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Telling stories in science communication: case studies of scholar-practitioner collaboration

Michelle Riedlinger, Jenni Metcalfe, Ayelet Baram-Tsabari, Marta Entradas, Marina Joubert and Luisa Massarani

Abstract   Reflecting on the practice of storytelling, this practice insight explores how collaborations between scholars and practitioners can improve storytelling for science communication outcomes with publics. The case studies presented demonstrate the benefits of collaborative storytelling for inspiring publics, promoting understanding of science, and engaging publics more deliberatively in science. The projects show how collaboration between scholars and practitioners [in storytelling] can happen across a continuum of scholarship from evaluation and action research to more critical thinking perspectives. They also show how stories of possible futures and community efficacy can support greater engagement of publics in evidence-informed policymaking. Storytelling in collaborations between scholars and practitioners involves many activities: combining cultural and scientific understandings; making publics central to storytelling; equipping scientists to tell their own stories directly to publics; co-creating stories; and retelling collaborative success stories. Collaborative storytelling, as demonstrated in these case studies, may improve the efficacy of science communication practice as well as its scholarship.

Introduction   'The crocodile who swallows the sun' in South Africa; stories of bad guys changing water sustainability legislation in Canada; teenagers wearing GoPro cameras while visiting a Brazilian science centre; an Israeli online news editor sceptical of the value of science stories; and co-created stories about possible bioenergy futures in the United Kingdom. All of these events share one important feature: they involve scholars collaborating in different ways with practitioners in projects involving storytelling. This paper uses these specific cases to offer generalised findings for employing storytelling in science communication.

In this *practice insight* we define storytelling as a narrative (or story) structure that usually focuses on two aspects: a sequence of events and the actions of one or more characters [Dahlstrom and Ho, 2012; De Graaf, Sanders and Hoeken, 2016]. Stories usually have an identifiable beginning, middle, and end, and involve some kind of conflict and resolution, or 'cause-and-effect' structure [Hinyard and Kreuter, 2007; Dahlstrom, 2014].

Storytelling about science can be used by science communication practitioners to achieve a number of objectives: from raising awareness about science and inspiring people to take an interest in science to more critical deliberation about science and its societal implications. The intended audiences for such storytelling are various, for example: school children, consumers of the media, museum visitors, representative publics being consulted about an issue, or a concerned group of people who have come together to deal with an issue of mutual concern. The case studies presented in this paper cover this wide mix of publics and also have a diversity of objectives.

Scholarship indicates that storytelling can be powerful for inspiring various publics in science or creating a sense of awe [Dahlstrom, 2014; Downs, 2014; Kaplan and Dahlstrom, 2017]. For example, Dahlstrom [2014] argues that narrative formats offer increased interest and engagement when science is presented to lay audiences. A growing body of science communication research indicates that storytelling taps into readers' and viewers' imaginations and emotions [Martinez-Conde and Macknik, 2017]. Stories provide unique ways of communicating how science intersects with human experience. This is particularly well used by the entertainment industry to capture attention and promote the enjoyment of science [Kaplan and Dahlstrom, 2017]. Some scientific fields lend themselves to capturing audience attention via the creation of conflicts and uncertainties and coming up with solutions and answers. Forensic science, for example, is a rich source of dramatic storylines featuring unique, headstrong characters and compelling (sometimes gruesome) visuals, explaining its popularity as a central theme in many television series [Kirby, 2013]. Yet, narratives can engage audiences with most scientific disciplines. Randy Olson, a marine biologist who went to Hollywood to study storytelling, emphasises narrative arcs for creating greater interest in science stories [Olson, 2009; Olson, 2013; Olson, 2015].

Engaging stories about science can increase publics' understanding of science, especially when the story places science within societal contexts and makes it more relevant [Avraamidou and Osborne, 2009; Negrete and Lartigue, 2004]. When new scientific findings are presented as stories, communicators are obliged to put findings in a broader societal context, which helps audiences organise and process new information [Downs, 2014]. As such, stories help people to understand complicated concepts and make science more relevant to their everyday lives.

Stories can also engage or involve people directly in science. Scholars have found that storytelling can be an effective tool to engage publics in research across a range of areas such as health [Cawkwell and Oshinsky, 2016], conservation [Gross et al., 2018] and geosciences [Stewart and Nield, 2013]. Stories highlighting the scientific reasoning process can be powerful and credible strategies for public engagement [Dahlstrom and Scheufele, 2018]. This is particularly true of controversial issues, where stories can allow people to make up their own minds about topics such as

vaccines [Cawkwell and Oshinsky, 2016; Shelby and Ernst, 2013] or climate change [Sheppard et al., 2011]. Stories can also be powerful tools for persuading people to change their attitudes and/or behaviours [Dahlstrom and Ho, 2012].

Dramatic and engaging narratives have been shown to activate readers' and listeners' brains in several ways, including triggering the release of hormones that increase feelings of empathy and concern [Zak, 2015]. At the very least, stories allow readers, listeners and viewers to be transported into a different world where they can identify with characters in a story and where the emotions of characters resonate with them [Kaplan and Dahlstrom, 2017]. Furthermore, the elements of suspense and anticipation capture and keep our attention [Downs, 2014; Zak, 2015]. That could explain why, compared to non-narrative texts, stories are generally considered to be easier to process and understand, more persuasive, more memorable and more engaging [see e.g. Dahlstrom, 2014; Downs, 2014; Zebregs et al., 2014; De Graaf, Sanders and Hoeken, 2016]. This is equally true for science stories where audiences encounter the lived experiences of real people, i.e., scientists or research users who interact with scientific information or issues [Dahlstrom, 2014].

However, while storytelling can be effective at communicating science to various publics for various purposes, some scholars have raised significant concerns about the ethics of privileging storytelling over science-based reasoning in science communication [Dahlstrom, 2014; Kaplan and Dahlstrom, 2017; Dahlstrom and Scheufele, 2018]. Concerns take many forms: (1) stories are perceived to be subjective and could therefore taint or distort the objective nature of science; (2) stories are often associated with imaginary tales, fabrications and fiction; (3) stories are persuasive, but don't have to provide evidence to back up claims; and (4) stories could mislead people when they believe the content without careful scrutiny [Dahlstrom and Ho, 2012; Kaplan and Dahlstrom, 2017].

Some scholars have also expressed concerns that storytelling is often employed by those whose agendas may be considered "anti-science", such as interest groups that oppose childhood vaccinations [Cawkwell and Oshinsky, 2016]. However, a growing body of science communication researchers and practitioners argue that communicators need to overcome their "storyphobia" and recognise the power of stories to create an emotional connection with their audiences. Instead of shying away from emotions, communicators should think of stories as facts that are wrapped in emotions [Jones and Crow, 2017; Olson, 2009], and harness the communication potential of a partnership between science communication and storytelling [Martinez-Conde and Macknik, 2017]. Our paper presents generalised understandings of what makes effective storytelling in collaborative science communication projects between scholars and practitioners.

Scholar-practitioner collaborations and storytelling

This paper builds on the outcomes of the Bellagio science communication conference held in Italy, November 2017,[1] which brought together science communication practitioners and scholars, including the authors of this paper. One of the conference goals was to investigate the opportunities and benefits that arise when scholars and practitioners of science communication collaborate with each other. We identified storytelling projects as one of the major areas where

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[1]https://www.scicom-bellagio.com/.

collaboration occurs; some of the benefits associated with bringing scholars and practitioners together to work on storytelling activities in science communication have already been documented. For example, Miller [2008] points to work happening in the field of risk communication for research associated with storytelling that can apply directly to practice. He suggests that the 'three translations' work of Weingart and colleagues [2000] is a good starting point for those wishing to demonstrate the value of research for practice. This approach involves telling stories about science that connect with audiences and give them some efficacy in determining how they want to live. When offering advice for scholar-practice collaborations, Han and Stenhouse [2014] draw on their own collaborative experience of helping members of the environmental advocacy group, the Sierra Club, with their climate change communication work. Using findings from existing risk communication research on effective messaging, movement building and political advocacy, and data collected internally on the experiences of Sierra Club leaders, they developed a method to help the team create useful climate change narratives for the organisation. They advise scholars to consider proactive, rather than reactive research support for practitioners by shaping collaborations to help answer the "big questions" in the field, and moving activities beyond transactional relationships where scholars provide one-off services to practitioners [Han and Stenhouse, 2014].

In this practice insight, we present five case studies of collaboration between scholars and practitioners that offer generalisable findings for employing storytelling in science communication. These case studies of scholar-practitioner science communication involving storytelling occur along the continuum of science communication scholarship that we discussed at the Bellagio conference (from direct evaluation of practice to philosophical considerations of the nature of science, society and science communication) — see Figure 1. The case studies also represent a range of science communication activities: printed books, online news articles, museum exhibitions, public dialogue events, and community group activities related to citizenship and policymaking. They demonstrate the benefits of storytelling as a tool for public engagement in science, as discussed earlier, of raising awareness and interest in science; increasing understanding of science; and encouraging direct involvement of publics with science.

Our case studies show where collaboration can create and validate stronger stories in the public domain and lead to more ethical and appropriate storytelling about science. We highlight the opportunities and benefits that collaboration between science communication scholars and practitioners provides for effective and ethical use of storytelling in science communication.

Collaboration creates and validates stronger stories in the public domain

In this section, we present two very different case studies that show that collaboration between scholars and practitioners creates stories with more legitimacy and efficacy. These two case studies are examples of empirical scholarship linking to practice for mutual benefits.

The first case study from South Africa links the work of cultural studies and linguistic scholars with science communication practitioners to produce a
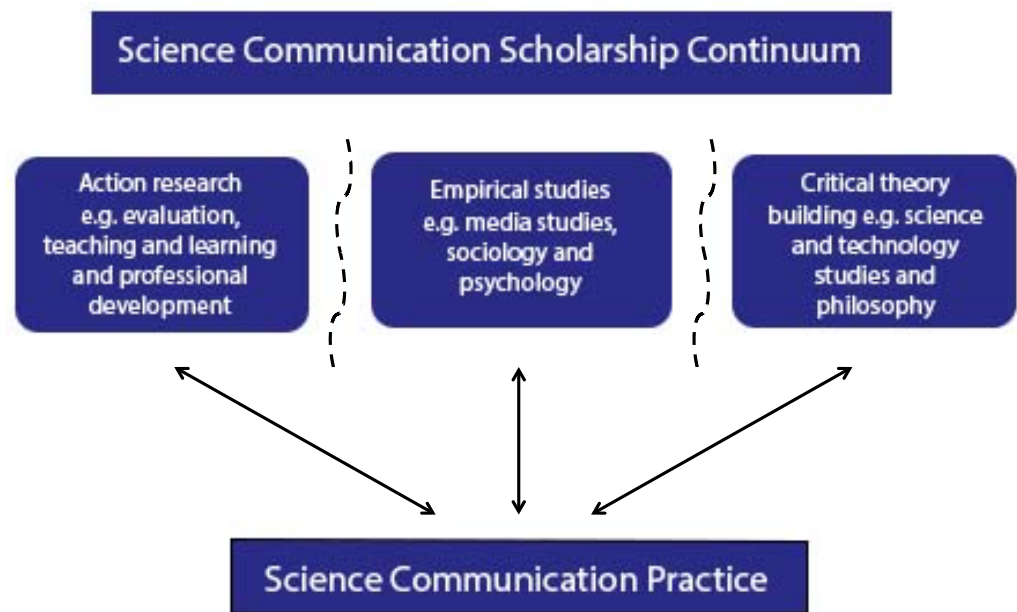
Figure 1. Science communication scholarship continuum and its potential interaction with science communication practice.

storybook, *'The crocodile that swallows the sun'*[2] — a collection of ten ancient stories about the African night sky retold for children of today. Science communication practitioners were told by various publics that "stories about the southern sky" were important parts of some indigenous cultures, but practitioners found it difficult to find examples of these stories. The production of the storybook built on interviews recorded in the latter half of the 19th century by linguists, Wilhelm Bleek and Lucy Lloyd. They interviewed narrators among the /Xam people and recorded many of their myths and legends.[3] With the help of Bleek's daughter, Dorothea Bleek, Lloyd continued the work after Bleek's death in 1975. Much of the original material was recorded in nearly extinct Khoisan languages such as !Xu and /Xam [Du Plessis, 2014] meaning that these stories were difficult to translate and interpret. However, an English version was published as *Specimens of Bushman Folklore*[4] [Bleek and Lloyd, 1911]. Since, then, other scholars have made efforts to preserve indigenous knowledge about the African night sky that originates from Tswana, Xhosa, Zulu, Venda and other African cultures.[5]

Three scholars who were also authors interested in literature for children — Maritha Snyman, Bheki Ntuli and Danisile Ntuli — selected ten stories from the original collections and rewrote them. South African astronomer Thebe Medupe wrote easy-to-understand explanations of the astronomical phenomena mentioned

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[2]Downloadable at http://www0.sun.ac.za/scicom/wp-content/uploads/2019/02/crocodile-who-swallowed-the-sun.pdf.

[3]The Bleek and Lloyd archive is available in a digital format at http://lloydbleekcollection.cs.uct.ac.za/, including a collection of ancient images at http://lloydbleekcollection.cs.uct.ac.za/stow.html (Accessed February 7, 2019).

[4]The book *Specimens of Bushman Folklore* is available online at http://www.sacred-texts.com/afr/sbf/index.htm.

[5]See, for example a compilation of African starlore, available online at http://www.psychohistorian.org/display_article.php?id=200901111733_african_star_lore.content (Accessed February 7, 2019).

in each story. Each topic was presented from two perspectives — the ancient story and our current scientific understanding — adding up to a richer perspective on Africans' connections with the night sky. By presenting the ancient myths alongside the scientific explanations, these stories create linkages between indigenous knowledge and present-day science. Combining an emotional appeal with rational content, these stories demonstrate that it is possible to embrace the beauty of the star-lore along with an appreciation for current scientific understanding.

This collaboration between scholars and practitioners appears to have created more engaging cultural and scientific stories for children than could have been achieved otherwise. The science communication practitioners benefitted from the empirical work of the scholars, who in turn benefitted from having their work more widely disseminated. The book, first published in 2004, has been reprinted many times by the South African Agency for Science and Technology Advancement (SAASTA).

In this second case study, a collaborative project idea was initiated after a panel talking about science coverage in online media at the 6th Israeli Science Communication Conference held at the Davidson Institute of Science Education in June 2015.

In the panel session, the editor of the *Mako* news website, a central news and entertainment site in Israel, was criticised by an audience member who said *Mako* didn't have a science reporter and was publishing mainly "clickbait". The editor explained that this was a simple question of resource allocation. He said:[6]

> If I pay a lot of money to a serious freelancer to do a thorough job on a science item and only 700 people will click on a website with 7 million daily page views — then you have to ask — did I spend my money in a sensible and logical way?

A collaborative project came out of this interaction between *Mako* management and the science communication unit at the Davidson Institute, which is the educational arm of the Weizmann Institute of Science. The science communication unit worked with scientists to produce engaging science stories for *Mako* that described a sequence of events and the actions of one or more characters. These stories dramatically increased the quantity and quality of science content in *Mako*'s coverage [Baram-Tsabari et al., 2019, in press]. Scientists could share accurate, innovative scientific information and make this part of the everyday news consumption of the Hebrew-reading public. This collaboration was later extended to *Ynet*, Israel's most widely-read news website. This is an example of how the deliberative and critical space afforded by a scholarly conference created a collaboration between practitioners with great impact on the science availiable in the general news media.

But there was another person listening to the panel that day — Yael Barel-Ben David, a PhD science communication student from the Technion-Israel Institute of Technology. When Mako's editor stated, "people are less interested in science than

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[6]https://www.youtube.com/watch?v=ohf7iPOR-iA&t=0s&index=6&list=PL0ZkulyfP8bdVBIiEaaEFHKE3mCKg4Q_i.

in other topics", she asked herself whether this assumption was in fact backed by evidence [Barel-Ben David, Baram-Tsabari and Garty, 2018].

Barel-Ben David developed a set of analytics to assess publics' engagement with online science news items written by scientists compared with general news items written by the sites' staff reporters. She analysed pairs of news items — a science item written by a scientist and another item written by a reporter on the news site, that were published on the same content channel at similar times. For each pair, she examined four quantitative parameters indicating the extent of public interaction with the information: number of clicks, likes, comments and time spent on the page. She did not find meaningful differences on the measured parameters (e.g. views, likes & comments) between science items written by Davidson's scientist writers and reporters employed by *Mako* or *Ynet*. It seems that audience members did not view the science stories as less engaging compared to other information offered by the news sites.

This research produced the first empirical evidence of the Israeli public's interest in science stories. This, in turn, reinforced the practical justification of writing and publishing science-related items in the news both in terms of the time and resources invested by the scientists and the news sites. This project exemplifies how fruitful scholar-practitioner collaborations can improve storytelling practice, even when triggered by discomfort and conflict.

Collaboration creates more relevant storytelling

The two case studies in this section demonstrate how collaboration can make storytelling more relevant to publics, and thus engage them more in science — whether for improved understanding or changed behaviours. Both of these case studies involve evaluation of science communication practice or action research. Action research in science communication involves conducting studies while activities take place with the aim of improving the methods and approaches of the practitioners involved.

Our third case study examines the experience of 14 to 17 years old teenagers visiting the Museu da Vida (Museum of Life), a science centre in Rio de Janeiro, Brazil, during a non-school visit. Scholars placed a GoPro camera on the head of one of the teenagers in each group visiting an exhibition about the science and history of Oswaldo Cruz Foundation (Fiocruz), a health research institution linked to the museum. The exhibition was a 'traditional' exhibition, with low technology use and rich use of historical objects and documents.

The objective of the collaborative study was to understand the experience of adolescents when visiting a science exhibition [Massarani, Fazio et al., 2019; Massarani, Reznik et al., 2019]. In particular, the scholars looked at what led to a lower or higher engagement for adolescents (1) among themselves, (2) between the adolescents and elements of the exhibition and (3) between the adolescents and the explainers. While the exhibit was based on low technology narrative techniques rather than employing interactive technologies, the teenagers made constant use of their cell phones as a way of photographing and recording the objects they observed during the visit. They also systematically made associations between the historical items, the associated narrative, and contemporary issues. This was

sometimes stimulated by the explainers, but at other times this occurred spontaneously when the teenagers created their own stories and connections.

It is interesting to note that, in a context in which science museums in Brazil and throughout Latin America are strongly based on human mediation, the teenagers explicitly commented on the work of explainers, sometimes critically. For example, some teenagers thought that the explainers were using strategies that they deemed inappropriate for their age, because the mixed group for the guided visit contained mostly younger children. It is a common practice for museums to provide guided visits that combine different groups of people who arrive at the museum at the same time. But there were also moments when the explainers stimulated rich conversation, which led to reflections beyond the themes of the exhibition, for example, climate change. Trainers are now using excerpts from the GoPro videos as part of a training module developed for science centre explainers in eight Latin American countries.

Reflecting on the findings from this study, it is clear that stories are best created when visitors are the main actors in the process. This contrasts with the perspective of those studying publics with the aim of improving our scientific storytelling where practitioners tell the stories they *think* are important in the ways they *think* will work. For science communication practitioners this may mean considering means for making various publics the main actors in the storytelling process. Secondly, this research identified the crucial role that explainers can play in evoking stronger narratives for visitors. This has led to better training of explainers using the GoPro video footage excerpts, where explainers are able to see the different perspectives of their visitors and learn about them. In this case, the scholarly evaluation of teenagers' interactions with an historical science exhibition through action research with practitioners led to a better understanding of teenagers and their ability to create their own stories about science. It also resulted in a training program designed to improve explainers' interaction with such visitors by sharing the real stories told through the lenses of teenagers.

In a very different case study, stronger science stories in the public domain came about because Canadian community groups were concerned about maintaining ongoing community engagement in water stewardship. The community-based groups, Wellington Water Watchers in Ontario and Waterwealth in British Columbia, joined with scholars from the University of Wellington in a partnership, known as Water Wins, to look at ways they could continue to gather community support for evidence-informed long-term water resource management [Pacheco, 2016]. In particular, the collaborative team wanted to know what stories might inspire community members to keep involved in water action.

The Water Wins team conducted face-to-face and online surveys with community members in Wellington, Ontario and the Fraser Valley, British Columbia. They also interviewed members of the organisations involved in the campaigns. The team asked for stories to find out what people in these communities knew about their local water and what they were doing to support local water management efforts. The most common activities were talking with others through their own channels and spheres of influence (e.g. through leading school programs or telling their own stories about local water to community members not associated with water issues).

The Water Wins team recognised that success stories focussing on what could be achieved through group solidarity were important tactics for these organisations to employ [Case and Zeglen, 2018]. They recommended that community groups focus on building a community base to ease people's anxiety about engaging in controversial policy processes. The scholars involved in the partnership found that community members were emotionally motivated to act in response to immediate and localised environmental crises or tangible threats. Community groups could trigger wider community participation through stories that relied on the appearance of a "villain" or "bad guy". However, this strategy was problematic because these stories could take the focus away from longer-term support for bigger issues, such as climate change mitigation.

The Water Wins team found that the key to sustained community engagement with evidence-based water stewardship was telling stories that focussed on the positives of sustained grassroots action. Such stories gave community members a sense of fulfilment and belonging, and a sense of community efficacy [Case and Zeglen, 2018]. This case emphasises the value of storytelling in mobilising community action and reinforces the benefits of scholars working alongside practitioners to better understand the social contexts and hence the relevance for creating change.

Collaborative storytelling engages publics in controversial science issues

In our final case study, storytelling was used to engage publics in discussions about bioenergy in the United Kingdom (U.K.). Bioenergy is an area of significant investment in the U.K., with potential to mitigate climate change [Resch et al., 2008], yet, publics' support is low. This is in part explained by controversies around the potential negative social and environmental impacts of bioenergy research, which divides public opinion [Business Enterprise and Regulatory Reform, 2008].

The Bioenergy Dialogue was a series of events held in 2013, carried out by the United Kingdom's Biotechnology and Biological Research Council (BBSRC). The goal was to discuss bioenergy with a broad audience, and consider people's opinions and concerns so that bioenergy research programs could respond to them [Entradas, 2016]. The discussions were based on stories of future scenarios on the use of bioenergy,[7] its social, ethical, and economic implications. The scenarios were written in collaboration between scientists and science communication practitioners. Four scenarios, set twenty years in the future, were designed as provocative projections of what the future in the U.K. would look like if particular decisions were taken concerning the use, or non-use, of bioenergy. The scenarios used personal stories, and scripts for short plays, involving fictitious characters, that participants acted out. Around 10–30 participants attended each event, including bioenergy experts, science communicators, school teachers, and stakeholders (farmers, landowners, and members of the public), decision-makers and non-government organisational representatives [see Entradas, 2016, for full description of the events].

Being shown such extreme scenarios inevitably led to discussions that contributed to a sense of shared concern in relation to the future directions of bioenergy

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[7]The scenarios were originally developed as part of an academic report of Dingwall, Balmer and Goulden [2011]. BBSRC Sustainable Bioenergy Scenario Tool and were adapted for use in the public discussion.

research. But the scenarios also attracted criticism by some of the participants, who described two of the scenarios as too unreal and imaginary [Biotechnology and Biological Sciences Research Council, 2013]. Science communication researchers conducted surveys and interviews with participants, and participants' feedback was used to adjust the scenarios and inform the format of subsequent events.

In this project, the use of stories that people could relate to were effective in engaging participants in the discussions on a controversial issue, even though they had very different interests, concerns and aspirations for bioenergy developments. The structure of the events meant anyone with an interest in the topic could talk and share their opinion, regardless of any previous knowledge on bioenergy.

This project did not lead to the incorporation of public opinion in BBSRC strategy development in bioenergy [see Entradas, 2016, for a critical view of the outcomes of the dialogue]. But despite the lack of policy outcomes from this project, it demonstrates that collaborative storytelling, involving scholars and practitioners with a range of publics may be useful for joint critical thinking about publicly controversial science issues. Storytelling for public engagement about controversial issues may only be effective if there are clear goals and aims for engagement, and continuous collaboration between all groups involved including policymakers, scientists, science communication researchers and practitioners and various publics.

Concluding remarks

The five cases of scholar-practitioner collaboration presented here demonstrate that a range of opportunities are available for science communication activities using storytelling as an output or process. For practitioners, collaborating with scholars can mean that their storytelling is more inspiring, memorable and relevant to their target publics. They are also more likely to be able to use stories to engage publics in better understanding of, critically reflecting about, and making decisions related to science.

For scholars, being involved in collaborative storytelling with practitioners can mean gaining a richer cultural picture of publics and their needs. When involved in evaluative or action research it means that research has practical outcomes that are more likely to be taken up by practitioners. Likewise, when collaboration involves empirical research it means that research has a greater likelihood of being disseminated and applied. While research that directly emphasises the benefits of improving practice is an important focus, collaborations can also produce generalisable findings and contribute to theory building in the science communication field. Finally, making publics central to the storytelling process and encouraging them to tell their own stories about science is essential when using narrative tools in science communication.

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Authors

Michelle Riedlinger is an Associate Professor at the University of the Fraser Valley, British Columbia, Canada. Her career spans the practical and research sides of science communication. Her research focuses on the communication of community-led science activities in environmental and health-risk assessment areas. Michelle is a Board member of the Science Writers and Communicators of Canada (SWCC) and Secretary for the Public Communication of Science and Technology (PCST) Global Network. E-mail: michelle.riedlinger@ufv.ca.

Jenni Metcalfe is Founder of Econnect Communication, established in 1995 to help scientists communicate their research. As a science communicator for 30 years, she has worked as a journalist, practitioner, university lecturer and researcher. She believes every person has a right to engage with science, so they can make more informed decisions about issues that affect their lives. Jenni is a member of the

Scientific Committee of the Public Communication of Science and Technology (PCST) Global Network. E-mail: jenni@econnect.com.au.

Ayelet Baram-Tsabari is an Associate Professor in the Faculty of Education in Science and Technology at the Technion — Israel Institute of Technology. She also heads the "Applied Science Communication" research group. Her research focuses on building on people's authentic interests in science to communicate science in more meaningful and personally relevant ways, and supporting scientists to become more effective science communicators. Ayelet is a member of the Scientific Committee of the Public Communication of Science and Technology (PCST) Global Network. E-mail: ayelet@technion.ac.il.

Marta Entradas is Principal Investigator at ISCTE-IUL, University Institute of Lisbon, and visiting fellow at London School of Economics (LSE). She leads the international project 'MORE-PE: MObilisation of REsources for Public Engagement with science' being carried out in Portugal, Italy, Germany, the Netherlands, the United States, The United Kingdom, China, Japan, and Brazil. She was Marie Curie Fellow at LSE (2016–18) and Fulbright Scholar at Cornell University (2015–16). Her current research focusses on the institutional communication of science with society. Marta is a member of the Scientific Committee of the Public Communication of Science and Technology (PCST) Global Network. E-mail: marta.entradas@gmail.com.

Marina Joubert is a senior science communication researcher and lecturer at the Centre for Research on Evaluation, Science and Technology (CREST) at Stellenbosch University, South Africa. Her research interests focus on scientists' roles in public communication of science, online interfaces between science and society and the changing policy environment for public communication of science in Africa. Marina is a member of the Scientific Committee of the Public Communication of Science and Technology (PCST) Global Network. E-mail: marinajoubert@sun.ac.za.

Luisa Massarani is Director of the Brazilian National Institute of Public Communication of Science and Technology and the Coordinator of the Master in Science, Technology and Health Communication at House of Oswaldo Cruz, Oswaldo Cruz Foundation. She is also the Coordinator for Latin America and the Caribbean of SciDev.Net | www.scidev.net Luisa is a member of the Scientific Committee of the Public Communication of Science and Technology (PCST) Global Network. E-mail: luisa.massarani6@gmail.com.