COMMENT

NICHOLAS KAMM/AFP/GETTY

Marine ecologist Jane Lubchenco (right) has helped to launch training programmes that help scientists to engage with policymakers.

So you want to change the world?

In these tumultuous times, **Nancy Baron** urges scientists to speak from the heart to build public trust in research.

Fifteen years ago, when I began to work as a communications coach, few scientists felt that engaging outside academia was part of their job. Now, when I ask workshop participants to stand if they 'want to change the world', almost all rise to their feet. Often, they look around in astonishment to see so many peers standing with them.

I work largely with environmental scientists: ecologists, hydrologists, fisheries researchers and others documenting the escalating challenges that face our planet. Some are moved by the disappearance of the wildlife they study, or the brooding omnipresence of climate change. Others are dismayed by divisive political discourse and election results, where evidence may have been devalued or dismissed. All are compelled to reach out.

This marks a radical shift. A decade ago I spent much of my time persuading scientists of the value of outreach to the public and policymakers. Today, most consider such communication crucial: they recognize that the publication of research in ▶

journals such as this one is not an end in itself, but a launch pad to further things. It is no longer a question of 'Should I do this?', but rather, 'How do I do this?'.

Fortunately, there's a quiet revolution happening, with workshops, guide books[1,2] and much discussion on social media about effective communication. This revolution is buttressed by social-science research on the benefits of turning stereotypically stiff and formal scientists into warm, accessible people. And it is supported by a growing network of scientists who mentor each other's outreach. There has been a shift from peer pressure to keep quiet, to peer support to speak up.

This year more than ever it has become clear that the revolution can be kept quiet no longer. It is time for scientists to take social responsibility and to be recognized and rewarded for doing so.

JUDGEMENT DAY

Fear of being judged by one's peers still haunts many academics. No matter who they are talking to, scientists often fret about how they might sound to their colleagues instead of concentrating on the audience at hand. They also worry about being subjected to the sort of abuse hurled at climate scientist Michael Mann. His famed hockey-stick graph, published in 1999, reconstructed a temperature record over the past 1,000 years. His resolve to speak out about his findings plunged him into a maelstrom of hacked e-mails and smears by climate-change deniers.

But a 2014 study[3] showed that scientists might risk less criticism than they think — at least from each other. A survey carried out at nine ecological and environmental conferences found that, to a surprising degree, scientists wanted to engage with the public and policymakers more. Many respondents believed that scientists should interpret and even advocate for the use of their science. A decade earlier, a similar study showed that ecological scientists strongly disagreed with the idea of active advocacy[4].

The question of how scientists should engage is a deeply personal one[5]. Nevertheless, there is a gap between desire and action. In the 2014 survey, the main barriers were a self-perceived lack of competence at navigating the science–policy interface, as well as past negative experiences and institutional norms that did not support them. Lack of time and resources, which often spring to mind first, were lesser factors. The survey found that the more scientists were aware of how their work fits into the policy landscape, the more likely they were to get involved.

'HOW TO'

There are organizations that can help. Two examples are: COMPASS, a non-profit, non-advocacy programme (for which I work) that helps scientists to engage effectively in the public discourse about the environment; and the Leopold Leadership Program, now a part of the Stanford Woods Institute for the Environment in California. Both were launched under the leadership of Jane Lubchenco, a marine ecologist at Oregon State University in Corvallis (before she became chief of the National Oceanic and Atmospheric Administration), and others. These pioneering programmes were created to, as Lubchenco has said, aid "faster and more effective transmission of new and existing knowledge to policy and decision-makers and better communication of this knowledge to the public".

Since 2000, my colleagues and I at COMPASS have worked with thousands of environmental scientists. Over the years we have learned that teaching them communication skills is necessary — but not sufficient. Between the desire to communicate and actual engagement, there is a 'valley of death' that can stop scientists from trying out their skills in the real world. They need guidance on how to bridge that gulf.

The first step is to examine the big picture and determine what your role in a conversation might be. What do you uniquely bring to this issue? Next, analyse potential opportunities: identify the players, including the decision-makers and stakeholders, and determine what they need — and when. This is the key to making advice relevant and timely. Professional societies, government-relations departments at some universities, and organizations such as COMPASS can help to broker connections. So, too, can other scientists.

Strident campaigning is just one way to stand up for science. Warm and well-timed conversations with key players are crucial too.

DOMINIC FAVRE/KEYSTONE/AP

LINKED IN

Once a contact is made, a single successful interaction often creates new opportunities. That first action might be an opinion piece in a local paper, speaking to community members, or an e-mail to someone in local government that meets with a positive response. Even just preparing properly for media attention to an academic publication can launch conversations with decision-makers that take on a life of their own.

This is what happened to Jenna Jambeck, who studies waste-management engineering at the University of Georgia in Athens. In 2015, a paper by Jambeck's team about international data on how much plastic debris enters the ocean each year was published in *Science*[6]. Because her working group of scientists was at the National Center for Ecological Analysis and Synthesis, where COMPASS has a staff presence, she asked for guidance. We helped whittle her 26 statistics down to a few compelling points: "Humans dump 8 million tonnes of plastics into the oceans each year. That's five grocery bags of plastic for every foot of coastline in the world," for instance. When the media flood came, she was prepared.

This launched Jambeck's role in the political conversation about plastic waste. Since then, she has become a sought-after expert at congressional hearings and around the globe. Her science is important, but it is

also her conversation that makes her so successful. Her voice resonates with people because of her optimism that this problem can be solved, along with her willingness to show her passion for recycling and waste management. One of her best lines is that she met her husband at the landfill.

Jambeck's friendly tone matters. A study this year revealed that scientists most prioritize communication designed to educate and defend against misinformation, and that they least prioritize communication designed to build trust and resonance with the public[7]. Yet research shows that people's willingness to listen is linked to how likeable, warm and authentic they find the speaker[8]. Building trust requires a human touch.

Ken Caldeira, an atmospheric scientist at the Carnegie Institution for Science in Stanford, gave a lecture on World Oceans Day to leaders of the United Nations Educational, Scientific and Cultural Organization in Paris this year. He presented the perils of acidifying oceans but reframed them as a question: how can we help the oceans help us? This empathetic approach resonated. Focusing on solutions, and using inclusive language such as 'we' and 'us' when talking to audiences makes scientists — and their findings — more approachable. Caldeira has also embraced social media. Twitter, Facebook and other social platforms are key to shifting public opinion, as events this year have shown. Scientists should join these conversations to extend their reach. Sometimes, despite doing the right work and reaching out to the right people, the science does not prevail. Jonathan Moore, a coastal scientist at Simon Fraser University in Vancouver, Canada, spent four years tallying up the social and environmental havoc that would be caused by a liquid natural-gas terminal on the northern coast of British Columbia: it would disrupt habitats that support salmon relied on by 11 First Nations groups over an area the size of Switzerland, his team found. Although Moore and his colleagues have published in the peer-reviewed literature[9], been covered by hundreds of media outlets and met with communities and policymakers, the terminal was granted government approval by a regulatory review process that many Canadian scientists find lacking.

SUPPORT NETWORK

Public engagement takes perseverance and courage. It also needs emotional support. It's a long haul, and hard to do alone. In 2014, Moore was a member of the first cohort of the Wilburforce Fellowship, run by a charitable foundation in Seattle, Washington. The year-long programme is designed to provide leadership and communications training to scientists at all career stages to form lasting networks of support across Canada, the United States and Mexico. Initial training lasted only a week, but fellows continue to share successes, failures and advice for resilience through social media and e-mail. At conferences, they stay up late discussing how to advance their goals and offer each other encouragement.

Some of the earliest fellowships, including the Leopold programme, were intended specifically for tenured academics, because outreach was seen as a career risk. This is changing. The next generation of young scientists is most eager to change the world, and is stepping up to do so.

Canada's government, elected last year in place of an administration that was accused of muzzling government scientists, has promised to usher in an era of evidence-based decision-making. More than 1,800 early-career researchers have contributed recommendations on how to rebuild confidence in environmental assessments and regulatory reviews — so far with mixed results (see youngresearchersopenletter.org).

Sally Otto, an evolutionary biologist at the University of British Columbia in Vancouver, directs the Liber Ero (Latin for 'I will be free') fellowship. It funds early-career scientists to do applied research on important conservation issues and provides training in public and political outreach. Otto also donated some of her 2011 MacArthur 'genius grant' to launch a policy fellowship that embeds scientists in government in Ottawa. The scheme is run by Mitacs, a Canadian non-profit organization that specializes in partnerships and placements between academic and non-academic institutions.

"There is a 'valley of death' that can stop scientists from trying out their skills."

Young scientists are under massive pressure to win grants and publish. So a growing cadre of senior scientists is instigating fellowship programmes that provide early-career researchers with communication skills and connections, and in some cases also funding.

Such efforts are changing the academic reward systems, albeit too slowly. Several institutions now have tenure packages that recognize communication and outreach, along with conventional measures of publication and teaching success. Lisa Graumlich, dean of the College of the Environment at the University of Washington in Seattle, has expanded her definition of impact to include public engagement, which she considers a logical product of engaged scholarship. Some argue that engagement, although harder to measure than citations, is a better proxy for academic success[10].

Training on how to extend into the public realm and understand the workings of government shouldn't be available only through boutique fellowships or under the wings of a few motivated senior faculty members. It should be a part of every young scientist's education. In 2014, COMPASS led a working group funded by the US National Science Foundation (Building Systemic Communication Capacity for Next Generation Scientists) to assess the science-communication workshops and training available to US graduate students in science, technology, engineering and mathematics. We provided recommendations for integrating science-communication skills into graduate education (see compassblogs.org/gradscicomm). So far, these early efforts, in need of funding, have languished.

SPEAK OUT

In these uncertain times, the voices of scientists are more important than ever. Efforts should not only target political leaders, but also aim to create a groundswell of public support. Ultimately, leaders must listen to their constituents. This is a time for scientists to double down and launch a ground campaign for the hearts and minds of the public.

Society needs to hear from those who can explain empirical evidence in a way that resonates with people's values, whatever they may be. We all need to be more open-minded and inclusive — and we need to muster the courage to speak from the heart and learn to listen with empathy.

My experience is that scientists can emerge as powerful agents of change. By building capacity, collaboration and confidence among researchers, we can bolster public engagement, inform decision-making and inspire society to forge a better future. ■

Nancy Baron *is science outreach director for COMPASS, a public-engagement organization for scientists, and author of* Escape from the Ivory Tower: A Guide to Making your Science Matter. *She is based at the National Centre of Ecological Analysis and Synthesis in Santa Barbara, California, USA.*
e-mail: nbaron@compassonline.org

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Supplementary information accompanies this article online at go.nature.com/2hnvspi.