



## Commentary

## Duty now for the future: a call for public outreach by animal behaviour researchers

Jordan M. Bush<sup>a</sup>, Hwayoung Jung<sup>b</sup>, John P. Connell<sup>b</sup>, Todd M. Freeberg<sup>a, b, \*</sup><sup>a</sup> Department of Ecology & Evolutionary Biology, University of Tennessee, Knoxville, TN, U.S.A.<sup>b</sup> Department of Psychology, University of Tennessee, Knoxville, TN, U.S.A.

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Perceived differences between 'facts' and 'beliefs' can be unclear in the modern era and can have dire consequences. For example, measles have been brought back from near-extinction by an anti-vaccination movement founded on a single debunked study (Parker et al., 2006). The planet continues warming at alarming rates because efforts to mitigate climate change are presented as 'anti-American and anti-freedom' by some lawmakers (Antonio & Brulle, 2011). Biblical interpretations of the origins of life are offered as 'alternatives' to evidence-based theories in public school classrooms in Tennessee, Louisiana and Minnesota (Tennessee House Bill 368/Senate Bill 893, 2012; Louisiana Science Education Act, 2008; Moore & Kraemer, 2005). An alarming number of people conflate opinion and fact and have difficulty distinguishing between science, nonsense and nonsense (Dean, 2017; Helfand, 2016; Shermer, 2011).

A clear disconnect between scientists and the general public in modern society is caused by many things, including public misconceptions of scientific facts and science as a process (e.g. Hamilton, Hartter, Lemcke-Stampone, Moore, & Safford, 2015; Mooney & Kirshenbaum, 2009) and a general distrust of the academic 'elite' (Gauchat, 2012). However, scientific outreach and

communication can be effective tools to build trust, explain scientific concepts and reforge connections with disenfranchised communities (Nisbet & Scheufele, 2009; Wynne, 2006).

There have been repeated calls for scientists to engage with the general public (Friedman, 2008; Marincola, 2003), not only out of civic duty but also for the benefits that routinely follow community engagement (Jensen, Rouquier, Kreimer, & Croissant, 2008; Pace et al., 2010). Although most scientists report only infrequent participation in outreach (Besley, Oh, & Nisbet, 2012; Entradas & Bauer, 2017; Jensen, 2011; Rees, 2006), there are scientists across all disciplines who regularly engage with the public through outreach activities or publicized writing (e.g. Bentley & Kyvik, 2011; Jensen, 2011; Jensen et al., 2008). Within biology, animal behaviour researchers have a particularly strong track record of public engagement. In a survey of French researchers, Jensen et al. (2008) reported that 69% of behaviour researchers participated in at least one popularization event between 2004 and 2006, compared to only 34% of life scientists as a whole. Additionally, the outreach fair held in conjunction with the annual Animal Behavior Society meeting has attracted over 300 participating researchers over the past 8 years, showcasing the value the animal behaviour community places on outreach efforts (e.g. <http://www.animalbehaviorsociety.org/NEWSLETTERS/62-2/meeting-events.php>).

In this paper, we hope to achieve two goals. First, we wish to encourage animal behaviour researchers who are not currently involved in outreach activities to become involved. Second, we hope to encourage current participants to reflect on how to

\* Correspondence: T. M. Freeberg, University of Tennessee Knoxville, Department of Psychology and Department of Ecology & Evolutionary Biology, Austin Peay Building 211, 1404 Circle Drive, Knoxville, TN, 37996, U.S.A.

E-mail address: [tfreeber@utk.edu](mailto:tfreeber@utk.edu) (T. M. Freeberg).

improve existing animal behaviour outreach programmes, and to continue to foster an academic culture that values scientific outreach. By *outreach*, we refer to ‘any scientific communication that engages an audience outside of academia’ (Poliakoff & Webb, 2007, p. 244), usually with the intention of increasing the public’s knowledge or appreciation of science. Hereafter, we will refer to the nonscientist members of the general public as ‘the public’. We argue that not only do we animal behaviour researchers have responsibilities as scientists to the public, but also that we are in a unique position to perform high-quality outreach. Compared to findings in many other sciences, findings in animal behaviour are often easy for the public to understand, are visually appealing, connect easily to average people’s experiences and contain positive underlying messages – four key aspects of effective outreach (Nisbet & Scheufele, 2009; Reynolds, 2009; Varner, 2014). Animal behaviour researchers ask questions about recognizable species and behavioural patterns that members of the public have likely seen in their homes, backyards or zoos. Additionally, our research frequently has important implications for the conservation of populations in the wild, or for the welfare of captive animals in homes, farms or zoos. Thus, animal behaviour outreach has the potential to inspire interest and direct emotional connections with the public in ways that few other sciences can.

Here we define outreach and provide a wide range of outreach possibilities. We then give rationales for scientists to take some of their finite time and resources to implement outreach, and offer suggestions for ways to become involved in outreach programmes. We discuss four key aspects of effective outreach and describe a range of examples of effective outreach efforts in animal behaviour. We conclude with a call to arms for animal behaviour researchers, and the departments and organizations that support them, to continue to champion efforts to connect with the public.

## WHAT IS OUTREACH?

Globally, the vast majority of scientists’ communication effort goes into writing peer-reviewed articles intended for other scientists (Bentley & Kyvik, 2011). This makes sense, as journal articles are the currency of the field and a key factor in job searches and tenure reviews. However, few members of the public read this primary science literature; most do not have the expertise or field-specific vocabulary to understand scientific publications and/or do not have easy access to subscription-based journals. Outreach serves as a bridge between academia and the public, a way for scientists to communicate their work to their larger communities in a way that is easy to understand.

Science and science communication are creative processes; as such, there are many different types of scientific outreach (Besley et al., 2012; Table 1). The most common outreach approach occurs through media outlets, such as press releases, radio interviews, popular science writing, nature documentaries and TED talks (Hayes & Grossman, 2006). These outreach approaches are typically one-sided, with scientists producing an informative product but not directly engaging with the members of the public who consume it (Peters, 2013). In contrast, social media outlets, such as blogs and Twitter, allow scientists to interact with their readers through comment threads and online conversations (Kouper, 2010; Zarrella, 2013). These platforms are effective tools for drawing attention to newly published research (Peoples, Midway, Sackett, Lynch, & Cooney, 2016) because they engage people through the internet, a major source of the modern public’s news (Brossard & Scheufele, 2013). For example, the science blog ‘IFL Science’ (<http://www.iflscience.com/>) routinely posts articles on recent scientific discoveries that generate thousands of shares and hundreds of comments on Facebook.

Community events such as school visits and public lectures also let scientists personally interact with the public (Table 1). These face-to-face interactions allow researchers to challenge negative stereotypes of scientists as ‘socially inept workaholic males’ (Losh, 2010) and let audience members lead discussions with their own questions. Finally, scientists can explicitly involve the public in the scientific process through citizen science campaigns, where private individuals collect and send scientific data to scientists (Bonney et al., 2009), or by directly involving local communities in scientific enterprises, such as employing citizens as field technicians, local experts or guides (Alpert, 1996). Clearly, a number of different outreach strategies can be used, combined and modified according to the goals of the activity. Thus, scientists can adjust their outreach efforts to fit their audience, resources, time availability and personality.

We should also consider nontraditional outreach methods, such as ‘Creative Products’ (Table 1). These include the use of art, literature or entertainment as forms of science communication. While often not considered by scientists, these forms of communication have the potential to engage diverse audiences through their use of visuals and storytelling techniques. For example, the blending of the science of chaos theory with witty dialogue led *Arcadia* by Stoppard (1993) to be nominated for both the best science book ever written (Randerson, 2006) and for the 1995 Tony Award for Best Play. Creative products can also offer financial incentives. For example, engineer John Coveyou used his degrees in biology and engineering to found Genius Games, a company that specializes in producing board games exploring scientific topics such as cell division and protein folding (<https://www.geniusgames.org/>).

## WHY SHOULD SCIENTISTS ENGAGE IN OUTREACH?

A wide variety of benefits follow successful outreach initiatives, ranging from individual skill development to wide-scale shifts in societal perceptions. Many scientists report that participating in public engagement activities strengthens their written and verbal communication skills (Clark et al., 2016). These communication efforts force scientists to think about their research topics in broad and less jargon-laden terms. Participation in outreach activities has also become increasingly important to obtain funding. For example, the National Science Foundation requires all submitted research proposals to include a Broader Impacts statement that describes positive societal outcomes that will result from the proposed research, which can include mentoring, education and outreach (National Science Foundation, 2016).

Successful outreach in animal behaviour also provides the public with greater appreciation for the value of basic behavioural research. Basic research is inherently valuable because it increases human understanding of the natural and physical world, and can lead to unexpected applications in the future (Brennan, Clark, & Mock, 2014). For example, natural history observations that female screwworms only mate once in their lifetimes led to the development of the sterile male technique, a method of insect control that has been used to control a number of harmful parasites and agricultural pests (Brennan et al., 2014). As a second example, one of us (Freeberg, 2004) did his dissertation research on the social transmission of songs and mating preferences in a species of blackbird, and was later surprised to find that this work was cited as an important example in conservation biology for maintaining behavioural variation in populations (Ryan, 2006). Unfortunately, the value of basic animal behaviour research is not always obvious to people outside the sciences. Lawmakers and reporters frequently use scientific funding as an example of wasteful government spending, targeting basic research projects as being obvious, useless or uninteresting (Otto, 2016). Animal behaviour research has

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