

## 2016 Conference Transcription

Date	Friday 1 Aril, 2016
Session Title	Thriving In Uncertainty
Session Time	12:45-12:05
Moderator	n/a
Speakers	Angela Cassidy
Notes	n/a

## Introduction

<b>Carlo Buontempo</b>	Hello and welcome to Future Everything 2016 Festival Podcast Series. Over two days, in Manchester's iconic Town Hall, we tasked designers, artists, scientists, and many more, to rethink our resources from life, earth and intelligence to community and uncertainty. Our speakers asked what we might need less and more of in our near future. Speaking in Thriving In Uncertainty, we heard from Welcome Trust Fellow Doctor Angela Cassidy, one of the country's leading researchers into Bovine TB and badger culling. In this session, Angela asked what our expectations are around science, and how does the media stoke our uncertainty about scientific progress. Regularly asked her opinion by BBC Radio Four, Angela looks at the unknown knowns in contemporary science, and how we make sense of them.
<b>Angela Cassidy</b>	We were asked to think about what uncertainty means to us. I work across the history and social studies of science, so a key question for my whole research field is 'what does uncertainty mean for scientists?' What I'm going to be talking about today is about uncertainty and about some of the expectations about uncertainty that are made by, and for, and about scientists, when they interact in society and the wider public sphere. I'm going to be quite whistle stopped, because I'm going to be covering ideas from across my field of things that people have had to say about this, but I'm just going to start with a video.
<b>Video</b>	There are reports that there is no evidence of a direct link between Baghdad and some of these terrorist organisations. There are known knowns. There are things we know we know. We also know there are known unknown's, that is to say, we know there are some things we do not know, but there also unknown unknowns, the ones we don't know we don't know. 'Excuse me but is this an unknown unknown?' There are several unknowns. I'm not going to say which it is.

<p><b>Angela Cassidy</b></p>	<p>So as has already been discussed slightly, but I'm going to go into a little bit more, this was a press conference that Donald Rumsfeld, who was US Secretary of Defence, just before the Iraq war, and he was being quizzed about the whole question of whether there were WMD's in Iraq. He came out with this statement, and there is actually a website which just has this statement twitching slightly. There's been a lot of debate about this statement, whether it was nonsense, whether it was something profound, whether it was sort of profound nonsense, whether it was just part of the general fog of war and confusion. The fact that you can see that clip and you still don't actually know whether he thinks there's WMD's, or not, I think is quite telling. However, it can also be quite a useful tool for thinking about different situations of uncertainty, and classifying and understanding them a little bit better.</p> <p>So to draw from my own field of research, which is the history of animal health, is quite useful for thinking about this. So your classic example of the unknown unknown, in the recent history of animal health, is of course BSE, where these cattle were getting very sick, and we literally had no clue. All our models of infectious disease at the time, all our understanding of infectious disease was not anticipating what turned out to be the causative factor, which is a prion. So this was not an infectious organism, there was no virus, there was no bacteria. It was a completely unknown unknown, and because of that, that's the root cause as to why; firstly the science was very difficult, but also the interaction between science and policy was almost catastrophic in places because of this disjunct. It turns out we were very lucky, in that we did actually get an understanding of it quite quickly, and as it turns out, it wasn't as serious a public health problem as it could have been. But it is a very classic unknown unknown situation. Nobody could have anticipated this. Secondly, and this is the particular work that I'm working on, is the history of Bovine TB, and the relationship between badgers and Bovine TB. I'd like to point out, this is a stuffed badger. This picture was actually taken as a joke, because badgers are nocturnal animals and you don't actually see badgers and cows together very much, but it gets used in the press anyway, but I quite like that, poor stuffed badger.</p> <p>One of the issues with Bovine TB, is that there are an awful lot of known unknowns. There's a huge amount of uncertainty, but we have actually a pretty good idea of those things that we don't know. It's just that there's so much of it, and that makes it very difficult for both scientists and policy makers to get to grips with. In Rumsfeld's statement, there's the fourth version which is the unknown known, which he does not talk about, and there's been some debate about that idea. I think it's best understood as things that are essentially tacit knowledge and skills. So just to explain, this is the callipers that vets use for testing for TB in cattle, so testing the reactions to tubercular. Now, if you can imagine trying to measure the size of a lump on the side of a cow that is cross, in the rain, and it's the two hundredth one you've done, there's a considerable amount of skill involved in that process. So there's large parts of how we know stuff, which is about skill, and that's often another thing that is not generally taken account of terribly well.</p> <p>To move on, this is called the certainty trough, but the trough has dropped off the bottom of my screen. This is a schematic, I should say, rather than</p>
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something that has been quantitatively measured. This is from the work of a man called Donald Mackenzie who worked on development of nuclear missile guidance. What he talked about is the relationship between how much people know about something and how certain they feel about it. What he found in that particular case, is that the people who are working very closely with it, so the scientists and the engineers who were trying to develop these systems, had quite a keen awareness of the uncertainties in what they were doing. However, their managers and the more senior military who were working with them, were much more committed to the idea, but they had much less awareness of how much uncertainty was involved, so they were very confident in that technology.

Donald then also talked with wider publics, who were of course very critical of nuclear weapons in general, and so they tended to overinflate the amount of uncertainty that was involved. I think this is quite an interesting model, and certainly, the key thing is that the relationship between how much you know, how much expertise you have, and how confident you are, how much uncertainty you're aware of, is nonlinear, and it's unpredictable, and in different cases, it changes. So, for example, you could argue that in the case of GM technologies, up until the 1990s, wider publics were up here and something happened to take them up here. In the case of Bovine TB and the relationship with badgers, which I've been studying since the 70s, in the first few years of those investigations, the scientists and vets were very, very confident about the relationship between infection in badgers and infection in cattle. Whereas now, we have much more of a sense of uncertainty. So it's more like they went from here to here. So going back and forth like that is one way of thinking about that relationship, between how much you know and how much awareness of uncertainty you have.

That then interfaces with ideas about what science is in the first place. Ideas about science in the public sphere tend to think about the certainty of knowledge, in particular, and often the idea that science can be an authority. This is the national history museum, whose working motto is 'a voice of authority on the natural world', which it is. Other aspects of public science can focus on the spectacle and the power of big science, and so this photo of the Large Hadron Collider, which you probably recognise is a very, very good example of that kind of thing. Another aspect of this kind of wider public image of science, and I should say this is a cultural image, rather than necessarily an understanding of the public. So this is something that works across society, is also about the history of science. Our understandings of what was learned in the past is also used to bolster this sense of certainty.

We have science and public, and we can think about this that we have science in public, but then we have science in private, which is rather a different thing. This is from a book by a man called [inaudible 10:45]. What he was talking about is actually science in the past and science in the present. So he was seeing science in the past, that has been agreed upon, as set and certain. Science that is happening in the present, science in the making, as uncertain. But you can apply this model to science in public and science in private. So if we think about science in private, once we start studying what scientists do and how they work, it's a messy business doing science. Some of these hashtags

about overly honest methods, I think, have been brilliant at making this messiness of trying to be a scientist much more public. That we make these decisions about how to do a particular experiment, it will be for good reasons, but it will also be because the centrifuge would explode otherwise. There's a new one that's come up recently, which is an ecologist's confessions. A lot of those seem to be particularly about the more bodily relationship you have to have with your research subject, if you're a field ecologist. Science also involves longstanding, bitter, personal feuds. It can involve controversies. This is the longstanding controversy in evolution about how you classify creatures that just go on for decades and decades. Sometimes they never get resolved, it's just everybody gets bored. So science is human, science is done by people who are human and are messy. So science in practice is a messy, messy business, but often in the public sphere, we don't get to hear about this.

So that process of public and private science then combines with ideas about the past and the future. When we're talking about what happened in the past, that can have a lot of rhetorical power, and sometimes science can have a hand in this. So while we think about the past history as something that's set, obviously our understanding of what happened in the past is partial, and is always going to be partial. Arguments about our evolutionary ancestors has huge political valence, especially when it comes to issues around race and gender. Arguments about why the dinosaurs died out can often have reflections in concerns about our own society. These two images are from the Olympic opening ceremony, which was all about our national myth of a nation that has come out of an idyllic rural existence, via the industrial revolution, to create a great nation.

We also have imagined futures, and this is where actually historians can say a great deal about the future, because people have been trying to imagine what's going to happen in the future for a very, very long time. Here we have a periodical from the late nineteenth century trying to imagine how people will go about the city in the future. Nobody is walking, and this is central London. Our ideas about the future often turn out to be massively, staggeringly wrong, but massively staggeringly **wrong** in the same way. Obviously, we do this via fiction all time, but we also do it part via science, and that is part of the power of science. So Malthus making predictions about the problems between, what happens between population and food supply, that's had resounding consequences ever since.

Further idea's about imagined futures, we can see these imagined futures very directly constructing the technologies we decide to build, but also the society we decide to build, and obviously we've just heard a lot about that in terms of dystopic idea's about the future of trying to prevent a bad society coming forwards. At the moment, it does seem that we are in more of a dystopic mode and there's awful lot of apocalyptic visioning's going on. This can get awfully twisty sometimes, which I think is fantastic. These are recent promotional photo's that NASA have released, where they're actually drawing on nostalgia, about past visions of the future, in order to imagine a future where we go to space, which I think is brilliant, and they're absolutely very beautiful images as well.

When we get this process of public and private science, this disjunct, and we get these imaginings about past and future coming together. What we get is expectations about what science is and what it can do. Primarily, this gets thought about in terms of, particularly, via technology and technologies. The cure for cancer is a complete cliché, because scientists have been saying we're going to have it for a very long time now. Often this process, and again it's a process of talking about what happened in the past, and then imagining what will happen in the future, in order to shape the present, a lot of the work that has been done about this has tended to focus on technologies. But I actually think that you can apply this to non-technological expectations about science. These are a bit more subtle, but I think they are actually quite powerful. This is where I'm going to talk a bit more about the TB situation.

One of the things that we've had is this recurring cycle of research about TB, policy action about TB, public protests and argument, and then scientific reviews. This is the series of senior individuals who've been commissioned by government to review the science about TB since 1980. This is now seven and I think this guy's been asked twice. I'm not saying that actually periodically reviewing the science about TB is a bad thing. I think it's a great thing, especially because the science around TB is in the making. The problem is that every time a scientist has been commissioned to do this, it's with the expectation that they will provide a final word and resolve this controversy, and that's quite clearly not happened. So there is something very problematic there about that expectation, that science can do all of these things. There are also absences of expectations. There's things that we could anticipate if we thought about it, but we assume are not an issue. Again, in the badgers and TB situation, that's certainly happened. Despite the fact that there were active protests, and activism about this right from the early 1970s, there has never been an anticipation, that public activism, public opinion, the actions of people might be important, either in the science or the policy of this issue.

There was also widespread assumption that the animals and the environments are there to be experimented on or acted upon, and of course, what we've actually found is that it may well be that the society of badgers becomes disrupted, and that spreads the disease further. That has created huge difficulties, both again for the scientific understanding controversy, and for what policy makers can do about it.

So thinking more about expectations, one of the things to understand about this, is this is a process that's happening over time. So it's a constant cycle and so we get these repeating cycles. As I say, that process with the scientific review is a really classic example, but you get many others. You can see it in technologies where there are certain technological ideas that just keep coming back. The idea of the flying car is really powerful, even though it's a silly idea, and people keep trying it and finding it's a silly idea, but we keep coming back to it. The idea of the house of the future, now we're seeing coming forth in terms of the idea of the internet fridge and the internet of things, these ideas keep coming back, whether or not people actually want them, whether they are useful or not. There's something really interesting there about why do these ideas cling

	<p>on? Why do they keep coming back? There is something there about amnesia. Sometimes what you get is a cycle, where the expectations become failed, and people recognise that it didn't work. We're seeing a lot of cynicism about the internet things, but in another twenty years, we might see another round of it. So you get short term cynicism, but long term repeating the cycle. There's a real question about why does that happen.</p> <p>I think there it can also allow us to start thinking about solutions, not so much solutions, but mitigations; things that we can do to try and help deal with all of these problems. Firstly, and I think most importantly, rather than trying not to look at all those unknowns, we need to look at them, we need to think about them, what kind of unknowns are they? What kind of things have we never anticipated? What kind of things do we know we don't know, but we can't really get at? What kind of things do we not want to think about at all? What kind of things can we just not know? We have to acknowledge those things and we have to think about it. We have to think more and really value institutional memory, in specific institutions, but also across society, [inaudible 20:54] is brilliant and it's very typical. If your institutional memory in one organisation is the old guy, and then you don't have it any more, you're in trouble. We need mechanisms to bolster our collective memory. We need to widen the evidence base, particularly when we are dealing with these very problematic science policy situations. What we regard as evidence needs to get a lot broader, and it needs to start including things like history and politics and culture and so on and so forth.</p> <p>Finally, we just need to open up, make those scientific processes visible, and acknowledge the mess of the world. Hopefully if we can start becoming easier, and more happy about the fact that the world is a messy place, and living with that, then we may at least not be setting ourselves up for falls on a constant basis.</p>
	<p>We hoped you enjoyed Ben's talk and thanks for listening. You can hear the rest of the talks from 2016 at <a href="http://futureeverything.org/2016podcasts">futureeverything.org/2016podcasts</a>.</p>

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