate existence. A body now has multiple agency. It is simultaneously a possessed and performing body prompted not only by people in other places, but by internet data streams. Bodies are animated not only by social and cultural imperatives, but also by telematic promptings. The schizoid body becomes a split body (not a split mind / body but a split physical body). Bodies will become portals for people in other places.

Imagine being in Perth and being immersed in online, real-time streaming media – scanning sites in London, whilst acoustically listening in to voices in Los Angeles, whilst someone else in Tokyo is possessing and performing an action with your left arm, prompting you to collaborate and complete the task with your right arm.

### **Alternate anatomical architectures**

It is an evolutionary imperative to engineer alternate anatomical architectures. The artist has performed with a third hand, a virtual body, an extended arm and exoskeleton (a six-legged walking machine). With the propel: body on robot arm performance, the body's trajectory, position/orientation and velocity was choreographed by a large industrial robot arm. The Ear on Arm project is to surgically construct and cell-grow an ear on the forearm; then to electronically augment it to become internet-enabled. A bodily structure has been replicated, relocated and will be re-wired for additional capabilities. Having evolved with soft internal organs to function better, biologically, we can now engineer additional external organs to better interface and operate in the technological terrain and media landscape that we now inhabit. Everyone will be in at least two places at once. Interchangeably as a physical body in one place and a phantom body elsewhere. In the Re-Wired/Re-Mixed performance (For Radical Ecologies, Perth Institute of Contemporary Art, 2016), the artist in Perth could only see with the eyes of someone in London, could only hear with the ears of someone in NY, whilst anyone, anywhere could access his six-degrees-of-freedom exoskeleton and choreograph the movements of his right arm. His vision was disconnected from his hearing and his arm was disconnected from his agency. The body performed for five days, six hours a day continuously. A distraught and distributed body whose senses and a limb were outsourced to others everywhere. And imagine a synaesthesia not through the cross-wiring in one body, but a synaesthesia experienced through the cross-wiring of senses from other bodies, elsewhere.

### **Contestable futures**

It is no longer meaningful to imagine having a mind of your own, nor any mind at all in the traditional metaphysical sense. The traumatised body inhabits proliferating spaces of anxiety and ambivalence and needs to remain indifferent, open to possibilities. What it means to be human is perhaps not to remain human at all. The pathological and the perverse become the poetic promise of the chimera. The artist can do no better than initiate aesthetic actions – but actions that transgress, disrupt and generate alternate possibilities. A transition from psycho-body to cyber-system becomes necessary to function effectively and intuitively with forward masking in remote spaces, speeded-up situations and complex interacting architectures. Can a body cope with experiences of extreme absence and alien action without being overcome by outmoded metaphysical fears and obsessions of individuality and free agency? A body would thus need to experience its

actuality neither all-present-in this-body, nor all-present-in-that-body, but partly-here and projected-partly-there. This generates a radical emptiness, not through lack, but rather through an excess of its hyperlinks – an extrusion of its subjectivity. As bodies, our awareness and operation is now extended, interacting and operating with other bodies and machine end-effectors. The body acts with indifference. Indifference as opposed to expectation. An indifference that allows something other to occur, that allows an unfolding – in its own time and with its own rhythm. An indifference that allows the body to experience the uncanny and the alien. A body that films its internal body spaces, a body that endures being suspended with hooks into its skin, that allows an insertion of a sculpture into its stomach and whose arm gestures animate a six-legged robot. And a body that allows an ear to be surgically constructed and internet enabled on its arm. Alter the architecture of the body and you adjust its operation and awareness. The body is no longer merely an object of desire, but rather an object that requires redesigning.

*Stelarc is a Performance Artist and Distinguished Research Fellow at the School of Design and Art, Curtin University, Perth. His art is represented by the Scott Livesey Galleries, Melbourne.*

## What do we mean by 'open'?

'Open' has become one of the keywords of the age. As walls and borders have loomed large over the past year, openness seems more important than ever. We want more open governments whose actions can be investigated by the use of open data. We want knowledge and culture to become more open. Firms like British Telecom stress that they offer 'Openreach'. We want the skies, the seas, the roads to be open.

The pervasiveness of the word 'open' in contemporary discourse is striking, because it is an example of a concept from technology that has become applied to society at large. Early pioneers of computing loathed proprietary closed software that could only be run on particular machines. They developed open versions of operating systems like Unix, which could be extended and improved by anyone. Because open source leveraged collective endeavours and helped focus effort on particular aspects of software, it proved to be a very effective method of software development. It was through producing open source browsers like Firefox that Mozilla helped ensure that access to the web would not be controlled by proprietary browsers like Internet Explorer.

Open development has a strong track record in software development, but does that necessarily mean it is a good metaphor to think about society at large? In a famous book published in 1945, *The Open Society and Its Enemies*, Karl Popper criticised philosophers like Hegel and Marx for their deterministic view of history, rooted according to Popper in Plato's rejection of Athenian democracy. Popper argued that Hegel and Marx had, by their insistence that there were inexorable closed laws of history, laid the foundations of twentieth century totalitarianism. For Popper, the only way of escaping the closure of historicism was the open and fluid dynamics of a liberal, modern democracy.

However, Popper's description of what constituted an open society was vague – it is largely defined by being not historicist and not totalitarian. We can all easily agree that we do not want to live in a totalitarian society, but what is an open society? What are its limits? Is it a society where there are no restrictions on what giant corporations like Apple and Amazon can do? Is it a country which rejects socialised health care because it does not want to restrict the choice of the individual patient? The collapse of communism ushered in a triumphalist neo-liberalism in which the wisdom of the market rules supreme. Isn't a society ruled by the market just as closed as one ruled by Marxism?

Think about the BBC. The chaotic early development of radio in the United States and concern that the limited range of radio frequencies might be overwhelmed resulted in the British government, in the form of the General Post Office, taking a very closed and controlled approach to radio. The British Broadcasting Company was formed in 1922 by a consortium of radio manufacturers and financed by a levy on equipment. Sir John Reith, when appointed as the first Director General, knew nothing about radio, but quickly established a strongly educational and religious ethos and also made it clear that he would be independent of government. In this approach, Reith was bolstered by the strong cultural consensus of the 1920s around what was respectable and improving.

As a government monopoly with a restricted cultural outlook, the BBC is, strictly speaking, a closed organisation – for the first thirty years of its life, it was a monopoly. Yet in terms of access to culture and the promotion of national well-being, most British people would say that the BBC has been a great success, and would consider it to have promoted open culture.

Part of the reason for the BBC's success was that Reith made it clear from the beginning that the BBC would be independent of government, when he refused to act as a government mouthpiece in the 1926 General Strike. The licence fee was also valued as a mechanism that transcended commercial interests. The BBC is valued because it offers everybody access to a wide range of culture in a way that is not wholly driven by market imperatives.

The BBC model will not work in an international digital environment. In the 1920s, it was much easier to impose national frameworks for the adoption of new technologies. But part of the lesson of the BBC is that openness does not necessarily mean the adoption of market-oriented solutions. A truly open body values impartiality and independence and resists commercial or government pressures. An open society cherishes the belief that every citizen should have the opportunity of satisfying their curiosity on any subject. The way in which the internet lowers the barrier to publication and allows me to publish articles and books whenever I like is something that should excite a truly open society.

That doesn't mean that in an open society all knowledge comes free of charge. Consider the print precedents. Books are expensive commodities, but the public library system (until it started to be gradually strangled by funding restrictions) enables me to get hold of any book or article I want for the price of a postage stamp. That is an open system. As the public library system is undermined, the assumption appears to be that we will get books via Amazon, paying through the nose for each item. That is a closed system.

An open society is one in which knowledge is open. Everything else – freedom of speech, democratic government, religious freedom – flows from that.

The great nineteenth century librarian Sir Anthony Panizzi said in 1836:

“I want a poor student to have the same means of indulging his learned curiosity, of following his rational pursuits, of consulting the same authorities, of fathoming the most intricate inquiry as the richest man in the kingdom, as far as books go, and I contend that the government is bound to give him the most liberal and unlimited assistance in this respect.”

That's a pretty good motto for an open society. And a good benchmark for a healthy internet.

If an open society is driven by a thirst to share and make available knowledge, it follows that open knowledge will break down borders and barriers. Sir Anthony Panizzi, who designed the famous Reading Room of the British Museum where Marx studied, was himself a refugee, who had been forced to flee Italy because he had been fighting for democratic reform. That is why Panizzi was convinced that open access to knowledge will break down borders and barriers.

Openness isn't about untamed market economics. It isn't about unlimited consumer choice. It isn't even necessarily about freedom of movement. It is about access to knowledge. The concomitant of this is that an open society is a questioning society. It is a society that doesn't take anything on trust but wants to investigate and interrogate. It doesn't blindly follow precedent but wants to work things out for itself. It questions and interrogates what words like 'open', 'disruptive' and 'transformative' mean and how they are used.

The motto of the Royal Society, founded in 1660, is 'Nullius in verba', which means 'Take nobody's word for it'. That's a great watchword for an open society.

# VVFA: Superstition

## as a last resort

Very Very Far Away (VVFA) is a public-facing research project consisting of a podcast, a workshop and a series of special projects, seeking to reignite future ideologies. VVFA focuses on democratising future narratives, through exploring multiple perspectives simultaneously, and disseminating new cultural fictions. Bringing members of the public and experts together, each episode is a designed fiction, collectively crafted into a web of stories capturing new space potentials (future roles, future social and organisational structures, and collective aspirations) subsequently documented and disseminated via podcast. Its method uses space exploration as a lens to examine current ideas and values that may pertain to future society through technological advances. This process, crossing the boundaries of disciplines, enables the conceptualisation of future worlds, through which newly-formed ideologies can permeate the public realm.

website: <http://vvfa.space>  
podcast: [http://bit.ly/vvfa\\_podcast](http://bit.ly/vvfa_podcast)

The following text is an extract of a fictional correspondence between our narrator, a journalist, and a lithium-mining specialist working as a trader on the Astronomical Stock Exchange (ASE), prior to the recorded interview.

This conversation is inspired by a workshop run at The White Building, Space Studios Art and Technology, in Hackney Wick, London, during October 2015.

**Subject: Superstition as a last resort**

Hey.

Sorry for the delay! We've been super busy, producing another segment. To be honest, after our last exchange, I got into a very drawn-out argument with a colleague regarding a specific sentence in your last email. You said: "One way or the other, we are all governed by agreed upon fictions". She said she thought that statement was a bit grand. I think she was a little taken aback with your notion that "fictions are more alive than us, like living organisms that keep evolving and reproducing, to the point that we are host bodies for these ill-formed thoughts".

I kept drawing a parallel that, as journalists, information is our lifeblood in many ways, but she didn't seem to get on board with your metaphor. Are you still interested in doing an interview? Let me know your availability and I'll arrange my schedule around yours.

Looking forward to hearing from you, and hope everything is going well!

J

**Subject: RE: Superstition as a last resort**

Good to hear back from you, was wondering what happened to you. About your sceptical co-worker – I don't think there is any cure for that kind of complacency, some people never understand. At least I wouldn't waste my energy explaining it to them over and over.

Not that I need to clarify, but you must see it. Things have been different. The world has gone weird. Everywhere you look, from headlines to Tweets and our ride-share convos, everything is weird now. Bizarre creatures have appeared, rewriting old morality into pitch-perfect conspiracies. Our wasted hope has come crashing down on the horizon. Rational self-interest has given way to magical thinking – the last resort when fear takes hold.

**Subject: RE:RE: Superstition as a last resort**

But magical thinking and hope are two different things. Can't we have hope and remain rational?

J

**Subject: RE:RE:RE: Superstition as a last resort**

I think we can, but it's not what I see most of the time. We don't know how to frame our desire for hope, so we'd rather just wish things in and out of existence. We pray, we curse, we damn and we condemn, hoping our magic spells will rewrite the world around us and banish inequality from this plane of existence. We want to believe we can remake the world – the world flipped upside down and turned inside out (and, best of all, made flat!).

And yet we do it, by sliding into superstition. We argue about our most basic beliefs: Flat Earthers v. Space Communists, Transhumanists Enthusiasts v. Prophets of the AI Apocalypse, Grammar Fascists v. Emoji Apologists, Internet Trolls v. Sanctimonious Journalists. All we have left is the ability to denounce, to point the finger at the other guy in the name of transparency. That's what we feel has become our only inalienable right, our civic duty.

**Subject: RE:RE:RE:RE: Superstition as a last resort**

So, you believe that we have reached a point where we can only be ideological partisans? Do you think our individualised narratives have completely divorced us from factual reality?

In a previous email, you mentioned that journalism should be a stronghold of objectivity. I'm not sure if that is an achievable goal, but I would argue that it's only in the process of questioning these personal narratives that we can obtain some measure of truth.

J

**Subject: RE:RE:RE:RE:RE: Superstition as a last resort**

I know I shouldn't judge, but when you describe the work you and the other producers of your programme do, I start to think that, at this point, you journalists are just trying to make it through the day. Never addressing the fact that you're all just saving face: the last bastion of the integrity of a dying breed. You have this shared belief that there is a truth out there, embodied in the struggle of decent folk. As though you can remain separate from the masses, as though anything can be observed at a distance without running the risk of tampering with the specimen. Manipulation is always necessary for knowledge, or truth (and certainly to play the market). And that's not saying anything about your industry's business model...

**Subject: RE:RE:RE:RE:RE: Superstition as a last resort**

You know I appreciate your point of view, but I feel you're oversimplifying. You're implying that any shared belief is a symptom of collective delusion. Don't you think that is a bit extreme?

Shouldn't there be a place in society for shared visions? The global situation is complex, the planet is composed of myriad interdependent economies. Out of all people, you should be well placed to know that a lot of our natural resources are found on other planets.

J

**Subject: RE:RE:RE:RE:RE: Superstition as a last resort**

Yeah, the situation is complex: rising temperatures, rising sea levels, final sunsets over wasted horizons. Let me ask you something – doesn't it feel like these are our last moments on Earth?

It's no wonder that in a world we feel is spinning out of control, our only recourse is superstition. A world that some believe to be flat while others regularly commute back and forth from the moon. A world where those of us who can afford it get seasonal vaccination against plagues brought on by the thaw every season and the poor are left to die. A world of privately-controlled news outlets routinely contradicting each other. A world not so much governed by AI but where cities are clumsily automated sets of services; where fortresses of tailored knowledge are built by the rich and paranoid – the same people who would have built survival bunkers years after

the cold war had ended. A world that unfolds in the breathy exaltation of the prophets of self-improvement and deregulation. A world completely hollowed from statehood and running on competing cybernetic management systems. A world which has been drained of its fossil fuels. A world in which I trade asteroid-mined lithium futures for 14 hours a day, waiting to find out what other valuable metals are extracted from the Martian regolith.

**Subject: RE:RE:RE:RE:RE: Superstition as a last resort**

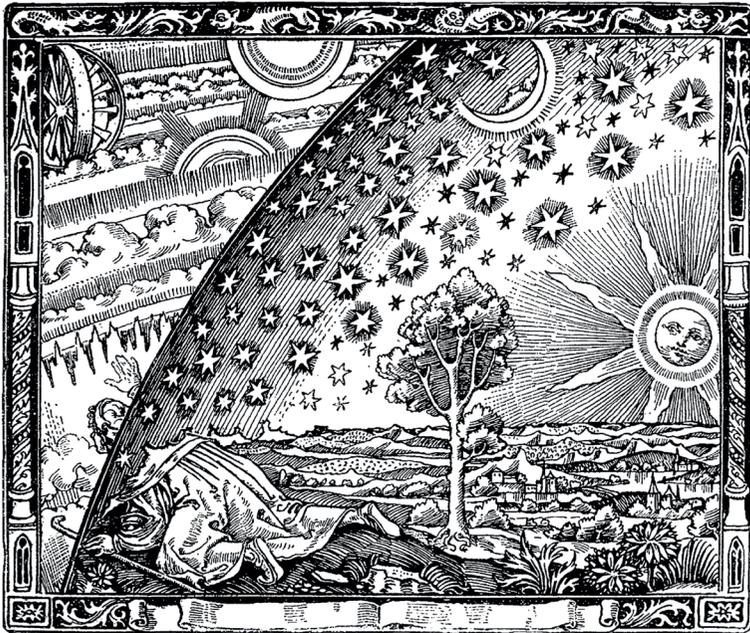
It sounds like you are quite concerned with the global situation. So you feel like we've all become isolated from each other? I'd like to explore this further. Would this be a good place to begin our conversations for the radio piece?

J

**Subject: RE:RE:RE:RE:RE:RE: Superstition as a last resort**

Isolated AND insular, indeed. Earth has become an island (the idiots who think the globe is a pancake surrounded by a wall of ice might be right in the end – metaphorically anyway). Earth is a dying island where resources are incredibly expensive, where life has become slower and where the poor are trapped. How many of us, do you think, will get to become colonists? It's an expanse of land and water where geography is meaningless and where people attempt to hang on to cultural myths while their lives are dictated by a failing economic infrastructure. Meanwhile, the business of speculation over resources in space is thriving. It keeps the digitally literate employed – lucky me!

If you want to chat on Skype, I am available next Tuesday UTC +8.



## “The longings for new worlds knows no bounds”

*Image: Flammarion engraving, wood engraving by unknown artist. First appeared in Camille Flammarion's L'atmosphère: météorologie populaire (1888). Source: Wikipedia*

Before I go into detail about Ars Electronica Linz and its participation in Digital Design Weekend, I'd like to say a few words about the metaphorical burden of 'borders' and the huge expectations invested in the 'bridges' taken up by this year's Digital Design Weekend at the Victoria & Albert Museum in London. It's not that I'm of the opinion that this topic is unimportant. Quite the contrary – if one calls to mind the political discussions in the USA, Europe and England, their sole point seems to be: how best to set oneself apart from the others? But I'm particularly taken by the Bridging Open Borders theme. What is meant by 'open' here and what exactly does the title refer to? Is this meant to go in the direction of stronger community thinking of open territories, or does this have to do with more diversity and direct exchange among existing open territories? The Digital Design Weekend in London will display to us the palette of potential approaches to this topic.

To confront this matter in somewhat more inspired fashion – especially in these turbulent times – I wish to invoke French astronomer and author Nicolas Camille Flammarion (1842–1925), who said: “The longing for new worlds knows no bounds”.

Nicolas Camille Flammarion was an outstanding person who made his living from the natural sciences and science fiction in equal measures. The co-founder of the Société Astronomique de France (SAF) was a prolific author of scientific articles, and his fantastic tales influenced, among others, the Parisian surrealists. Particularly prominent was a 19th century illustration, the origins of which are unknown but that came to be known as the Flammarion engraving as well as Wanderer on the Edge of the World (or in French: *au pèlerin / on pilgrimage*) when it was published in one of the SAF's journals of popular science and gained fame as such. Now, one may very well hold the view that art and science meet in this image. Nevertheless, I am of the opinion that an interpretation involving nature is a much more convincing one. And here, I would like to bring up the idea of a 'first nature' and a 'second nature', whereby the first one is the given nature, the one that surrounds us and long pre-existed humankind, and the second nature is the one that human beings have constructed and that encompasses the first one. With the help of technical instruments and technological processes, humankind created a new reality of life that goes beyond the first nature and is based on people's longings. The first nature with a naturally grown landscape, with trees, bushes and fields; a sun that the lone wanderer calmly observes, and the wild sea of stars that stand in stark contrast to the ordered world of technology and science with its automated sequences, repetitions and experiments – our second nature which is, like the first, a part of our shared reality. Whoever believes that harmony constitutes the tenor on both sides of this representation hasn't taken note of the wild predatory felines on the top of the wood engraving's frame, who signify the dangers on both sides. Nevertheless, the wanderer seems hungry for knowledge and, with an outstretched hand, self-confidently goes forth. He turns his back on his accustomed surroundings but proceeds cautiously, on his knees, slowly approaching this other world, the second nature, with all of its undiscovered secrets and mechanisms.

The longing for new worlds is not only the driving force of the wanderer in Flammarion's engraving; it is also what motivates the artists that Ars Electronica Linz are showcasing on Digital Design Weekend.

Veronika Krenn wants us to realise that we are already part of new worlds, though we are hardly capable of understanding them. She creates tangible objects that function as proxies of data and information, and thereby calls attention to phenomena of this day and age.

Davide Bevilacqua points out a totally new dimension that people per se are hardly capable of comprehending, much less influencing – machines that communicate with each other and exchange information. What sort of world are machines contriving? Can machines develop longings?

Leo Peschta's robotic works question the functional efficiency of automatons. He builds machines that are sufficient unto themselves and serve no further purpose. In a world in which machines are considered, above all, as aids, but are increasingly being endowed with intelligence, Peschta argues on behalf of a new understanding of machines – respect as well as distance. As if we were encountering a new acquaintance, a complete stranger. We surely wouldn't believe all this person's claims right off the bat. And s/he would, first and foremost, have to earn our affection.

Irene Posch and Ebru Kurbak, for their part, create tools that connect worlds. They embroider a computer, and completely reinvent electronic components and devices by combining traditional textile handicrafts with electronic technology in extraordinarily futuristic ways.

Especially now, in times of digital reality that we have manufactured ourselves, we realise that we actually don't understand it – we can't read it, speak it, smell it, taste it or breathe it. To get an impression of our times, we need artists who immerse themselves in new worlds and, from these vantage points, boldly look back to tell us what and where we happen to be at the moment. Inherent in the people we require is an incessant longing for the unknown and the novel. Precisely like the artists featured in this exhibition, as well as Nicolas Camille Flammarion.

[www.aec.at/export](http://www.aec.at/export)

Here, I would like to express my sincere thanks for having been invited again by Irini Papadimitriou of the Digital Design Weekend at the V&A. Our gratitude is also due to the Austrian Cultural Forum in London, as well as the AVL Cultural Foundation and NIO Nextev (UK) Limited for their support of the participating artists.

## Further information

You will also find further information and discussion on some of the other projects represented at the Digital Design Weekend in our Github repository which is at: [digitransglasgow.github.io/bridgingopenborders](https://digitransglasgow.github.io/bridgingopenborders)

Among the projects you will find there are:

- **Babitha George**, Duet
- **Rob Toulson, Justin Paterson, Sarah Kayte Foster**, Get Inside the Music
- **Marlene Huissoud** is challenging the properties of natural resources from the insect world. The piece presented at the V&A is composed by two materials from the honey bee, which produces a bio-degradable resin; and from the Indian silkworm, which discards its hard cocoon when it reaches maturity.
- **Karen Palmer**, Riot
- **Gascia Ouzounian, Christopher Haworth, Peter Bennett**, Optophono: Making Music Interactive
- **Katherine Willis**, Hack the City!
- **Garnet Hertz**, Disobedient Electronics: Protest (2017)
- **Helen Steer**, Making Music, Discovering Science
- **Helen Manchester**, Tangible Memories and Parlours of Wonder 'Care-ful' co-tinkering for elder care
- **Kasia Molga**: in my practice I am fascinated with data. Since the advent of IoT – the concept, technologies and network – I started exploring real time environmental signals; not for the purpose of storing, analysing and using them as information to our advantage, but as the language of the source of these signals (biosemiotics), be it air quality, processes in soil or voices of tiny microbes. These signals – that data – make things undetectable and invisible – present and noticeable.
- **Eszter Bircak** on the future of education and leading women innovators
- **Arianna Mazzeo**, Art-ificial Boundaries, Everyday Flux and Pressure of Common Practices
- An interview with **Regine Debetty, Morehshin Allahyari** and **Daniel Rourke** on the Additivism project
- The weird + eerie: an interview with **Lawrence Lek** by **Henry Broome** on crossing the line + exposing the deeply embedded through VR
- **The Austrian Cultural Forum**, Emotion + the Tech(no)body
- **Ling Tan**, Measuring Air Quality through our Subjective Experience
- **Luca Damiani**, Art, Design and Neurodiversity
- **Moin Roberts**, Islam, Slave/Master
- **Paul Granjon, Michka Melo**, Power of the Mud
- **Samuel Fry**, Connecting People in the Arts
- **Tactical Tech**

Contact:

Irini Papadimitriou *i.papadimitriou@vam.ac.uk*  
Andrew Prescott *andrew.prescott@glasgow.ac.uk*  
Jon Rogers *j.rogers@dundee.ac.uk*

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