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Why are scientists so quiet? Cultural and philosophical constraints on the public voice of the scientist

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Abstract

In this post-truth era of virulent attacks on science and online trolls, we scientists find ourselves scrambling for a foothold in an environment in which everyone has a voice —- and in which the truth can be virtually impossible to distinguish from "fake news," and everything else in between. How do we react as a profession to shore up our own standing, and the importance of our work and of evidence-informed decision making, when the public is struggling to recognise credible scientific knowledge within this information free-for-all? I believe we are at a turning point that will serve as the catalyst for the remaking of much of what we have long understood as the culture and "rules" of science. First, we need to turn our attention to, and seek to understand, the profound impact of new information technologies on how we "communicate science." We need to critically analyse our own culture of knowledge-making and acknowledge and challenge the constraints that have long discouraged scientists from speaking out, leaving many of us now stranded ineffectually on the edge of public discourse. But this is just the first and most obvious step. If we challenge our entrenched culture, we will also be forced to rethink science education and, ultimately, how we "do science;" that is, how we create knowledge, our ultimate goal. This means recognising and embracing the new opportunities that change is throwing up, rather than bemoaning the inevitable pain of disruption. To do this, we need to loosen the academic hierarchies that have "quietened" scientists, we need to teach science students to speak out and to speak up and learn how to do so ourselves. Most importantly, we need to drive the restructuring of knowledge-making by overcoming our tendency to huddle in silos, and work collaboratively instead. This paper argues that by collaborating not only across disciplines, but also in genuine partnerships with communities, businesses and industries, we can go a long way to retaining trust in, and appreciation of, the power and validity of science and the scientific process.

Introduction

I am a practising scientist and science communicator. Not one well-versed in the dissection of the practices. As such, I present my comments as "Notes from the field".

Charles Darwin

As a young marine scientist, I was fascinated by rather strange organisms, barnacles; upside down prawns stuck on their back in a concrete cage, grasping at waves for a lifetime. Much later I discovered that Charles Darwin had been an even bigger fan of barnacles. I read of his meticulous, painstaking study of the world's barnacles, an effort that consumed eight years of his life and ended in a serious bout of ill health.

As an ecologist and sometime evolutionary biologist myself, Darwin's theory of natural selection has influenced everything I've investigated and interpreted. It is part of my lens on the world.

But, it was Darwin's *reason* for embarking on his global barnacle study — while leaving his sensational idea for *On the Origin of*

Species by Means of Natural Selection locked in a drawer at home in draft form, unseen and unread for eight years — that touched a nerve.

Darwin's obsessive journey from 1846 to 1854 into what Rebecca Stott (2003: 206) calls 'barnacle darkness' in her wonderful book was partly driven by curiosity. Of the more than a thousand species he'd brought back to London on the *Beagle* there was only one he had not been able to catalogue and describe. This soft, small, dun-coloured creature he'd found many years earlier inside a conch shell on a Chilean beach would turn out to be a rare, burrowing barnacle.

But it was not just this troublesome scientific loose end that drove Darwin to spend so long finessing his books on barnacles. Darwin had an "instinct for postponement". He realised he needed to prove himself as a scientist, and a systematizer if he was to be listened to when he did, finally, publish his most important work, *On the Origin of Species.* So, he gave his wife detailed instructions on how to handle publication of *Origin* should he die before his barnacle study was complete.

But the first book, *Living Cirripedia, A Monograph on the Sub-class Cirripedia*, with figures of all the species meticulously detailed won him the Royal Society Medal in 1853. He still had the Balanidæ to go! Together with his geological treatise on Coral Reefs, the barnacles books established Darwin as a scientist "who had won his spurs". Stott (2003: 167) argues that, "Without his barnacle spurs and barnacle contacts, *On the Origin of Species by Means of Natural Selection* would have been very differently received."

When Darwin finally published his theory of natural selection in 1859, he had a global web of scientific contacts forged through his barnacle work, a ready-made community of colleagues ready to recognise the importance of his new theory. He was taken seriously, not, as we know, by everybody, but by a sufficient number of his peers.

That was almost 160 ago, but the story is still relevant today, and particularly so in this apparently confounding post-truth era we find ourselves living in. I say confounding because we, as academics, have all played our part in building or reinforcing our global culture of "knowledge-making".

Knowledge-making today

The many different hurdles and gateways we've put in place to weed out unreliable, biased, ill-conceived and incomplete information are designed to ensure that by the time we present our knowledge to the world it is a close to complete as possible. As senior academics, most of us are probably confident in the authority with which we publish and in the credibility of our work.

But this structure and culture have also had perverse consequences which go back to Darwin's story and, in some ways, to my own. We have built a knowledge hierarchy — and a similarly strict professional hierarchy — which has not only protected the veracity of what we produce, but has actively discouraged scientists from taking part in public debates, particularly young scientists who are, as Darwin noted, yet to win their spurs.

The result, I have observed, has been to quieten our profession. Many successive generations of scientists have assumed that the discovery process is mostly about generating "research outputs," that their job is only to generate new knowledge, not to advocate or argue, but to let the facts speak for themselves.

There are very few scientifically trained public intellectuals because our structures do not support them, and scientists rarely see themselves as public intellectuals, or advocates. Indeed, many scientists understand that to actively seek the public spotlight risks drawing the contempt of their peers. In fact, despite the many passionate arguments and discussion behind the scenes — and some notable exceptions of internationally recognised science voices — the public face of the scientific community is mostly hesitant and tight-lipped.

In my own case, I was acutely aware of the scientific hierarchy as a young academic. I felt just as compelled to speak publicly about science then, as I do today, but I made a concerted effort to remain quiet, to recognise, and behave in accordance with my then junior standing. If I spoke out, I spoke strictly within the direct realm of my active research. I did not use my expertise to comment on other matters of the day, even if they were marine in nature.

In Darwin's time the *quiet* that this hierarchy engendered was perhaps not such an obvious a problem as it is today. The ability to contribute ideas was already limited to those with access to a printing press, a stage, a pulpit, or a soap box. And audiences too were relatively small.

Even in my own early career, during the early rise of the internet, there were no "broadcast media" available to anyone with an opinion and access to a keyboard or phone and an internet connection. We still had many reliable mass media gateways, through which pre-vetted information flowed. Many publications had specialist science writers whom we could trust to do our communication for us and who also investigated the investigators.

Media today

Now, as scientists, we find ourselves scrambling to find a foothold in an environment in which everyone has a voice, and in which the truth can be virtually impossible to distinguish from "fake news," and everything else in between. As the Yale science communication theorist, Dan Kahan recently wrote (2017), the problem is not the much-maligned lack of scientific literacy in many of our societies. Although scientific literacy is highly desirable, it is not essential for the public to recognise what it is that science "knows."

The real difficulty for audiences, Kahan argues, is "identifying who knows what about what… and distinguishing the currency of genuine scientific understanding from the multiplicity of counterfeit alternatives" (Kahan, 2017). Everybody appears to be peddling facts.

But what does it mean for scientists if the "cream" does not necessarily rise to the top in an information free-for-all, as we had optimistically postulated in the early days of the internet? Personally, I think we need to recognise that we are at a turning point.

We may, in future, look back at the dynamic changes we are witnessing as the catalyst for the remaking of some of what we have long understood as the "rules" of scientific practice.

First, we need to turn our attention to, and seek to understand, the profound impact of new information technologies on how we "communicate science."

But that is just the most obvious issue. I'd like to explain why I believe this must also challenge us to rethink what we teach in science education and, ultimately, how we "do science:" how we create knowledge, our ultimate goal.

I am not pessimistic: change always throws up new opportunities. But we need to be able to recognise and grasp them. So, what is the future of rationality in a post-truth world?

Fake news, propaganda and barefaced lies are, of course, not new. More than three centuries ago Jonathan Swift famously noted that "falsehood flies, and truth comes limping after it" (9/11/1710)[1]. The British novelist, best known for *Gulliver's Travels*, was also an astute political commentator and published various pamphlets expressing his concerns about what we might today recognise as post-truth facts. But in Swift's time the distances and speeds at which "falsehoods" could travel were very limited, so too was the size of the audience they could reach.

Today, falsehoods do more than fly: they seem to arrive fully formed in our consciousness via our screens. The internet has dramatically accelerated and amplified the sensational, the unreliable and the blatantly untrue — we all know that. But there is something else we need to consider about the design, or the shape, of the virtual world. Before instant digital communication, in many countries we had gateways: we chose news and views via publishers we trusted to have vetted them first.

In researching this paper, I came across the multiple websites and Facebook pages for the Flat Earth Society. They claim to be places "for free thinkers and the intellectual exchange of ideas,"[2] and their latest crowd-funding campaign is raising funds to launch a satellite to prove that we "round earthers" have been conning the masses all along. The websites look professional enough and the satellite plan has all the hallmarks of a scientific investigation. A ridiculous example, perhaps, but one that goes to Kahan's concerns about the challenges of recognising credible scientific information. This is especially so when the "tools" of science (in this case a satellite) confuse the issue, or as he puts it "pollute the scientific communication environment."

One thing troubled me most. In the virtual world, the glossy claims of the "flat earthers" or anyone else without knowledge or authority are only one click away from the CSIRO or NASA, or any of the Academies.

We know this "flat virtual space" is fuelling some troubling communication practices, like "false balance." When one "side" of an argument is just as accessible, vocal or visible as the counter view, we are at risk of assuming an equivalence: that they are the two sides of a "balanced debate."

For scientists, the obvious example is the way in which this faux duality has bogged down the climate change debate in Australia, and beyond. We see Professor Brian Cox seated alongside the former One Nation Senator and vocal climate change denier Malcolm Roberts on ABC TV in the name of "balance," and within minutes a lifetime of study and research becomes equivalent to an ill-informed conspiracy theory.

We also know that any opinion, bias or prejudice can find validation somewhere on the internet, and that automated content-selection algorithms reinforce particular views. It is difficult to counter 'selective exposure', 'selective perception' and 'selective retention'; others have talked in detail and with considerable insight and knowledge of such matters today. In the domain of science, research shows that genuine science news initially spread quickly online, but

[1] https://www.thoughtco.com/art-of-political-lying-by-swift-1690138

[2] https://www.tfes.org/

that rumours have greater staying power and persist for much longer on platforms like Facebook (Cook et al., 2007).[3]

For climate change mitigation, something very close to my heart, this means we find ourselves stuck in a repetitive and redundant debate, when we should be channelling our intellectual energies into solutions. This is not, of course, a circumstance *caused* by new communication technologies — these are just tools — but there are many with vested interests who are exploiting them. And there appear to be just as many with pre-conceived ideas of how the world works, and conspiracy theories, who want to use them. As scientists trained to be quiet, we find ourselves on the margins, rarely being heard above the din.

At the same time, another factor has come into play. As a public advocate for evidence-based action to offset, mitigate and ultimately reverse climate change, I am regularly on the receiving end of various trolls' extraordinary views. Trolls use the kinds of insults we would not consider hurling in person, but with the anonymity of the online space their inhibitions seem to melt away.

So, to our long-standing cultural constraints that discourage advocacy and agitation, I would add the undeniable pressure from trolls.

So, what, as scientists, do we do?

Get in the communication game

First and foremost, "get in the (information/communication) game." Again, that might seem obvious, but how we do that is a bit more complicated.

If we scrutinise the way our knowledge system has evolved over the centuries, it wasn't a bad model for the circumstances of the past. Discouraging researchers from speaking out until the knowledge they were generating had been vetted and verified, and they had built a considerable cache of context, was a powerful way to build our credibility. Our quiet culture did help strengthen the knowledge system.

Now, however, everything has been turned on its head, and the silence and hesitancy of scientists are putting our knowledge system at risk. The question becomes, how do we raise our voices while retaining the rigour and the reliability of our knowledge creation?

I don't want to depress anyone, but I am sure many readers are familiar with the emerging interest in citations analysis. A decade or so ago, a library and information science researcher from Indiana University put many academic noses our of joint when he revealed that 90 per cent of journal papers are never cited by anyone and that half are never read except by their authors, referees and journal editors. Publishing in *Physics World,* Lokman Meho (2006) called this a "sobering fact". And, approximately one article a minute is added to PubMed. Are its 26 million or so papers to date a knowledge triumph or a tragedy? While we've become very good at adding to the global knowledge vault, we are not very good at getting that high-quality information out.

In the face of today's sometimes savage and frequently ill-informed attacks on science, scientists and our findings, I think that speaking out, well beyond our conventional outlets, can strengthen our position.

Yet we are so accustomed to building our careers on the back of peer-to-peer communication that we may not regard talking to the public as part of our remit. We need to

[3] See also Cook (2017) — Ed.

build this into our promotion and rewards process and training.

We really do need to be able to translate complex concepts for diverse audiences, and we do need to engage much more with other academic fields, so we can begin to understand a bit more about things like the power of message framing, and that even the font we choose influences how people view the information we are presenting. There is no shortage of empirical research that points to the best ways to convince an audience that our information is valuable and genuine.

This goes back to the ways scientists can help make it easier for the public to distinguish between credible information and the "flat earth society."

We may need to make a concerted effort to "brand" ourselves as credible, engaging, interesting sources. To do so, we must be able to explain what we do, why we do it, and why it matters to anyone. That is, the "so what?" of our work.

But branding and communications won't win this battle alone. What, then, would it actually take to turn this quiet culture around?

Analysing the sociology of science

I feel incredibly fortunate to have chosen to major in the Philosophy and Sociology of Science, alongside Ecology, at university and what I learnt then informs what I do today.

However, most scientists of today, our scientific elite, and most science students, our scientific community of the future, have not studied any aspect of our Western scientific culture or how systems of knowledge-making have been built. Scientists are mostly unaware of all the hard work that has been put in by successive generations of philosophers and sociologists to situate scientific knowledge within our cultural and social mesh. Most scientists would deny that science has a political element, or that observations can be biased.

When we begin to look deeply at how knowledge has been constructed, we can no longer think of science as pure. When we understand that the cultural pressure *not to engage in public debate* begins to appear deliberate and duplicitous. It also invites us to consider other ways of knowledge-making, which I believe can only make us better scientists. This would give us room to rebalance the biases in Western scientific culture that have, for example, largely excluded women and non-Western forms of knowledge. I believe that the social/philosophical/historical study of science and knowledge production should be an integral and integrated part of the science curriculum. This will help us evolve our practices.

How should we be doing science?

This goes to my ultimate point. If we begin to think about how we make knowledge — not just how we communicate that knowledge in this post-truth era — this throws up a fundamental challenge. That is, to examine the way we *do* science, indeed to look at the way we do all research.

It is a rare and marvellous opportunity to have all the academies together to suggest a new way forward.

The process of research has long tended to prioritize isolated development. It is fundamental science that wins Nobel Prizes, and we understand the importance of this research because history has taught us that from fundamental knowledge much else —much of it unanticipated and unimagined — flows. That is certainly true.

But as scientists we are also solving complex contemporary problems. And to do this effectively we know we need to work across

academic disciplines and we need to collaborate with a whole range of professions and industries and decision-makers, who have an intimate understanding of, and a stake in solving, the many multi-faceted problems we are seeking to address.

This provides us with an opportunity to think about creating knowledge differently. Research practices are evolving. Collaboration and interdisciplinary research are about the co-creation of knowledge. If you co-define and co-create research, you involve your partners — those with a stake in the problem you are solving — in the process of discovery. You may find your work is taken up even before it is published, so your research may have an impact even before the first paper comes out. And this real-world impact plays an important part in public debate: it is visible, tangible evidence of the value of an evidence-based approach.

The very relationships necessary for collaboration create valuable new pathways along which credible information and ideas automatically flow. When we involve our partners in the scientific process, they learn the strengths of our method and the rigour of our approach. They develop respect for this form of knowledge creation and can explain the process to their friends.

That's one part of the answer. But, what about taking even another step back and asking ourselves to think more deeply about *how* we identify the gaps in the knowledge and problems we could like to solve.

Likewise, we tend to look at them in isolation, when I believe we — all our many disciplines — could, and should, be working much more closely together.

I see this all the time in my own field. We ask a contained question, we attend to what is "up close," then produce the new knowledge, then wait for it to be taken up. We may be identifying important problems, but without a plan for finding a workable, economically and socially acceptable solution.

A new form of collaboration

Over the past decade or so, successive Federal Governments have recognised the value of co-creating knowledge, but mostly in terms of collaboration between academia and industries, as a means of driving innovation (AG, 2009) and, in turn, of securing Australia's future economic prosperity.

Personally, I think the issue of collaboration is about more than facilitating industrial translation; it is about reimagining everything we do in science within a social, cultural and economic context, as part of the big picture. It is about doing science differently. Facilitating engaged science, funding more diverse partnerships, doing research together.

For us pre-interneters this might seem like a huge challenge, in terms of our academic culture, our skills and our practices. But over the many years I have been teaching, I have seen waves of changes moving slowly through our system.

Today's students and early career researchers are digital natives — and they are more open in the way they do science — this means they are expressing online, in real time, their enthusiasm for something they are discovering, in much the same way as they might report on a social event. They are tweeting from the lab. And suddenly their friends, family and followers are commenting and contributing: they are engaged with the very practice of science. "Next gen" scientists are crowd-funding their research. They are running citizen science projects.

Their professional organisations are engaging with communities.

Next-gen researchers do, of course, understand the importance of verification, but they don't feel the constraint of the cultural "muzzle" in the same way as did Darwin, or even myself. Generational change is already underway.

Interestingly, the World Economic Forum (WEF) identified the spread of misinformation online as a major risk in its *Global Risks* Report as early as 2013 (Stroppa & Hanley 2017) and it has since responded with a series of conferences and workshops about science communication, canvassing how we might counter "fake news."

Recently, the WEF Young Scientists — a select group of the world's most promising scientists under 40 — have been drafting the WEF's Universal code of Ethics for Researchers. The very first responsibility on the list for researchers and the organisations they represent is "to engage with the public." This, in my mind, represents very significant cultural change. The code goes on to exhort scientists to pursue the truth, maximise benefit and minimise harm, engage with decision-makers, support diversity, be mentors, and be accountable. Its message is that we must talk and engage, agitate and argue.

Conclusion

I am confident the three matters of which I have spoken represent a positive way forward for science in the post-truth era. First, lifting our voice; second, critically analysing our history, culture and practice; and, third, evolving our knowledge production to engage communities in the entire practice.

In the past we have mostly converged on the best evidence for, say, the value of adding fluoride to water. But we're now operating in a polluted science communication environment, with lots of toxic messages muddying the waters. Research tells us that people acquire their scientific knowledge by consulting others whom they identify with, who share their values and whom they therefore trust and understand.

That, in my view, is good reason for us to take stock, to take steps to address the limitations of our own culture and begin to dismantle our silos and to build diverse partnerships; all of which can make us part of those trusted conversations.

At the very least, my life-long interest in barnacles suggests a place we definitely don't want to find ourselves: stuck to the same old science rock, increasingly irrelevant, and drowning in a sea of noisy change.

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