**Transcript of panel discussion on  
The Lessons of History for the Future of Science**

NB: When citing this transcript, please use this style: Frame D, Hikuroa D, McAloon, J, Priestley R, Salmon R. 2017. Transcript of panel discussion on the lessons of history for the future of science. In: Priestley R, Nathan S, editors. The lessons of history for the future of science, Journal of the Royal Society of New Zealand. 47: Supplemental data. Doi 10.1080/03036758.2017.1313280

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*The following is a lightly edited transcript of a panel discussion on the Lessons of History for the Future of Science. This discussion, which was open to the public, was held at Victoria University of Wellington on 24 November 2015 as part of the Finding New Zealand’s Scientific Heritage conference.*

REBECCA PRIESTLEY: Kia ora tātou and welcome to this panel discussion on the Lessons of History for the Future of Science. Our panellists today are Professor Dave Frame, director of the New Zealand Climate Change Research Institute at Victoria University of Wellington and director of the Deep South National Science Challenge; Dr Dan Hikuroa, an earth systems scientist and research director for Ngā Pae o te Māramatanga, also an associate investigator for Te Pūnaha Matatini; Associate Professor Jim McAloon, a historian from the School of History, Philosophy, Political Science and International Relations at Victoria University of Wellington; and Dr Rhian Salmon, senior lecturer in science communication from the Science in Society group at Victoria University of Wellington. Each panellist is going to start with a short address on today’s topic then we’re going to have a bit of a discussion and open to questions from the audience. First we’re going to hear from Dave Frame.

DAVE FRAME: The area I work in is climate change. I am a physicist by background, and I’ve also worked as a policy analyst. And I did a philosophy degree. I am also a first-year undergraduate in history and economics. It’s a bit scary talking to you because you all know much more about history than I do. But I have a bit to say about what I think my community—people working on climate change—can learn from history.

One point is that climate charge is a large problem; it’s a global problem, and we know that environmental change, at regional scales and larger, can have massive implications for societies. Another point is trying to govern difficult problems, and history gives us lots of examples in that area. The third point is really about responses and creative ways of approaching problems. So I just want to say a quick little bit about each.

First, there are loads of examples of environmental change placing massive stresses on societies. In prehistoric times there were people in North Africa when the area that is now the Sahara was not the Sahara—it wasn’t a desert. And as the water table went down, some people headed towards the coast, which was a good long-term strategy, and others bet on moving back, retreating into valleys within the Sahara region. That was a bad strategy – they went bust, and died out. But along the way, they invented some amazing water efficiency technology.

But even in much more modern times we see environmental stress creating major stresses for regimes. In fourteenth-century Europe, weather-related famine caused massive stresses, during the Great Famine of 1315–1317. I was struck by the role of climate in social stress when recently reading a very short history of Russia—Orlando Figes chose to begin his history with the famine in 1891 (Figes 2014). Probably partly because he wanted to end the story in 1991 and wanted a round number, but he also made a fairly strong case that the famine played a very important role in creating some big momentum behind social change.

So we know that the responses to environmental change, environmental stress, can be big enough to have massive implications for societies, and it would be surprising if the multi‑annual drought and dry conditions that have been happening in the Middle East haven’t played a role in some of the events in the Middle East over the last few years.

So I think there are a lot of places like that where we can look at the amplitude of environmental stress and see what the knock‑on effects are. Given that we’re looking at a long timescale change in the case of climate change that’s really relevant.

There are also lessons we can learn about what not to do, in terms of governing problems, and my favourite example here is something that was very well intentioned, but ended up having bad outcomes, and that was the Polish Lithuanian Commonwealth which had this parliament where they had a free veto. So with the best will in the world, they said look, outside of the room, we’re all unequal; some of you have big estates, and some of you have small estates, but inside this parliament all the nobles should be equal and we’ll make that real by giving everybody a free veto. So if you didn’t like a piece of legislation you could stand up and say ‘I forbid it’, and walk out, and that was the end of the legislative session.

So the intention behind it was all very admirable, but the consequences were disastrous. But in the case of climate change, the way the United Nations framework convention works, the way the conferences and parties work, have been too much towards that end of things, and we need to learn the lessons of history that that sort of thing is a bad strategy in the long run, however well-intentioned it may be. And I think that’s a slightly surprising lesson for some people, for many climate advocates who suffer a bit from idealism.

The final one is in the response side and here the example I give is another one that I think feels a bit strange, and that’s the example of the abolition of the slave trade in the UK. Lord Palmerston’s Government made a big cash payment, effectively, to slave owners to stop owning slaves, to shut down the slave trade system, and then having purchased that political support, he—using the British Navy—shut down the trade. And, what’s interesting is that that payment would fail any modern tests of anything like justice or equity, but it was extremely effective, and it got to the right outcome.

And in the case of climate change we spend a lot of time talking about climate justice. But the people who talk about climate justice talk about climate change as though we have an unallocated good, like a pie to cut up, or a radio spectrum to auction. But what we actually need to do is to get people to *stop* *doing* something. And so I think there are lots of examples, usually much less in your face than the slavery one, where we acquire that sort of reasoning.

But the slavery one is one of the few cases that is roughly as big as the climate problem—slavery was a global problem and it was the provision of energy through stolen labour. In the case of climate change it’s the provision of energy with a massive great pollution externally, but it also leads to bad outcomes.

So I think there are lots of way in which we can learn from history, and I think some of them are quite surprising.

REBECCA PRIESTLEY: Great. Thank you, Dave. And could I ask Dan Hikuroa to talk next?

DAN HIKUROA: Kia ora Rebecca. Kia ora tātou. Kia ora tātou katoa.

So the lessons of history, for the future of science.

I’m going to take a few short seconds and describe my journey here so you might be able to understand the message that I’m going to share with you in just a moment.

I trained as a geologist, I did a PhD mapping rocks and then I did a post‑doc looking at climate change in the Cretaceous, and seeing how the oceans responded to that, and then concurrently with doing my PhD I was lucky enough to be invited to teach at Te Whare Wānanga o Awanuiārangi in Whakatane. That’s a tertiary institution which gives NZQA approved degrees, and Masters, and PhDs.

And while teaching there, I found myself in a little bit of dilemma and I had to go and speak to the Vice Chancellor and said look Graham,[[1]](#footnote-2) you pay me to come and teach about tectonics and I can teach plate tectonics, but the class members keep sharing with me these amazing narratives; these amazing stories which seem implausible and fantastic but when you actually hone in on them it looks like they’re making the same types of observations that might lead you to the conclusion of plate tectonics. So I felt a bit uncomfortable, because I was teaching them about those things but they were giving me more information back. And he just smiled and said look, it’s because they love you and they appreciate what you’re doing, so just get on with it.

And that was pretty much all I needed.

The other great thing was that all of those people came from communities, and so I’ve generated some amazing relationships with those people and I still work with them and with their communities today.

So after the post‑doc looking at climate change in the distant past there was an opportunity, a new research institute was being set up, and the director there was quite visionary and he said look, just come in and we want to be doing great things. It was built up out of the ashes of the Geothermal Institute, which existed at the University of Auckland, and it was called the Institute of Earth Science and Engineering.

And Peter,[[2]](#footnote-3) the director, said to me, ‘Tell me your dream job’ and I said that, based on my experience with the PhD and then with the community down in Whakatane, it would be something where I could go and work with communities, help try and solve their problems, and help try and realise their dreams. And he said, ‘Perfect, write that down and that can be your job for a few years. I’ll have to go and get some money; I’ll support you for a couple of years and then you’ll have to get some research contracts’.

So all those contacts I’ve made while I’ve been in Whakatane, then I went back to them and started working with them on various projects.

One of the key things I want to share about lessons of history is that a lot of what those people were sharing with me was indigenous knowledge, and in New Zealand of course that’s mātauranga Māori.

Yesterday I gave a presentation (Hikuroa 2015) that outlined that science is to be understood as a state of knowing, knowledge or cognisance of something, and science is both a method for generating knowledge and then all the knowledge that’s been generated according to that method. So am I getting agreement there? I’m getting nods, shakes, nods. Great. It’s a good start.

And so the scientific method is a suite of techniques that are empirical in nature, for investigating different phenomena, acquiring knowledge, and updating and integrating previous knowledge. I’m still getting nods? Great. This is really going well.

And then, you know, there are systematic observations, measurements, experiments, coming up with hypotheses, and those types of things also define what science is.

And so I’ll just share one short snippet of a type of indigenous knowledge in New Zealand called the maramataka. Hands up anyone who’s ever heard of the maramataka before? A few of you in the session yesterday should have your hands up.

So the maramataka is a calendar system. It’s a system for marking time, based upon a lunar cycle. One particular tribe, Te Whānau‑ā‑Apanui, which is based down by Ōpōtiki on the East Coast in the North Island, in their calendar they have 30 days, but they keep one day in abeyance, because they know from time to time that when they come into the new moon, which is when the old moon has just disappeared and you look in the morning and then if no moon appears before the dawn, then you have to insert that extra day. So then we get a 31-day month.

Now within that time chronometer, there were a number of activities that have been observed, and so Pauline Harris, another speaker from yesterday (Harris 2015), shared with us some amazing research that is underway, which will predict accurately when rats will become significantly more active, during the day and during the night. And the other piece of evidence she shared yesterday was when flounder, on a particular day, will come right into the shallow waters, less than 10 centimetres deep, in the middle of the day on a particular day that is predicted with accuracy in the maramataka. We still don’t quite know why; we just know that they do.

But the critical thing there, is that the maramataka, I would suggest, is one way of knowing and understanding, or cognisance of something. It was a method for generating knowledge, and it’s the knowledge that’s been generated according to that method. You might be hearing me repeating myself a bit here. I mean, the method is empirical in nature, because it’s all based on observation and prediction about what things will occur. It’s been tested through millennia, and it’s a system for acquiring new knowledge, and then also updating, integrating previous knowledge.

So how is that different from science?

I would posit that that particular form of mātauranga Māori fits the criteria for being science, because it’s been generated according to the scientific method.

Now, in the interests of time I won’t go into all the other debates, and certainly it’s not a scientist trying to grab that stuff and say aha, we can steal it now and publish papers and get lots of kudos. The point is, is that suddenly there is this whole new world of knowledge out there, which has hitherto been disregarded as being implausible or fantastical or myth and legend. The key difference is that often it’s just explained according to a Māori world view. And so, maybe the lesson of history for the future of science that I’d like to share is that suddenly, all the indigenous knowledge that exists around the world, we can suddenly now say, that might have been generated according to the principles of science. And so maybe the lesson we can learn, is that the stuff we’ve ignored, we can now regard as science. And one of the neat things about a Māori philosophy is that we’re described as walking backwards into the future. So we’re always looking at what’s already happened, and then using it as a predictive tool for what might happen. And maybe one of the lessons that we could learn is that we could walk backwards into the future. We can suddenly start to consider indigenous knowledge as science, with all the amazing opportunities that presents.

So kia ora mai tātou.

REBECCA PRIESTLEY: Thank you Dan, and now I’ll ask Jim McAloon to speak.

JIM MCALOON: Thanks everyone. I’m coming at this forum from my normal work as a historian, interested in economic and social history, particularly of Aotearoa New Zealand. And I guess there are three main things I’d like to suggest.

One is, perhaps to reflect just a little bit on some of the practical dimensions of applied science, and then a couple of thoughts about the way ahead in terms of endeavours in the history of science, and in the scientific enquiry.

The first point is that New Zealand’s economy, as most of us will be very well aware, depends largely on export and primary produce. And that state of affairs has often been criticised as implying underdevelopment, backwardness, lack of modernisation. Indeed, the current shadow finance Minister, and the Labour Party, have reacted to this year’s budget by saying, ‘Well the first thing we’d do would be diversify the economy so that we’re not dependent on commodity prices’. *If only it was as simple as that*, I thought.

But that’s an old idea. Yeah, that being dependent on the primary sector is backward. It goes back at least to Dr Sutch, if not before.

Other economists, though, have suggested that perhaps it’s sensible to do what we’re good at. Thinking of John Condliffe, one of New Zealand’s most distinguished economist exports of the mid-20th century, and thinking through some of these themes, I’ve been drawing on some ideas expressed very well by some friends and colleagues in Australia, who have also thought about what makes a natural resource economy work.

To borrow a line from one of them, and to use language that was fashionable in this country about 15 years ago, successful resource-based economies are knowledge economies. Applied science, which we’ve heard a bit about in these two days, is important. Learning, adaption and innovation are key.

Now of course listening to Dan Hikuroa yesterday, and just now, I was reminded that learning and adaption are the key to any successful resource-based economy. A case in point is the highly sophisticated natural resource use cycle of some Māori, of Ngāi Tahu, summarised in the enveloping term ‘mahinga kai’ or ‘mahika kai’, depending on how far south you go. In Atholl Anderson’s expositions of this—he is Ngāi Tahu himself—he derives a three-season year: summer, winter, spring. And the resources that are used in each particular part of the year are very carefully laid out based upon, of course, very careful observation and experience.

And he makes the point too that in the distinctive southern regional economy, one critical factor was that kumara would not grow south of about Banks Peninsula. It was pretty marginal everywhere in the South Island. So, different things had to be done, in order for that thriving southern Polynesian civilisation to survive and to prosper.

And of course it also relied upon the careful development of methods for preserving and storing food, because there’s no point in a seasonal abundance. Like my broad bean patch: I can’t eat five tonnes of broad beans in December, so I’ve got to find some way of preserving them in order to derive maximum benefit from the resource.

So this suggests a great deal of emphasis on careful analysis and that’s really, I guess, just to reinforce the points that Dan has been making.

But there’s also a great deal of evidence of scientific observation and innovation in the settler resource economy. Now Vaughan Wood, who is here, knows a fair bit about that in terms of grass science, not only professional grassland scientists, but also the constant experimentation engaged in by ordinary farmers as far back really as the 1840s and 50s. That alongside the State-funded institutions, the Department of Agriculture, the agricultural colleges, the DSIR and its component parts that we heard about this morning. That’s all important.

And as well as sustaining and developing the traditional grasslands economy the other challenge that faced and continues to face New Zealand’s resource-based economy is product diversification, or to put it crudely, doing things other than just processed grass. Okay?

And there are all sorts of stories that are not as well-known as they should be. For example, let me nod to Lincoln University, which employed me for 15 years, and recall the scientific work of a horticulture lecturer, David Jackson, who in the early 1970s began to think about the potential of Canterbury as a wine-growing region. He had a great deal to do with development of the Waipara label. He had curiosity that had very important practical benefits; he wrote a very important text on cool climate wine.

Okay, that’s easy enough, and that approach would even recommend itself to our current political masters.

But another dimension I should like to emphasise is the importance of scientific research that is not economically relevant. I would hope that one day New Zealand’s science history is regarded as being as much a part of that very problematic elusive slippery thing, national identity, as are our novelists, poets, dramatists, not to mention rugby players. And I guess in that context I have to wonder and have to hope that we might be able to break out of our silos.

We’ve heard about a few of the dubious myths that attached to Lord Rutherford, Sir Ernest Rutherford; we’ve heard about Haast; we’ve heard about how women scientists are hardly part of the standard images.

I think there’s an enormous job to do in what is sometimes called recovery history. That first stage of just look, here are the stories; these are the things that have happened, that people should know about.

Part of the reason for that, I think the major reason, is that we just need to know that there’s been so much intellectual capacity in our history. Cameron Smart’s paper yesterday (Smart 2015) contained some very interesting material about how radar scientists in New Zealand were very much at the head of the game, in the 1940s.

I take Kate Hannah’s points from this morning (Hannah 2015) about how women scientists are marginalised. The two Lucies, oh they were botanists. Okay, but who knows what their fields of expertise were?

Likewise, Beatrice Tinsley was mentioned; the great astrophysicist. In fact, there is a Tinsley lecture in her name, with the Royal Astronomical Society of New Zealand; but then again, it’s not well known beyond that particular silo.

And again, perhaps if you ask anybody what they know about her; she was brilliant; she was female; she had a hard time, and she died young. Less is known, in the common domain, about her field of endeavour, which was galactic evolution.

So the lessons that I draw from are that the work in the history of science needs public support, and scientific work that does not make money has just as much a claim on the public purse and on public support, as do the humanities. Because it is simply part of a civilised society that free inquiry be supported.

Just imagine not knowing what the clouds of Magellan are? Those two famed wisps of light there (see Figure 1). Small, perhaps satellite galaxies of our Milky Way, not too far away in cosmic terms.



Figure 1: The clouds of Magellan, above and to the left of the observatory dome. (ESO / Y. Beletsky) URL: https://www.nasa.gov/press/2013/july/nasas-sofia-investigates-the-southern-sky-from-new-zealand-1/#.WM8AiGW8xHi

Imagine not knowing the significance of a naked eye star which flared in the larger of those clouds in 1987; you can see it just there (see figure 2), just below that red patch in the after image. It was the first naked eye supernova since 1604. Imagine not knowing what it was. See there’s just something I think about being human, about being, dare I say, civilised. And incidentally, that very significant event was co‑discovered by a New Zealand amateur astronomer called Albert Jones in Nelson.



Figure 2: The large Magellanic Cloud before (left) and after (right) the explosion of SN1987A. The supernova is visible on the right image just below the Tarantula nebula, in the upper part of the irregular galaxy. Credit: ESO, https://www.eso.org/public/

Imagine not knowing how the Southern Alps were formed. Imagine not knowing how our beech forests work, or the amazing range of creatures and plants above the bush line, in the Southern Alps.

My point is simply that this is all part of the human spirit, and scientific work needs to be justified in those terms as well as in utilitarian terms.

I was pleased to hear this morning the paper on the history of the DSIR (Galbreath 2015) because it reminded me that the Minister in charge of the Department from 1935 to 1947, with a couple of years off, was Dan Sullivan, one of my favourite Christchurch Labour politicians. And his vision, I think, of the integration of scientific and human curiosity, was, in a way, a little bit holistic, and I just put that quote up there because as well as supporting the view of scientific research as economically important, I think he will also have said it was simply about the human spirit. What Sullivan said, in 1923, was that he was ‘not prepared to agree that New Zealanders should be hewers of wood and drawers of water or merely growers of food. We want our people to be able to write and produce books, beautiful furniture, and all the other products of art and secondary industries, in order that they should have the opportunity of developing every special attribute and of attaining to the highest possible standard of technical civilization’ (NZPD 1923).

So I’ll leave it there before I wear out my welcome.

REBECCA PRIESTLEY: Thank you Jim. And now we hear from Rhian Salmon.

RHIAN SALMON: Thank you. Kia ora tātou.

A couple of years ago I was at a conference in Australia, about science communication, and there was a fantastic panel. And it was pretty much on the value and importance of science and communicating science, and the room was packed, it was full of science geeks, and people who love science, and science communicators and scientists, mostly. Lots of people who just were overflowing with how incredibly exciting science is and how the whole world needs to know how great it is. And one of the panellists stood up—she was a very well regarded academic, from the social sciences, and I imagine the kind of person who would ordinarily be quite confident speaking at conferences and on panels—and when she stood up she looked incredibly nervous. And she actually confessed right up front and said, ‘I’m incredibly nervous’. Because, she said, ‘I have to admit, I actually don’t find science very interesting at all and I find it a bit boring, and frankly I find your evangelising about science quite off-putting. It does nothing for me.’ And she talked about her field, she talked about arts and culture and music, and, she sort of said ‘It’s not that science is not relevant to me, I don’t want you to think that I don’t think science is important, I’m just saying that it’s not my thing. But, I do very much want to understand the influence that science is having in my life and in my culture; and to be able to be part of the decision making about important issues related to science.’

And so, I think there is a very important point there, that we don’t have to make people advocates and enthusiasts for a particular discipline, like history or science, in order for them to feel empowered by knowledge from these disciplines. And so, I was thinking about that a bit, because when I was asked, at somewhat the last minute, to join this panel, I thought goodness me, a group of people who are interested in history and science … that’s daunting because, to be honest, I have never been that interested in either history or science as purely intellectual exercises. But I’m very, very interested in the relevance of both of those things.

So, having declared myself as an outsider I then want to mull on the title of this panel, which was the ‘lessons of history for the future of science’. And it got me thinking less about *what* we can learn from history and more about *how* we can learn from history, which, obviously, sort of overlaps with my interest in communication and translation of knowledge.

And then I sort of had this image of these two figures, History and the Future, and I got this image of History handing over these scrolls of knowledge to the Future: ‘Here Future, here is what I know, here is my knowledge, take it and learn from it.’

And it reminded me quite a lot of what we traditionally have done in science communication, which is: ‘Here public, look here, knowledge, scrolls of knowledge, learn from it and you will be wise like me.’

And, you know, there have been 30 or 40 years of really good research, in the social sciences, and science and technology studies, which has shown really very convincingly, that that kind of transfer of knowledge actually doesn’t work. And in a lot of cases, especially when it’s related to societal issues, controversial issues, or other things that touch your soul, that actually it can backfire. And in the field of public engagement with science this is known as the deficit theory, and it’s known as the deficit theory because it’s based on this premise that—actually, this is going to be me being very patronising to all of you, so bear with me momentarily—the premise that you have a deficit of knowledge. So: I have knowledge; I’m going to fill the deficit that you have and then when your deficit has been filled with knowledge you are going to then think what I think and believe what I believe and do what I think you should do.

And time and time again this has been shown to not be the case: vaccinations, GM, climate change, all sorts of issues, and the literature suggests that a much more mature approach to this kind of communication is through dialogue, genuine conversations. So, by genuine conversation I mean we talk, and I listen and I learn from you, and you learn from me. Not, I treat you like a five-year-old and we pretend to have a conversation but I know I’m right. And so that’s two‑way conversation. And then more recently there’s been a real growth in what we call co‑production of knowledge or co‑creation of knowledge, where together we actually work together to create knowledge and bring all of our different knowledges together.

There’s a lot of work in this space; and I know this kind of work is happening in lots of other disciplines, sometimes with different labels as well.

So that got me back to my little metaphorical figures that I’ve been hanging out with, and thinking how can History and the Future have a dialogic interaction? Or even better, one that is a co‑production of knowledge or co‑creation of knowledge between History and the Future?

So I’ve sort of had these two figures hanging out on my shoulders for the last 24 hours, History and the Future, and gosh it’s quite a responsibility, you know? It’s quite a heavy burden, because really the obvious conduit between those two is us, in the present. And I absolutely acknowledge that this is not in any way a new concept and it is deeply engrained in most indigenous cultures; this idea that we are the caretakers of a treasure that the past has handed to us and that we are looking after for the future generations.

And that’s a very beautiful way of looking at the world, but it’s also a very critical way of looking at the world, and I think it’s something we’ve lost touch with. That actually, if we are to be that conduit, between the past and the future, if we want to have some kind of dialogue and interaction between history and the future, then we need to have that channel, and we have to develop the skills for that channel in ourselves, in the present.

But the other thing that really jumped out at me, which is much harder than time travel, is that that conversation is also a cross‑cultural conversation. So the culture of the past and the culture of the future are two very different cultures, and to have that conversation, you also need to understand the cultural context of the times, and so history needs to be able to understand what information is going to be relevant for people in the future and vice versa.

So, I’ve been thinking about the ways that we can help this conversation happen. First, we clearly need to look back at these very well‑established traditions, especially in indigenous cultures, of our culture as conduit, of oral tradition, and of respect for elders.

Secondly, and this is more relevant for Western culture, we need to acknowledge historians, and the very important conduit role they play between the past and future. But also—to go to a very important point that Kate Hannah made this morning (Hannah 2015)—to acknowledge that if you want that information to propagate beyond the discipline of history, then it has to be shared outside of your own discipline. It has to be shared in a broader way.

And both of those lead to my third point, which is that what we really need is to get much better at cross‑disciplinary and cross‑cultural dialogue. Let’s not worry about time travel, let’s just try and get our skills right so that we can communicate between two cultures or two disciplines, and I think that those other mechanisms will come. So that the lessons from history will more usefully inform the future.

I do genuinely believe that the most important way that we can ensure that the lessons of history are able to inform the future of science, or anything else, is to foster those skills, and I think in order to foster those skills we have to look at the incentives inside our current culture, which do not, currently—especially in research and academia—do not necessarily reward that kind of breadth of knowledge and cross‑disciplinary communication.

REBECCA PRIESTLEY: Absolutely, thank you Rhian.

We’re going to open up to questions in a minute—we’ll have a roving microphone, so put your hands up. But first I’d like to ask the other panellists if anyone would like to respond to that?

DAN HIKUROA: I have a quick one. Kia ora.

I think, building upon what you were just saying Rhian, when Rebecca introduced me, she introduced me as an earth systems scientist, and that’s the way I view things now.

Now I trained as a geologist, and I worked with geographers, and I worked with physicists and chemists, but in the work that I was doing one of the lessons I think of history is that I couldn’t solve those communities’ problems just as a geologist, and I couldn’t realise their aspirations and their dreams as a geologist; I actually needed to throw that out, and start thinking about it all as a system, and that’s a Te Ao Māori view of the world anyway, that everything is interconnected and everything is related. So I think maybe one of the lessons is that we can train in our disciplines, but we then really need to somehow work across and have an openness of mind to other disciplines.

And the other example I’ll give is I found myself at an anthropology conference this year and I was stunned to know that these people are asking exactly the same questions I was asking, and often using the same type of methods that I was using to answer them. So, it was really an eye opener for me.

And maybe one quick one without trying to dominate. On climate change, when Māori came from Polynesia to New Zealand there was a big latitudinal shift, and so they had to adjust their practices to the current context. And just as soon as they adjusted to that, they had some whoopsie-daisies with some large birds, and some local extinctions with some other mammals that lived on the coast, and so resources became a bit scarce. And then they got hit with a little ice age.

Yet by the time Cook got here, he commented that, you know, these were very healthy looking people; there were lots of them.

So whatever was held in that knowledge system and the way in which knowledge was managed, maintained, and things like kaitiakitanga, or managing resources; that could be a good way for us to look at understanding potential impacts of climate change in the future.

So, on that note I'll hand it on.

REBECCA PRIESTLEY: Do we have some questions from the audience?

Kate, over here in the front.

KATE HANNAH (from audience): I have so many questions.

I’m going to start with the one that I’ve been thinking about a lot, in the context of the topic. I was looking forward to this conference. I’m working with scientists, and I’m really interested in what you guys think about what, of their own histories, scientists know, don’t know, need to know? Because I’m constantly surprised what people know about Haber, because they know he did ‘some chemist stuff’, but they don’t know what happened to him. And I’m always interested in that story.

And so I think in the climate change context I’m intrigued as to what about the past people need to know to be better scientists?

DAVE FRAME: I think Dan’s example is an interesting one where everyone has a disciplinary background or an idiosyncratic background, and people come to learn that they need to know more about the earth system as a whole if they’re going to have a career in climate science, but they all still come with their disciplinary biases and all their history and all their cultural background, all the things that come with being a person. And, I think it’s very diverse how people engage with the history of their discipline, how people engage with facts, and how people engage with the normative aspects, the ethical aspects, of a situation.

Many people in my own cohort were totally uninterested in the history of science. Studying physics, I remember a lecturer, Valda McCann, trying to make the historical dynamism of physics real for people, to make the discovery of quantum mechanics real for people. She was saying, ‘80 years ago this stuff wasn’t known’.’ And ‘Somebody built it,’ you know, as a system of theory and so on, somebody built it. And some people really engaged with that point and found it to be quite inspirational, that your work could actually have these revolutionary implications, but many people were more like ‘Yeah, we know,’ and it wasn’t that they had a shallow engagement with the subject, it’s just that things that are related to it weren’t of interest.

And I think in climate change you get this massive diversity of ways people encounter information, and some people see it, quite sincerely, as an ethical problem or a problem of global justice and other people just as sincerely regard the idea of global justice sceptically, and respond ‘give me some precedents,’ and they just don’t attach to it. Because of the size of the climate change issue, we’ve all got very limited understandings of it; we all come at it in our own particular ways; we think we understand it and we don’t necessarily overlap even with the core beliefs that other people have and it’s one of the difficult things about the problem.

REBECCA PRIESTLEY: Great. We had a question from Sydney.

SYDNEY SHEP (from the audience): Thank you all. It might be a bit of a provocation but I’m riffing off of Rhian’s last comment so just bear with me for a moment. If we’re talking about cross‑talking and cross‑walking, what if we pose this question: ‘The lessons of science for the future of history’?

REBECCA PRIESTLEY: Does anyone have a response?

DAVE FRAME: Lots about energy and information, I think. I think science and technology matter massively for how society uses both information and energy. We had a series of important energy revolutions from the late middle ages until the start of the twentieth century, and we’ve had an information revolution in the last 50 years, or so. I think these basically thermodynamic quantities play a massive but under-girding role in determining what sort of lives and societies are possible, and I think that’s a fascinating and underexplored area for historians. I know there’s some work by Vaclav Smil on the history of energy which is really interesting. But I also think there’s much more to be done and understood about how societies deploy energy and use information.

RHIAN SALMON: I just want to reflect here that it has often bemused me a bit how science managed to grow a whole field called science communication, but we don’t have, you know, ethics communication and politics communication and history communication, and so I might throw that one back to, if you are talking about the discipline of history as opposed to the future of history just being the future (because it becomes history) … somebody in the philosophy department here recently came and found me and said I want to learn from you because you guys seem to do a really good job at promoting science; we need to do the same in philosophy. And I do wonder about the humanities sometimes, there’s something to be said about learning some of the lessons we have learnt and about what we’ve done wrong as well, around communicating and engaging more broadly about the relevance and importance of science.

DAVE FRAME: The starting assumption is that you guys are good at that, and that we’re lousy.

JIM MCALOON: I’d just like to very quickly come back and say that what I draw from science for the practice of history, it might be a slightly old-fashioned view of science, I don’t know, that it is possible to a reasonable degree of certainty, to actually know things, and that will make me a troglodyte in terms of history I’m afraid, but yeah.

DAN HIKUROA: Maybe just a quick response here as well. One of them would be through my knowledge of mātauranga Māori is learn to live within your means, whatever that might be, because there might not be future without it.

REBECCA: Okay, John’s got a question.

JOHN HEARNSHAW (from the audience): This morning we had a session on DSIR, and I made a comment at the end of that session which I would like to repeat here for this wider audience, and what struck me was that speaker after speaker described the amazing research done by different DSIR divisions (Lewis 2015; Hearnshaw 2015; Davey 2015; Warrington 2015), and there was a strong feeling of regret by many of the speakers, that DSIR no longer exists, and there’s no longer support, in this country, for the big expensive science that universities can’t really afford, and it just seems a great shame that we don’t have that mechanism. Nearly every other civilised country has national institutes that are entirely Government-funded to support both curiosity-driven science, and indeed science of relevance to the economy.

I think the lesson of history is we should be trying to think of ways for more Government funding for the more expensive branches of science.

Of course my particular interest is astronomy and we need a national observatory in this country because the University of Canterbury can’t do it alone, and it just strikes me as a great shame that of the 34 countries in the OECD, New Zealand and Slovenia are the only ones that do not support astronomy at a national level.

And if we had something like DSIR, not saying it has to be a renaissance of DSIR, but something like that, a mechanism for the national funding of science, would not science be so much better in this country?

DAVE FRAME: Absolutely. I agree with you and I also think that actually it’s no coincidence that when people show something of the human dimensions of science they often choose astronomy. There is something quite fundamental about our context that astronomy and a handful of other disciplines bring, I’d say, that it is incredibly striking and hard to ignore. And it’s no surprise that where those sciences are healthy, science is embedded in your culture much more deeply.

But the other point I would make is an analogy about how competitive incentives can destroy institutions: last time I was in the UK we visited a Roman villa which was home to around 80 people for several hundred years. As that society collapsed people no longer lived together in a collective arrangement. In the dark ages the locals disassembled that institution brick by brick. It could hold 80 people; it was quite a big farm, a great facility which could provide a way of people teaming up together and getting gains from scale on a number of fronts. But as trust collapsed and the incentives to look after yourself strengthened they disassembled it. They undid it; they unmade it and used the stones to build their own little houses and look after their own families. So it was quite a conscious move to take away this collective facility and create much smaller private facilities because the incentives told them to. And what they went into was a world of anarchy where it’s a self‑help system and everyone looks after number one, and that’s the tragedy of New Zealand’s reforms of its science funding system. It’s so focused on providing competitive incentives that it ends up destroying trust, destroying collaboration and ultimately becoming a far less efficient way of doing science. I’m pretty sure we are less efficient, as scientists, than 1970s scientists would have been with our technology because we spend so much time competing with each other and writing low probability bids and having to schmooze governing bodies—who are generally pretty scientifically ignorant. I probably shouldn’t say this as a director of a National Science Challenge, but it’s true. That’s the reality of the science funding system in New Zealand. And the problem is a lack of scale and a lack of incentive to work together to build those collective public goods.

DAN HIKUROA: I’ve got just a little bit to add to that. One of the other things just to really quickly respond there is, we have to realise that as scientists we’re actually beneficiaries of society. We exist upon the goodwill and the taxes that we all pay, but we have to, as science communicators, do a better job of saying ‘Hey, this is the benefit,’ and communicating that better. So I think it’s both, exactly as Dave says, we need to act collectively, kotahitanga, and then also do a job saying ‘Hey look, we’re open, responsive, we are your beneficiaries.’

Kia ora.

REBECCA PRIESTLEY: Great, I think we’ve got time for another quick two and then I’ve got a question. Jean?

JEAN FLEMING (from the audience): I’ll try and be quick.

I’d like to introduce one more word into the discussion about the effectiveness of communicating between groups, between cultures maybe, between disciplines, everything that Rhian has been saying.

The word that is missing is ‘respect’. It’s respect for your audience if you’re a science communicator, and an ability to listen to what the other side has to say. I’m guilty of that when it comes to the corporate culture, and I’m trying very hard to listen, but there’s a whole lot of personal stuff in my background that makes it very difficult for me to respect and listen to the managerial corporate culture.

But I do think that if you look at it in terms of a mutual understanding and respect, then maybe we can take the lessons of history and go forward.

At the moment I see that as nowhere near happening. But, in my head, that is the reason for the rise and rise in science communication.

REBECCA PRIESTLEY: Great, and we had one question just here.

MALE AUDIENCE MEMBER (not identified): Quick point on one of your comments Dave, about slavery. I do wonder about that notion, and I work off of Andrew Nikiforuk’s book *The Energy of Slaves* (Nikiforuk 2012) where he points out that the parallel of mass extraction of coal ran along slavery, and we actually replaced the energy of slaves with the energy of fossil fuels.

Which leads to my question: The lessons of history of Joseph Tainter. In his book *The Collapse of Complex Societies* (Tainter 1998), he points out that they collapsed due to diminishing returns. And in terms of science, I don’t know if there’s an example exactly, but, off the top of my head, where Marie Curie, 120 years ago discovered two elements, pretty much on her own, with the resources she had. Nowadays it requires thousands of people as well as billions of dollars to create the Large Hadron Collider so we can find the Higgs Boson. So we’re seeing those diminishing returns.

My question is for anybody on the panel, seeing how we’re on the cusp of peak oil and other energy shortages, how will that affect the collapse of industrial civilisation and the future of science?

DAVE FRAME: I think we’ll be lucky if we’re on the cusp of peak oil because of policy, then that would be a good thing, but I don’t know that we are or not. There’s a book by an American sociologist in which she talks about global trade networks before about 1500. It shows that when there were shocks to those trade networks, the people who suffered were mainly the peripheries, while the cores got back on their feet quite quickly. So I don’t see industrial society falling over in a heap at all. I think the cost of climate change is much more likely to be borne by people who are currently in a tough situation in already fragile states.

And this is yet another reason why I think the framing around catastrophe is a bad thing in climate change, because the more you tell people that the problem is worse—if they’re sort of thinking well it’s a collective action problem and then you tell them it’s worse than that, you turn it into a self‑help problem. You create those incentives for them just to look after number one. And they probably can do that quite fine. So I’m a sceptic about the catastrophists’ narratives in climate change.

I think that the sort of society we are in will probably do fine. There will be costs and those costs will exceed the benefits of doing something about it, but I don’t see why we would expect societies like ours to collapse. There are plenty of other energy sources as well.

REBECCA PRIESTLEY: Okay we’re just about out of time, but I just want to ask one last question.

Jim, you talked a bit about recovery history and I was just wondering, keeping in mind Rhian’s point that whatever lessons we learn we need to also think about how they’re communicated.

What kind of scholarship do you think we might need in this area? If you had a pod of money to fund some PhD students and Masters students to do some research that might help to uncover some lessons, what would you do with it?

JIM MCALOON: I’m a great believer in letting scholars follow their noses. Do what they want to do. And I think there’s a creative energy in that. We can’t prescribe, I think, how history will be written. We can’t prescribe how any form of scholarly endeavour will end up. So I’ll leave it open.

But just coming back to that last point just quickly, I agree with Dave about the problem of expecting a catastrophe to produce beneficial results. And I guess perhaps this is kind of tangential to your question too, Rebecca. We need to think about the sort of future we want and we need to think about how we’re going to make it.

And that might sound trite. But I put Dan Sullivan back up there because his focus on current research, and he and his colleagues did envisage a new social and political order. It wasn’t revolutionary, it was evolutionary, but it did change things. And I think there’s a lesson about human ingenuity and human will when you work together, that without being too optimistic and too starry eyed, is worth remembering.

REBECCA PRIESTLEY: Great, has anyone got anything to add?

DAN HIKUROA: Maybe a fairly quick response. I’d get kura kaupapa-trained students, teach them the principles of science and set them free.

REBECCA PRIESTLEY: Great, thank you. Hey we're out of time so big thank you for all our panellists.

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1. Graham Smith, CEO 2005–2015 [↑](#footnote-ref-2)
2. Peter Malin [↑](#footnote-ref-3)