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ESSAY

Navigating the waves of emotion in science communication

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Abstract

In this essay, we draw on the existing literature to discuss the roles for emotions in science communication. There is a widespread perception that emotions are detrimental to quality, particularly as a threat to the objectivity of science. This paper challenges this view by discussing the potential positive and negative effects of emotions on both the producers and recipients of science communication. Additionally, we outline the motivational and heuristic functions of emotions. Finally, we consider the place and roles for emotions in different models of science communication. The essay aims to support both producers and recipients of science communication in reflecting on their own emotions and the emotions of their counterpart.

Keywords

Public perception of science and technology; Science communication: theory and models

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1 ▪ Introduction

Emotions are a challenge for science communication: they almost always influence the cognitive processing of science-related information. This influence can promote the acceptance of science-based knowledge, but it can also contribute to its rejection. In contrast to their practical impact on science communication, emotions are still an under-researched topic, as Massarani et al. [2025] have recently noted when introducing a special issue of this journal on emotions in science communication. The present essay adds to these recent attempts to mitigate the shortage of investigations of emotions by focusing on the detrimental and supporting effects of emotions on the fabrication of objectivity as a quality of scientific knowledge. The recent special issue of JCOM on emotions has a focus on *communication science* perspectives. We complement it by adopting a *psychological* perspective on the *nature* of emotions and their *effects* on producers as well as on recipients of science communication.

By science communication we mean communication about knowledge from science (e.g. what is a spike protein, and what role does it play in COVID diseases?) and about the methods, institutions and effects of scientific work (e.g. how are spike proteins analysed?) [Bromme, 2024]. It also includes discussions about science, e.g. the ethical and socio-political responsibilities of scientists.

Emotions are important for science communication in multiple ways, specifically in shaping the experiences and behaviours of science communicators and influencing the quality of the contributions that make up science communication [Massarani et al., 2025; Taddicken & Reif, 2020]. Enjoyment when attending a science slam, or anxiety when reading a blog post on climate change, are examples where emotions are triggered by science communication. The joy that a scientist experiences when succeeding in getting an audience interested in their topic or, conversely, the disappointment communicators experience when they are not understood are examples of emotions experienced by science communicators. These situationally triggered emotions depend on a person's values and objectives and their past experiences with and beliefs about particular topics. Additionally, situationally triggered emotions can be based on pre-existing emotions, such that some people may be more anxious than others and some topics evoke more emotions more than others.

In the following sections, we examine how emotions can both hinder and support science communication. We then consider the effects of scientists sharing their emotions with the public. Finally, we explore how emotions shape audience engagement and their role in different models of science communication.

2 ▪ Emotions as a threat to objectivity or as a useful source of information about personal objectives

Objectivity refers to the independence of both the research process and the results obtained by researchers, particularly independence from their personal perspectives, goals and expectations [more differentiated definitions are provided by Gaukroger, 2012; Daston & Galison, 2007]. The canon of instruments and rules for the production, analysis and interpretation of data and validity claims, as well as for establishing a scientific consensus, supports the generation of what Douglas [2007] calls 'detached objectivity'.

Due to their potential distorting effects, emotions are sometimes viewed as a threat to objectivity, a fundamental quality of scientific research. Yet emotional judgements can be rationally justified; emotions do not inherently jeopardise objectivity. Instead, they provide information about one's own objectives and values. This positive cognitive function of emotions has been articulated by philosopher Martha Nussbaum in her concept of *Upheavals of Thought* [2001]. Nussbaum challenges a biologistic view of emotion as an irrational force that must be suppressed to enable rational thought. Instead, she argues that emotions convey evaluative information about the personal significance of the situations and events we perceive and reflect on. This information can be helpful to others and to ourselves, enabling self-awareness and reflexivity. Emotions are thus not merely reactive impulses, but are shaped by — and embedded within — cultural and historical contexts. Nussbaum's claim that emotions can support and enhance rational thought is backed by a substantial body of psychological evidence [Scherer, 2011].

The assumption that emotions can jeopardise a researcher's objectivity is based on a more general psychological hypothesis: that emotions impair information processing by more strongly activating the autonomic nervous system. With reference to this, Pham [2007] notes that emotions are complex states involving changes in autonomic nervous system arousal. These states are typically accompanied by physiological expressions, action tendencies, and feelings with particular valences [see also Strongman, 1987]. Emotions typically emerge from a cognitive appraisal of an object or situation, taking into account its significance for an individual's well-being [Lazarus, 1991]. According to this general assumption, Pham [2007, p. 156] stresses that such stronger activation impairs the following three rationalities:

- 'logical rationality: if a person prefers A over B and prefers B over C, then this person must also prefer A over C,
- material rationality: rational individuals choose courses of actions in a way that maximises these individuals' own utility,
- ecological rationality: not in the logical or material sense, but in terms of their consistency with societal goals, moral standards, or evolutionary purposes.'

Such impairment of rationality depends more on the type of emotion and the intensity of the emotion than on its positivity or negativity. Pham [2007] reports the following evidence on this:

- Effect on working memory: strong anxiety and also depression impair working memory. But: strong emotions can also cause a focus on relevant stimuli when it comes to making judgements before decisions.
- Effects on self-control: weaker emotions (e.g. joy), on the other hand, promote creative performance, more generous categorizations and the solving of problems where many constraints have to be taken into account.
- Effect on vigilance: mild depression has a favourable effect: it covaries with working more accurately, and with lower susceptibility to halo effects and to erroneous attributions of causes ('depressive realism'; affect-as-information hypothesis).

The affect-as-information hypothesis is particularly interesting in the context of science communication. The emotional experience provides a point of reference for evaluating the

target object: emotional responses can function as *proxies* for values [Pham, 2007, p. 162]. Emotions work by being assigned to a cause, which is then also evaluated. Why am I actually happy or angry? Who is to blame? Emotions therefore also indicate the evaluation of the conformity of one's own behaviour or the behaviour of others with social norms. Examples include guilt and shame as important emotions that are concerned with the social regulation of behaviour. The next section discusses such a case of the interpersonal effects of emotions on the behaviour of others.

2.1 ▪ *Effects of scientists' personal emotions and experiences on message recipients' engagement with science*

Scientists' own feelings about a research topic can have observable effects on message recipients' engagement with science. In van Eck and van der Meer's [2025] survey experiments on the perceived validity of climate-change statements, the researchers found that the scientist's emotional colouring (pessimistic, optimistic, etc.) did not affect perceived scientific credibility or recipients' self-reported willingness to act. The format (personal experience versus a neutral report) also made no difference. However, a pessimistic perspective (compared with an optimistic or neutral one) increased recipients' emotional reactions: participants felt more affected by the pessimistic presentation. They also found coherence effects: messages were seen as more scientifically credible when style and content aligned (e.g. a personal experience presented with emotional colouring, or a general fact presented neutrally) than when they did not.

It is also important to note that the attributed credibility was relatively high across all conditions. There is actually little variance when it comes to the fundamental acceptance of the validity of statements on climate change: climate change is now part of the socially shared perception of reality, at least in Germany. van Eck and van der Meer [2025] conclude that climate scientists might consider conveying their true emotions to appear more rational to the public, as consistency in messaging is essential. Scientific credibility and climate engagement are strengthened when the narrative aligns with emotional expressions, as findings show that scientists' credibility remains intact when they express their optimistic or pessimistic emotions or share personal stories.

Gregersen and Bye [2023] reported similar results from an experimental survey study in Norway with a representative sample. Gender had no effect, and trust in information from angry researchers decreased only slightly — consistent with van Eck and van der Meer's findings [2025]. Respondents' own emotional states mattered more: those reporting more anger or sadness took the information more seriously and rated it as more trustworthy. By contrast, respondents reporting no sadness or low to moderate anger reported higher trust in information from non-emotional researchers.

2.2 ▪ *When two people quarrel, a third is doubtful*

These studies show that emotions can play complex roles when message recipients observe the emotions of scientists. When researchers argue with each other and show emotions in the process, this can also affect observers' perceptions of the researchers' expertise, integrity and benevolence. In an experiment we conducted, involving a controversy between two educational scientists about the effectiveness of a training program [Tkotz et al., 2021],

we found that the emotional colouring of the discussion between the two scientists (neutral or aggressive) had no effect on the evaluation of the topic (i.e. the training program under debate) or on the general attribution of the cognitive possibilities of science ("Potency of Science"). However, there were differences in the ascribed epistemic trustworthiness of the scientists [measured with the METI, Hendriks et al., 2015]: the scientists in the neutral condition were attributed more integrity and more expertise by participants in the study. In addition, trustworthiness was also related to the assumed explanations for the conflict. If personal motives were assumed to be behind the conflict, this was associated with lower attribution of expertise, integrity and benevolence. Overall, it can be concluded that scientists who do not show (negative!) emotions are regarded as more reliable sources of scientific information.

Yet, Morris et al. [2019] were able to demonstrate a greater effect of personal stories than of a pure presentation of facts on the willingness of recipients of messages to act (personal contribution against climate change) and on the emotions of the recipients. Narrative transportation involves identification (immersion into the story) with the actors in a story, and the researchers assume that this immersion has an effect on the emotional charge of the information and on the willingness to act. These changes are measured not only by survey questions, but also by physiological variables such as heartbeat, which the authors interpret as an indication of the emotional effects. They measured the time between heart beats, the so-called interbeat interval. Its variability can be read as an indication of emotional arousal and of activation. Indeed, climate change stories with negatively valenced endings influenced pro-environmental behaviour by increasing interbeat intervals [Morris et al., 2019]. In the following section we will discuss more deeply the effects of emotions in science communication, using humour and fear, thereby contrasting a pleasant and a unpleasant emotional experience. *Humour* and *fear* are chosen because they both are examples of emotions which could be advisable as well as adverse — depending on their magnitudes and their effects.

2.3 ▪ *The effect of humour and fear in science communication*

Baram-Tsabari and Lewenstein [2013] explain that humour, for example, ironic language and explicit jokes, can be a good strategy to increase the effectiveness of science communication. The effectiveness of humour in traditional teaching-learning settings has been studied for many years, showing positive effects on motivation and learning, among other things [Banas et al., 2011]. Humour is to be understood here as a non-serious social incongruence [Gervais & Wilson, 2005]. This incongruence is also the basis for an explanation of the effect of humorous science communication. According to incongruity theory [Meyer, 2000], humour can be generated when content surprises recipients and violates social norms in a harmless and pleasant way. Hilarity is experienced in the cognitive resolution of this incongruity. Thus, reactions to incongruent content are both cognitive and affective. Yet, humour also represents a contrast to the serious nature of science and so has been extensively studied in the science communication field.

In an experimental study, Frank and colleagues [2025] examined the effects of humorous cartoons about scientific information in social media posts, comparing the effect of more biting humour (in this case, satire) with the effect of more playful anthropomorphic humour [defined as giving animals or objects human characteristics or emotions, see Epley et al.,

2007] and a combination of both humour types about Artificial Intelligence. The researchers focused on the mirth recipients experienced when seeing a particular cartoon and how the communicating scientist was rated. They found that the use of humour led to increased mirth, particularly the combination of anthropomorphism and satire, and that this mirth had positive effects on a communicator's likability and reinforced the perception that the viewer had engaged with an appropriate source of scientific information. Accordingly, a humorous, entertaining presentation can promote interest in science. The format of science slams is based on this assumption [Niemann et al., 2020].

However, other research suggests that humour in science communication is not always beneficial, as it does not necessarily enhance information retention [Pinto & Riesch, 2025]. Instead, humour might promote more superficial, heuristic processing of information [Schwarz, 2012], potentially undermining deeper understanding. It is likely that the impact of humour on science communication, in terms of shaping both attention and opinion, depends on various factors, including the specific topic being communicated [Yeo et al., 2023], the recipients' pre-existing beliefs about that topic [Anderson & Becker, 2018; Brewer & McKnight, 2015], or their involvement with the issue [Dobmeier et al., 2026]. Generally, humour appears to be an effective way to overcome reluctance to engage or act [Cook et al., 2026].

The behaviour-motivating function of emotions particularly applies to the emotion of fear. In principle, it is harder to establish a psychological distance to events that are perceived emotionally (as opposed to neutrally). McDonald and colleagues [2015] explain that psychological closeness and more intense emotional experiences could lead to either triggering action in relation to climate change or denying climate change and distancing oneself from it. Here, denial of problems and apathy are responses to internally control anxiety and reduce the unpleasant emotion of fear. Such avoidance reactions have been well studied in research on fear appeals. Drastic depictions have great potential to draw people's attention to a topic and to promote awareness of its importance. However, frightening, shocking depictions also make people feel helpless and overwhelmed and therefore prevent them from making a genuine personal commitment [O'Neill & Nicholson-Cole, 2009].

Such fear-induced avoidance behaviour is of course not what science communication directed at motivating action aims for. Accordingly, McDonald et al. [2015] recommend communicating scientific topics such as climate change in ways that maintain a certain psychological distance. Communication would primarily present distant effects (which may also be serious), but are distant from the message recipient, for example in terms of probability of occurrence, time, geographical space or social distance [Trope & Liberman, 2010]. Crucially, emotional reactions change with changes in psychological distance: increased psychological distance should prevent anxiety-induced avoidance behaviour. McDonald et al. [2015] emphasise that the optimal design of psychological distance also depends on the values, beliefs and norms of the audience, as well as the need to avoid fear and the resulting avoidant emotional reactions. Although inducing fear can be a means to grab people's attention to a science-related topic, this does not necessarily translate into personal engagement [O'Neill & Nicholson-Cole, 2009]. On the contrary, fear appeals can trigger defensive reactions, such as counterarguing or anger, ultimately deterring people from taking protective action. This can be particularly problematic in the context of climate change communication, where encouraging proactive behaviour is crucial [Bilfinger et al., 2024]. Therefore, the connection to fear must be made in a thoughtful and reflective manner

to foster engagement with an issue, and to counterbalance a post-truth era where emotional appeals often substitute scientific evidence [Lidskog et al., 2020].

The research discussed so far could inform actors of science communication about the emotional effects of their contributions — intended as well as non-intended effects. In the following, such applied implications will be discussed in a broader way by reflecting on the place and role of emotions in different models of science communication.

2.4 ▪ *The place and role of emotions in different models of science communication*

In science communication, a common distinction is made between an *instructional model* of science communication [often referred to as the *deficit model*, Suldovsky, 2016], which emphasises the epistemic gap between experts and laypeople, and a *cooperative model*, which is based on the idea of equal roles and mutual knowledge exchange. These are, of course, typified and simplified models, yet they are useful for illuminating the differing functions that emotions can play within each.

In the instructional model, emotions are primarily seen as effects produced in recipients. Many studies assessing message effects speak to this model of science communication. When science communication aims to emotionally overwhelm the public, it represents a problematic variant of the instructional approach.

By contrast, in a cooperative model, scientists can express their own emotions. This emotional openness allows scientists opportunities to demonstrate their commitment to a cooperative perspective not only on the epistemic level — through the sharing of knowledge — but also on the social level, through genuine engagement with citizens.

For example, sharing reflections about one's own emotions (why does it make me upset when our findings on climate change effects are ignored?) could be helpful for citizens to think about their expectations of scientists. Sharing reflections about possible detrimental effects of emotions on objectivity could foster citizens' trust in scientists.

Sometimes the values we have are rather implicit. Emotions could function as proxies for values (as explained above), and this could help scientists to understand their own feelings better. Furthermore, it could open a venue for reflecting on values comparatively, i.e. discussing those held by scientists as well as those held by citizens.

An important finding for science communicators is the very fact that the respondents' previous knowledge and beliefs have the strongest impact on the processing of new information compared with, for example, to the design of the new information [Bromme & Goldman, 2014]. This does not mean ignoring the quality of this design, but it could relieve science communicators of excessively high expectations and disappointments about their achievements.

3 ▪ Conclusion

In this essay, we have argued that emotions are an important part of our everyday interaction with the natural and social environment, and therefore important for all science communication. Emotions have effects on people's working memory, self-control and

vigilance. They can impair rational information processing (especially when highly activated), but they can also improve it (especially when moderately activated), depending on the context and content, and on the rationality criterion. Emotions impact the presentation of information and the processing of information. The emotional colouring of a message impacts its credibility and its (de)-mobilising effects. Emotions provide a heuristic for value judgements (i.e. personal values and social values). They are indicators of values in our own experience, and they are proxies for value judgements: what feels good is valuable, worth striving for. Because individuals know that their emotions are strongly correlated with their values and goals, they assume the same about other people. In this way, emotions are mirrors: the emotions people observe in others affect their own emotions. Other people's emotions are highly informative about them and their values. This is important because shared values enable trust. When researchers argue with each other and show emotions in the process, this can affect observers' perceptions of the researchers' expertise, integrity and benevolence. Yet scientists' openness about their own emotions regarding the topics of common interest (for example, the detrimental effects of climate change) can also help establish a cooperative relationship between researchers (as experts in scientific knowledge) and citizens (as experts in their daily lives).

What needs to be done? What practical recommendations can be derived? Objectivity is a meaningful and important standard for the process and outcome of scientific work and also for science communication. There is a widespread perception that emotions are detrimental to quality, particularly as a threat to the objectivity of science. It is important for researchers as well as for science communicators to challenge this view. This perception of emotions would be overly simplistic. Instead, it is helpful to be aware about the potential positive and negative effects of emotions on both the producers and recipients of science communication.

The standard of objectivity can best be met by being aware of the effects of emotions on oneself and on all other actors involved in science communication. Therefore, one should reflect on all emotions coming along with the production (as a researcher) as well as with the communication (as a science communicator) of scientific knowledge. However, one should neither suppress nor conceal them. On the contrary: by showing and addressing them, one can offer them for sharing and can support their understanding by others.

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