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# "Heading for Extinction": the representation of scientific knowledge in Extinction Rebellion's recruitment talks

## Aaron Thierry*

School of Social Sciences, Cardiff University, Cardiff, United Kingdom

This study examines how the climate action group Extinction Rebellion represents scientific knowledge in the public presentations used to recruit new members. Using a combination of semi-structured interviews and recordings of the talks and comparing them across four versions, we examine how the talk developed and identify four distinct modes of science communication. This analysis also highlights that many factors shape the mode of science communication employed, with the outcome particularly influenced by the editors' concept of how to best motivate action, as well as changes in the wider communication environment and the evolution of the movement's strategic aims. We note the way in which the modes are expressions of "boundary work" seeking to either include or exclude scientific views the group perceives as either aligning with, or running counter to, their political goals.

## Introduction

Recent years have seen heated public policy debates presented as questions of acceptance of scientific claims, such as those around GMO crops, vaccination, reducing obesity, or hydraulic fracturing for shale gas (Einsiedel, 2002; Williams et al., 2017). Often, social movements have been crucial to shifting public opinion in these debates (Breyman et al., 2017). Fähnrich et al. (2020) note how "*science and activism can serve as 'accomplices' or 'opponents'*" with activists seeking to either enlist support from scientific sources to legitimate their cause or else contest specific scientific and technological developments. In contested political arenas, all sides seek to appeal to the moral authority of science as being "on our side", and movements often go to great lengths to demonstrate scientific support whilst also trying to delegitimize the scientific backing of their opponents (Yearly, 2009; Kern and Opitz, 2021; Soßdorf and Burgi, 2022).

By amplifying particular scientific viewpoints, activists are frequently intermediaries through which communities comprehend scientific concepts and have thus been theorized as "*alternative science communicators*" (Fähnrich, 2018). Social movements can also contribute to important boundary work as to what is considered legitimate science, a classic example being the role that the group Act UP! played in shaping the scientific discourse on the treatment of HIV/AIDS. The activists' efforts ultimately brought about a shift in medical researchers' approach to drug trials (Epstein, 1995; France, 2016).

The role that social movements play in science communication is therefore a crucial area of study (McCormick, 2009; Fähnrich et al., 2020).

There is perhaps no clearer example of a scientific issue at the heart of politics today than climate change, and arguably no social movement has sought more to cloak itself in the authority of science than the climate movement. Climate change first achieved public salience in the 1980s as a topic of scientific interest, largely framed as another technical environmental issue in much the same way as the ozone hole or acid rain (Marshall, 2014; p. 162). It quickly became a common refrain across the climate movement that we must heed the warnings presented in scientific reports and adopt science-based targets (Corner and Clarke, 2016).

However, despite the prominence of efforts to share such information, it has not led to the necessary emissions reductions (Stoddard et al., 2021). Some have argued that the focus on science and the technical framing of climate discourse was itself partly at fault for depoliticizing the debate and preventing a more explicit discussion of underlying value disputes (Bowman, 2010; Schlembach et al., 2012; Marquardt, 2020). Others have argued that the dire forecasts and the scale of the transformations are too "traumatic" for our societies to bear contemplating (Brulle and Norgaard, 2019; Weintrobe, 2021), hence the collective tendency to avoid discussing the issue in social settings (Norgaard, 2011), but also in politics (Willis, 2020), as well as in the media.

The challenge of communicating climate science has been further complicated by fossil fuel interests embarking on an organized disinformation campaign designed to sow doubt about the causes of climate change by questioning and undermining the science and highlighting uncertainties and knowledge gaps (Oreskes and Conway, 2010; Dunlap and McCright, 2015). This included coordinated attacks on outspoken scientists accusing them of alarmism (Mann, 2015), potentially leading climate scientists and advocates to tone down their communications and err on the side of least drama (Brysse et al., 2013).

Faced with this conundrum, many groups have sought to research how to better communicate in ways that can effectively shift public opinion. Social scientists and psychologists have examined various approaches, including focusing on communicating about solutions (Stoknes, 2015), the level of scientific consensus (van der Linden et al., 2015), or that we need to de-scientise the debate and adopt new framings that appeal to people's values and immediate interests (Corner and Clarke, 2016, p. 51). Another suggestion is to avoid fear-based messages that trigger our psychological defenses (Hulme, 2007; O'Neill and Nicholson-Cole, 2009; Reser and Bradley, 2017).

It therefore came as somewhat of a surprise to many when, in 2018, the Extinction Rebellion launched in the UK demanding that the government "tell the truth" about the science of the threat from the environmental crisis and the scale of the transformational response required to meet internationally agreed climate targets. Not only that, but the group's frightening, do-or-die communications appeared to run counter to many of the recommendations of the climate communications literature. Extinction Rebellion argued that the public had been misled as to the severity of the crisis by the conservativism of past climate communications and the success of the climate disinformation

campaigns. Yet, the group quickly took off with hundreds of local groups forming in many countries around the globe (De Moor et al., 2021).

Extinction Rebellion brought a notable shift in the climate movement discourse, introducing a new tone of extreme urgency that was quickly adopted by other groups—the "science" indicated this was now a state of "Climate Emergency", and in response to their protests, we saw a wave of emergency declarations by local and national governments and a dramatic shift in public opinion (Thackeray et al., 2020). This emergency framing had been promoted by the work of clinical psychologists in Australia and the US (Morton, 2018; Salamon, 2019). It contradicted prevailing notions that activists should not communicate despair or desperation so as not to panic the audience and instead drew on an interpretation of the public health literature, which held the view that people make changes when they are made to face up to reality. The thesis was that people needed to be supported to sit with the traumatic emotions brought up by contemplating the climate crisis if we were to be able to move past the psychological defenses that were leading to paralysis in tackling climate change. Underpinned by an understanding that only if the future threat is internalized as real will we take the necessary steps to avoid such outcomes (Friberg, 2022).

For some, the "climate emergency" frame raised alarms that it could create the conditions for authoritarian overreach and that we should be suspicious of fearmongers (Sillmann et al., 2015; Asayama et al., 2019). But for Extinction Rebellion, the greater threat from the cruelties of totalitarianism was from the climate crisis spiraling to a breakdown of law and order and a degradation of protections for human rights (Todd, 2019). For them, the rhetorical stance of the emergency framing was used to justify their resorting to civil disobedience (Berglund and Schmidt, 2020, p. 32) as well as strategically to persuade people to join them in their acts of non-violent direct action against the government. Scientific knowledge was thus treated as a resource offering certification of the moral legitimacy of the groups cause (Soßdorf and Burgi, 2022; Rödder and Pavenstdätt, 2023). In their "Declaration of Rebellion", they state: "*In accordance with these values, the virtues of truth and the weight of scientific evidence, we declare it our duty to act on behalf of the security and wellbeing of our children, our communities and the future of the planet itself*" (Extinction Rebellion, 2018).

An analysis of those who joined the Extinction Rebellion in the UK revealed that many of them had never been involved in a climate protest or any civil disobedience movement before (Hayes et al., 2020). Many had joined the movement *via* a town hall talk that toured the country entitled "Heading for Extinction (and what to do about it)". The talk was styled as a scientific lecture and advertised as a "*hard-hitting… talk [that] walks us through the science of the climate and ecological emergency to understand the enormity of the situation we are in*".

Over the next 3 years, this talk has undergone substantial revisions that capture the new climate movement's continually evolving approach to climate communications and contain valuable insights into the dynamism of the activist's role as "alternative science communicators". The "Heading for Extinction" talk therefore makes an excellent case study for examining questions relating to how social movements use scientific authority and

TABLE 1 Data available for the different versions used in this analysis.

| Data type | V.1 | V.2 | V.3 | V.5 |
|---|---|---|---|---|
| Recordings* | Yes | Yes | Yes | Yes |
| Slides | N/A | Yes | Yes | Yes |
| Training notes | N/A | No | Yes | Yes* |
| Interview with editor/s | Yes | Yes | Yes | Yes |

*For the 5th version, there was also a training video.

specific scientific claims to support their ends and how this is updated as aims and tactics shift. This helps us critically evaluate the influence of social movement organizations on the public's understanding of science (Fähnrich, 2018).

This study seeks to examine the evolution of Extinction Rebellion's recruitment talk and, in particular, to understand the manner of science communication used in the different versions and how these contribute to and relate to the overall aims of the talk's authors. Particular attention is paid to the "sense-making" of the talk's editors (Fähnrich, 2018) and how the presentation of scientific claims was strategically used to motivate the audience members to join the group in taking part in acts of civil disobedience.

## Methodology

To address the aim of this longitudinal study of examining the evolution of the rhetorical use of science in the "Heading for Extinction" talk, two distinct types of data were collected, with the aim that the use of multiple data sources would help substantiate our interpretation of the situation (Clarke et al., 2018). First, the versions of the talks themselves, which included publicly available video recordings, and, where available, the slide sets and the speaker notes, as well as training materials for each version. Relevant parts of the audio recordings were transcribed for use in the thematic analysis. Fähnrich (2018) (who has done pioneering work in this area) stresses the benefit of analyzing documents and online sources relating to activists' use of scientific knowledge.

To complement this, in-depth interviews were conducted with key members of the editorial teams of the various iterations of the talk, with whom I was acquainted through my own involvement in the group. These interviews were conducted with the goal of better understanding the authors' intent and the reasoning behind any changes between versions. Five interviews were conducted, with members involved in drafting the different versions; each lasted approximately an hour and was conducted online using video conferencing software and transcribed. The interviews were conducted as semi-structured conversations and followed an interview schedule to guide the conversation (Given, 2008; Bryman, 2016, p. 670). The data available for each of the talk versions are listed in Table 1.

A thematic analysis was carried out on the written materials as well as talk and interview transcripts to look at how areas of interest, such as science as an institution, key scientific concepts, and views of how to communicate science, were conveyed in different versions of the talks. Some themes were selected in advance based on past

discussions in the literature, e.g., the information deficit model, science as skillful social practice, science as revealed truth, and representation of scientific uncertainty; however, these initial topics were amended and added to as themes of interest were detected from an attentive reading of the data. It was possible to triangulate the analysis of different modes of representation of science by combining these two lines of evidence to look for consistency and reliability of the claims made (Tomaszewski et al., 2020), and the themes identified were chosen to be as generalizable as possible to other situations of public engagement with science, especially with regards to its use by social movements.

As the interviews were mostly based on recollections about decisions that had already occurred, in some cases a few years ago, they were reinterpretations of events after the fact, and because these were largely isolated personal accounts, it was hard to cross-validate all the claims. The claims therefore need to be understood as interpretations (Roulston and Choi, 2018). However, we could compare this against the data that were collected from the talk materials and no obvious discrepancies were found. Generally, the recollections of the content mapped well onto what was in the relevant version of the talks.

This study restricted itself to the parts of the talk concerned with knowledge claims from the natural sciences (i.e., the "Heading for Extinction" part of the talk). The talks do also contain sections that mainly focus on claims from other domains such as social movement studies (the "and what to do about it" part). Whilst it would also be interesting to examine differences in the way these types of knowledge claims are communicated, that was not the focus of this investigation.

## Results

The following section highlights key developments in the talk, noting how the way science is used and presented alters between the versions. With reference to the primary materials and informed by the interview data gathered, we provide an interpretive analysis of why these changes occurred and how the modes of science communication used by the social movement in the alternative versions are adjusted to meet perceived changes in the aims and socio-political context of the talk.

By mode of science communication, we refer to a suite of characteristic ways in which scientific knowledge and practice are presented in the talk. For example, the degree of certainty ascribed to claims, the nature of scientific consensus, and the extent to which background knowledge is assumed. This study identifies four distinct modes used across versions of the talk.

## Mode one: basic truths and certain futures

This first version of the talk was produced in the first half of 2018, following the founding of the Extinction Rebellion. The way science is presented in the first version of the Heading for Extinction talk cannot be separated from the underlying strategy for civil resistance developed by Extinction Rebellion co-founder Hallam (2019a).

In Hallam's view, social change can rapidly be brought about through civil resistance founded on the tactic of mass imprisonment. This aims to force an overreaction from the state that leads to a backfire effect, whereby the repression of the few activists prepared to participate in an act of conscious sacrificial civil disobedience mobilizes a much larger mass of sympathetic observers who otherwise would have remained inactive:

> "*This is the key and primary mechanism of social mobilization, you notice it is nothing to do with information. Information is pretty irrelevant. It is sympathy for others who are in your cultural or political group*" (HFE v.1).

The initial focus of the Extinction Rebellion, therefore, was to identify people who were prepared to volunteer to go to jail in support of their cause. As Hallam explains:

> "*My estimate is that in Britain we need 1,000 people willing to go to prison… that's not a lot, that's 300 meetings*" (HFE v.1).

Yet, what makes someone volunteer to make such a personal sacrifice? Hallam's answer, inspired by his own admiration for "*various mystical traditions*" (HFE v.1) is to lead the audience members to experience "a dark night of the soul", whereby they encounter "*the horror… the reality of climate change.*" Hallam makes an analogy to receiving a cancer diagnosis; people are confronted with a stark choice:

> "*an option…to go back and go 'no, no, no, that Roger guy… I don't need to listen to him', or you can spend the whole night crying your eyes out and then you come out of it the following morning going 'I'm still here' and then you go 'right, this is the new situation'*" (HFE v.1).

Hallam accepts that many in his audience will not follow his preferred outcome and will retreat, but he is betting that a significant enough minority will select to absorb this "*new situation*". In this regard, Hallam consciously dispenses with much of the received wisdom in the climate communications literature around avoiding fear-based messaging (O'Neill and Nicholson-Cole, 2009; Reser and Bradley, 2017).

> "*The conventional notion is that is you tell people the truth they will get upset and they will move away from being active, because you've told them there's no hope. But this is not actually what happens. Most people get upset and move away but a minority of people will be mobilized because they go 'oh what the hell' or 'oh my god how terrible, I want to do something anyway'*" (HFE v.1).

The Extinction Rebellion sought to recruit members willing to commit to arrest. According to Hallam's view, this requires a fear-based message that presents the "scientific reality" of a threat to a person's core identity and concept of themselves as moral agents:

> "*The advantage is that these people will be motivated to do high-level activism. Because, if you just say there is a bit of a problem, people will be motivated to go on a march. If you say,*

*basically we're going to go extinct, 99% of people might rush to the opposite direction, but if you say, for the sake of argument that 1% of people say 'right I'm prepared to do… something dramatic because this is an assault on the most basic values that I hold'*" (HFE v.1).

This is further reinforced by Hallam's emphasis on motivation for activism being grounded in notions of service (such as honor, duty, and tradition) and that "*historically people who make sacrifices tend not to be motivated by the outcome*" (HFE v.1). His arguments for action were mainly based on virtue ethics as opposed to utility. This confronts another conventional tenet of climate communications, centered as it has been on a rationalist discourse, which frames the discussion as a value-neutral scientific and technocratic issue (Beinhocker, 2019; Wetts, 2020).

This culminates at the end of the talk with a series of questions designed to help the audience grapple with the moral quandary inspired by logo-therapeutic approaches (Frankl, 2004).

> "*Most are going to be mobilized by asking key questions about their life. What does it mean to be good… what does it mean to feel like you've not got regrets when you die?... Can you look your grandchildren in the eye and say you did what you could. Now none of those are to do with outcomes, they are all to do with what you think you are*" (HFE v.1).

It is argued in the talk that the "existential threat" posed by the climate crisis is a logical and self-evident conclusion for anyone acquainted with the facts of "*basic science.*" However, this requires that the presenter provide an explanation for why the severity of the analysis set out in the talk goes beyond that offered by the mainstream scientific community.

So, whilst the talk is premised as being founded upon "basic science," paradoxically, the content often questions the reliability of the consensus position held by the scientific experts in the field. This is justified by reference to psychological and sociological accounts of the scientific process:

> "*All the climate scientists who are in the mainstream are obsessed with positivity… They will say something like 'it's really bad, but there's still hope'… You can't explain this in factual terms. You have to look at this psychologically. Because they are obsessed with the Western secular rational culture which says you have to have a reason for doing things*" (HFE v.1).

The presenter therefore repeatedly calls on the audience to trust their own logical inference and understanding above that of the expert community. For instance, the only graph or data provided in this version of the talk is of the decline in Arctic sea ice volume, fitted with various statistical trend lines, nearly all are depicted as reaching zero volume prior to 2020, which is described, in a way clearly intended to shock the audience, as follows:

> "*This is objectively the most important graph in the world and it is probably the most important graph in the history of humanity. It shows what is happening to the ice… If you do listen to some of the major professors and*

*supposed intellectuals of the world and you ask them when the ice is gone they say 2030 or 2050. I don't quite know why, or at least that's a deeply psychological issue... anyway it's not, it's going to be 2022 isn't it, because we can all just look at the graph, it's a basic physical system, it's not complicated"* (HFE v.1).

The talk repeatedly and openly breaks from mainstream frames of discussions of climate change centered as they normally are on the Paris Agreement, stating boldly that "*what I'm going to talk to you about is what is **actually** happening.*" At one point, it is asserted that:

*"Thousands of scientists are involved in a process that doesn't really seem to accept what we've got. Which is that we are already above 2C, that's already locked in"* (HFE v.1).

The talk repeatedly uses the refrain that the conclusions being reached are incontestable basic facts. The audience is told again and again that they can verify what is being asserted for themselves and that it is:

*"...just basic physics..."*
*"...we're back to sort of basic arithmetic aren't we."*
*"I'm just trying to show you what is absolutely certain. It's absolutely certain if I understand basic physics & if we agree with basic arithmetic..."*
*"The pathway I've shown you, unless you want to question the arithmetic or question basic physics, is that is what is happening..."* (HFE v.1).

These statements are then summarized and presented as a moral dilemma as follows:

*"I've just taken half an hour to show you that anyone who can do basic maths and reads the basic scientific literature knows that we are wilfully heading toward this situation because of the actions of human beings... so by conventional jurisprudence the people running society are something to the right of Hitler. I can't escape that conclusion. I'm just being analytical about it... anyone who has the vaguest sense of decency and morality is going to be horrified by what is going on"* (HFE v.1).

The mode of scientific communication used in this version can be summarized as having the following characteristics:

a) It is stressed that the conclusions can be reached simply from an understanding of "basic physics";
b) holds that we can be absolutely certain about the outcome of our eventual impact on the climate system;
c) presents the mainstream scientific discussion as flawed and politically compromised, and
d) posits that the audience could reach these conclusions by acquainting themselves with the relevant literature.

The audience is therefore presented with a prophetic and categorical assertion of our impending doom, firmly embracing

the narrative of a "*post-apocalyptic present*" (Cassegård and Thörn, 2018; Friberg, 2022). From this, they are offered an "escape route" through joining the Extinction Rebellion movement by volunteering to risk arrest and sacrificially partaking in civil resistance.

## Mode two: an imperfect guide to uncertain futures

As Extinction Rebellion began building for its first mobilization in October 2018, organizers recognized they needed to formalize the recruitment talk as a scripted PowerPoint presentation. This new version was heavily influenced by the original but differed in significant ways, particularly with respect to how it presented scientific knowledge and its production.

The focus was still very much based on activating people who would be willing to take part in civil disobedience and risk arrest. As the talk makes clear:

*"[the strategy] is based on the belief that some smaller group of 'upstanding people' will not only be willing to act, but will be willing to do what it takes... we're saying that climate change is not a political issue, it's an issue of morality. What is happening is bad, it's evil and it has to be stopped"* (HFE v.2).

The design of the talk was still based on the delivery of specific scientific information to provoke a jolt in the audience:

*"The premise of this talk is to tell the truth and ask us all to act accordingly and consistently with the information that is available to us. Including our understanding of what actually enables change in the world"* (HFE v.2).

But rather than focusing on simply horrifying the audience, this version focuses on making space for grieving. One of the first slides reads, "*grief is welcome here*", with a quote from the famous bereavement counselor Earl Grollman that "*Grief is not a disorder, a disease or a sign of weakness. It is an emotional, physical and spiritual necessity, the price you pay for love, the only cure for grief is to grieve*". Stress is also placed on one's moral duties and responsibilities to loved ones and aims to dramatically reduce the psychological distance between the audience and the threat of climate change; as was explained in the interview, the aim was to make people see, "*this is your kids or grandkids, your nieces and nephews and **you have a responsibility here**".*

This was in part a reflection of the emotional state of the author as they went through the process of writing the talk:

*"I spent that summer, 2018, locked in a room researching climate science. Two things happened, one is I felt I got clearer on a better way to communicate the science and the second thing is I went into a massive amount of grief and shock..."*

It also reflects the underlying view that the talk is essentially about how emotion motivates people: "*people do things because of emotion not facts... so you are delivering the facts to elicit emotion*".

The talk calls for a shift in collective consciousness to "[accept] *this is a time of grief,* [that] *asks us to step into service, asks us to make sacrifices*" and, as with the original version, ends by drawing on techniques of logo-therapeutic questioning that invoke deep introspection about moral choices presented by the scientific claims laid out in the talk.

An important influence on this version was Morton (2018) booklet on the need for an "emergency" frame. Morton's work was inspired by lessons from public health literature and the need to help people face reality. As was explained in the interview:

> "*you tell people this really fucking awful thing is going to happen, or is likely to happen, or could happen, and you just sitting back and letting it happen is not in alignment with your values, and by the way you can do this thing.*"

It is related to why the concept of "telling the truth" is considered central to Extinction Rebellion's communications and is the group's first core demand of government and the media. Voicing a prominent view widespread across the movement, the author put it this way in their interview:

> "*It had such resonance, come on, people can cope with the truth, why would we not want to talk to each other about the truth? There felt a rightness in it.*"

But there is a recognition that hearing such messages can be painful and that people need to be supported in processing these negative emotions: "*That hurts hearing that, if you're open to hearing that it impacts you*". This was increasingly seen as vital to the process of addressing the climate emergency: "*I've always said to people, if you are feeling this stuff, it is part of the work, it's not instead of the work. Go and feel the feelings and don't do it on your own…*". A perspective shared by many climate psychologists who study those involved with work on the climate crisis (Head, 2016; Hoggett and Randall, 2018; Gillespie, 2020).

Engaging and being open with these strongly negative emotions is itself seen as a challenge to the political order, as the editor explains "*I think it really important to… communicate things in as brutal as possible way, frankly. Because the current system we sit in… optimizes for comfort and keeping us feeling disempowered*" and that this tendency is reinforced by cultural norms "*Our culture teaches, us to shut down what our bodies are telling us, and it feels important that they not do that, because our emotions drive us.*"

Speaking blunt truths is also regarded as part of the "*prophetic*" role of social movement communications (c.f. Moo, 2015), and this was part of the purpose of "truth telling" in the talk:

> "*People know this, things ain't working and they want a new story and part of that is telling them what they already know… this is seriously fucked. The relief people have of hearing that is 'yes, I agree!'*"

Therefore, it was felt that the talk should be as hard-hitting as possible in how it sets out the scientific case for action. However, partly due to concerns over the scientific presentation and veracity of the original version and a strong sense that, as Extinction Rebellion was going to be in the public eye, it needed to be constructed in a way that could stand up to scrutiny:

> "*We don't want to go into being accused of being alarmist because we are just picking bits [of science] semi-randomly… we'll just get unhinged if we do that. If we look like we're making stuff up or exaggerating.*"

To protect the talk from claims of misrepresenting the science whilst still striving to "*jolt*" the audience and open them up to feelings of grief and heroic responsibility, this version of the talk alters the discussion of science in three ways. The first is that the talk begins by going into detail about how scientific consensus is established and then seeks to frame how Extinction Rebellion recommends dealing with the scientific literature. The audience are shown a slide with two scales summarizing the view that (a) rigor is associated with conservatism in science and that (b) whilst seeking to avoid alarmism, they were highlighting specific studies in favor of what was regarded as "politicized" consensus reports. These scales are reproduced in Figure 1.
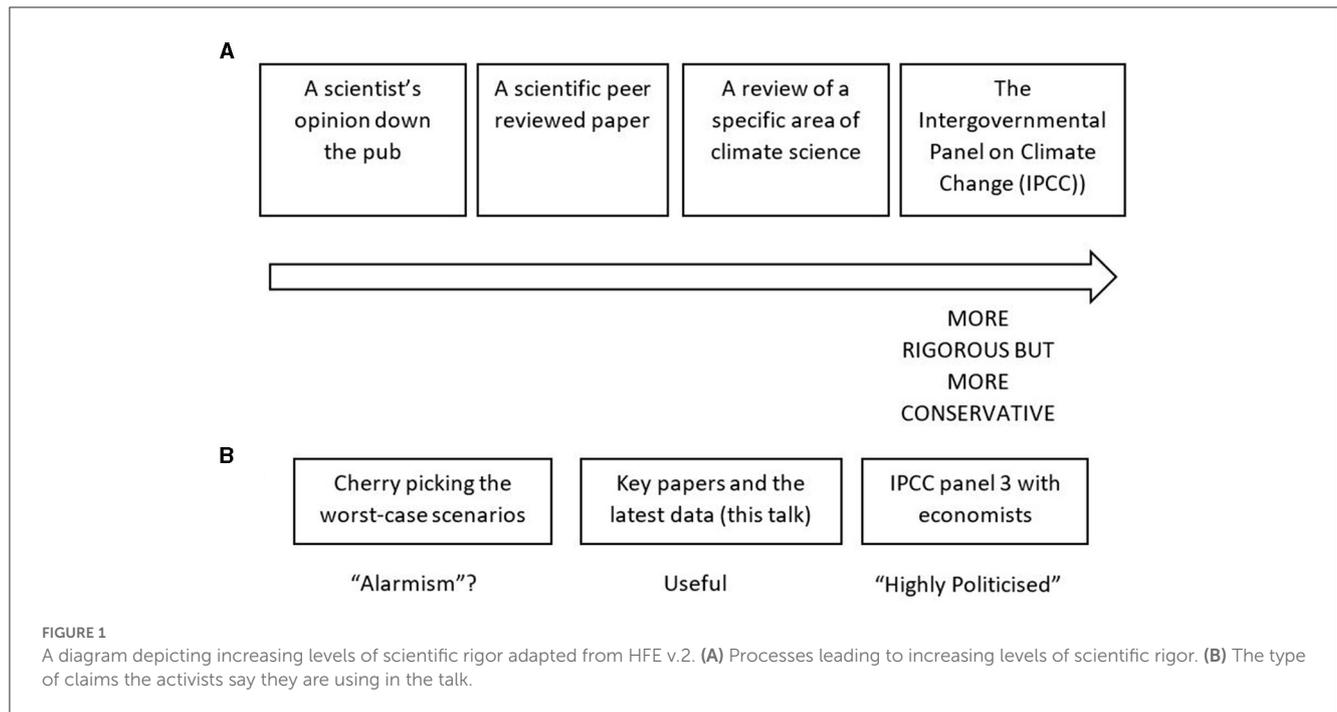
The reasoning that accompanies these scales is presented as follows:

> "*The thing with the climate science is that the information that comes out tends to be quite conservative, because of the processes involved. So, what a scientist might say down the pub or to a journalist is one thing, compared to what they'll say in a single peer reviewed paper where they are trying to say exactly what they know within that paper… And so, you get more rigor by reviewing a specific area of data and getting lots of different data sets. That has more rigor in it, and then the IPCC spends a lot of time looking for consensus across different fields and what the whole area is telling us. And of course, as that becomes more rigorous it takes more time. Some people feel that the IPCC has been deliberately hamstrung through this consensus process.*
>
> *So how then do you deal with the science. There have been some people who have been accused of cherry picking the worst-case scenarios and have been called "alarmists" and actually there seems to be more agreement these days with what the in quotes "alarmists" were saying. I don't know whether they are right or wrong but that's not what we intend to do today. We're using the voices of mainstream scientists… So really what we want to do is find the sweet spot to find to give you the good information*" (HFE v.2).

Science is therefore presented as a social process, with scientific claims having different levels of rigor and trustworthiness, as well as various biases, and that the public must rely on judging the soundness of expert opinion in complex risk assessments that we must make as part of civil society, with Extinction Rebellion positioning themselves as an indispensable and reliable guide. This is in stark contrast to the earlier view that there are revealed scientific truths that we can figure out independently for ourselves from first principles.

Another difference is that this version of the talk seeks to be clear about the provenance and credibility of claims rather than citing generic "basic science". For example, in order to stress the

**FIGURE 1**
A diagram depicting increasing levels of scientific rigor adapted from HFE v.2. **(A)** Processes leading to increasing levels of scientific rigor. **(B)** The type of claims the activists say they are using in the talk.

conservatism of mainstream climate science, the talk cites the eminent climate scientist Prof. Hans Schellnhuber as an example of "*scientists breaking rank*" and stresses he was "*for 20 years head of the Potsdam Institute for Climate Impact Research, Senior Advisor to Pope Francis, German Chancellor Angela Merkel and the European Union*" (Spratt and Dunlop, 2018).

It was felt vital to highlight that there are respectable opinions from credible scientists suggesting that the risks we face are greater than those in the mainstream consensus:

> "*It's what somebody with loads of credibility said… To me [the IPCC] is a backstop, we at least know this, but it's probably worse… so to use any credible voices for its probably worse is important… we have to be able to communicate the most difficult things*".

The final key shift was the acknowledgment of the *uncertainty* of climate science projections, as opposed to the stress on certainty in the original. Here are some examples of the ways in which this was done in relation to the concepts of tipping points, cascades, and feedback loops, which feature prominently as scientific reasons for concern:

> "*None of this we know until it happens…*"
> "*Could tip into this hothouse state…*"
> "*There's a debate but…*"
> "*There's different models on that…*"
> "*It's a possibility on our current trajectory, we know the way that mechanisms could work, I'm not saying it will…*" (HFE v.2).

Putting this together, we see that the change to the scientific presentation still confronts the audience with a stark threat, but the science is now presented as:

a) a potentially flawed social process possessing a trade-off between error-prone contemporaneity and rigorous conservativism;
b) the expert judgement of named and credentialed authorities and claims with clearly referenced provenance; and
c) estimations of huge, uncertain risks, about which we should be highly cautious.

These qualifiers can be regarded as playing an important role in allowing Extinction Rebellion to open the conversation about worse-case scenarios and "long-tail" (low probability but high impact) risks without being accused of alarmism. The shift to embracing uncertainty in science also means the audience can feel like there is potential to make a difference to the outcome. This fits with the move to focus on processing more complex emotions such as grief and anxiety, and sitting with such uncertainty allows for the mental flexibility necessary for self-transformation. This aligns with climate psychologist Salamon (2020) view that we "*must grieve, only when you are able to face the future as deeply imperiled - not the reliable, stable future you were promised or imagined—will you be ready to move on*" (c.f. Macy and Johnstone, 2012).

## Mode three: science as established authority

By 2019, the Extinction Rebellion had gained much public attention and entered a period of rapid growth. Greta Thunberg and the Fridays for the Future movement were also making headlines with their call to "Follow the Science". A specific "talks and trainings" team was established and tasked with updating

the talk and training a network of presenters to deliver it across the country.

This third iteration further reworked the existing versions, adding new elements and subtracting others whilst maintaining their two-part structure. As outlined below, the result was yet another unique mode of science communication that differed from both previous versions. The general trend was toward the talk being less shocking, instead aiming to be more respectable, professional, and accessible to a wider range of people, as exemplified by the branded slides produced by a graphic designer.

A key difference revealing how Extinction Rebellion's theory of change was evolving was that the stress on self-sacrifice and the need to volunteer for arrest were reduced. It was still stressed that Extinction Rebellion's core activity was civil disobedience and that "*people who sign up to be arrested are at the heart of our actions*" but it was also stressed that:

> "*for every person who is what we call an 'arrestable', somebody who is willing to be arrested to make this point there are maybe 10 or 20 other people, who are part of the movement who helped them get to that point… so you don't need to think that by joining Extinction Rebellion you have to get arrested, you don't, you can be a support person and be just as important*" (HFE v.3).

A notable feature of this version was how, to a large extent, it abandoned the "existentialist" frame of the earlier versions and instead adopted a more rationalist stance, putting forward a series of logical arguments for why people should join the movement. Instead of conceiving the talk as a life-altering event seeking out "upstanders" prepared to be arrested to maintain their self-concept as morally good people, the talk's new editors sought to persuade the audience through a more reasoned argument about the necessity and viability of Extinction Rebellion's strategy. Particularly notable was that the questions at the end of the talk about what it means to live a meaningful life in the full knowledge of the climate crisis were altered in favor of outlining reasons why the audience should get involved, which included "*meeting amazing people*", and that "*positive action is therapeutic*".

A key concern for the editors of this version was to produce a coherent argument that other members of Extinction Rebellion could be trained in delivering and that could be easily understandable to a general audience:

> "*We assumed little or no pre-existing knowledge so… we would need to explain everything from the get-go, what the concern was and what the forecasts were, and we needed to make that easy to grasp because there would be people who were not necessarily mathematically… or scientifically literate…*"
>
> "*This was to be given by a whole bunch of people who themselves weren't trained speakers… these would be people who had often not done any public speaking, often not very confident or not very skilled… we wanted to make sure that the slides were self-explanatory, so that if the speaker went off topic slightly the message would still get across.*"

Whilst still intended as a recruitment talk, the editors of this version had a sub-goal of acting as a form of "*grassroots

*science communication*", whereby it is envisioned that scientific information is being propagated through the community in the hope that "*more and more people [would start] to understand what is going on*". Compared to the earlier versions, the third version of the talk therefore goes to more trouble to explain key scientific concepts relating to climate change in a way the audience can follow. For example, the talk begins by describing the scientific basis of the greenhouse effect as the cause of global warming, and in this regard, it is more akin to an introductory science lesson.

An increased focus was placed on explaining the causality of impacts already occurring, with numerous vivid examples of human impacts from climate-related disasters around the world in the here and now. Whereas the first couple of versions were obviously more concerned with stressing the need to act to avoid calamitous future scenarios.

A particular concern was ensuring the talk could stand up to scrutiny, and the editors were:

> "*determined that we would be scientifically accurate, and everything would be backupable with statistics… there would be a list of references for anyone who wanted it, so that we could defend any challenges… if there were any climate skeptics for example who tried to challenge anything we said we would have data. We wanted to be rigorous but also impactful*".

Along with this, a choice was made to drop parts of the talk that questioned mainstream scientific conclusions and instead align the content of the talk with the dominant scientific view:

> "*On our side is the fact that we were representing a consensus view… and there was a bit of debate about this… the view of the people devising the first talk is that the IPCC is too conservative. We took the decision to stick very closely to the IPCC position, exactly for the reason that we couldn't then be accused of scaremongering or cherry-picking, we were presenting as close as we could figure out the consensus position, and our view was that was sufficiently scary on its own.*"

For the editors of this version, the power of their message came from holding up the IPCC as an authoritative scientific body whose sober warnings should be heeded given their rigor and expertise:

> "*I think the effectiveness of the first half… is partly that the information is quite shocking, but also it's presented in a way that conveys credibility, I think. It's graphs, it's references, it's all from scientists, it's from the IPCC. So we explain to them that the IPCC is a huge operation that collects consensus information... We go through all of how that works, and we say some people think the IPCC is conservative, but this is what the IPCC have said and this conservative body is saying these quite apocalyptic things, so that's why we should be worried. So, I think it was that sort of mixture of the quite frightening implications, but also the slightly measured way in which it is presented.*"

After that, the focus was on simplifying the script to exclude anything too complicated for the speakers to explain accurately or that the audience could not easily grasp. For example, explaining the science around concerns about aerosol masking was dropped, as

was discussion of tipping elements in the earth system; this was also in part because there was also a concern that these are still live topics of scientific debate and therefore regarded as too controversial:

> "there had been a few things in there that had been kind of complex like the whole thing about tipping points, which was not very well explained and a bit complicated, and not anyway consensually agreed by climate scientists."

Another choice, taken for the sake of simplicity of the message, was to revert to talking less in terms of probabilities and uncertainty. As one of the editors of this version explained:

> "It is always a trade-off because… communicating probabilities just sucks, because as soon as you imply that there's uncertainty people go in to 'oh its not going to happen mode', because it's not 100% certain and there's a lot of psychological research on that."

Whilst it may appear as though the emphasis was on relaying the facts to the audience (along with their provenance) in this version of the talk, interestingly, the editors" own views reject the deficit model approach to science communication. Instead, they explain that whilst "*the talk uses a lot of facts, by and large people are relatively unaffected by facts in their beliefs, and that's something that for scientists is hard to appreciate because of course scientists trained to believe that facts trump everything else.*" Instead, the editors stressed the importance of making people aware of their own psychological defenses, evoking strong emotions, stressing moral responsibility, and creating a compelling narrative. As one of the editors said:

> "Our view is that there is a crisis, the science is clear. We need people to act, people will only act if they feel a need to act- feelings are emotions, so we need to galvanize those emotions that's the reason for organizing these facts."

To sum up the mode of science communication in the third version of the "Heading for Extinction", it can be said to have the following elements:

a) It holds up the scientific mainstream position as robust, trustworthy, credible, and authoritative, and seeks to align the movement with the respectability of that authority.
b) It is more expository, both taking time to explain fundamental scientific concepts and giving many examples of already occurring climate-related impacts.
c) It tries to simplify the message as much as possible, leaving out additional complexity, and uncertainties in favor of stressing consensus positions and established facts.

Combined, these elements serve to protect the movement at a time when it is under a lot of scrutiny and is trying to establish its credibility with the general public. It is also a time when it is growing quickly and seeking to make it simple to train inexpert volunteers to deliver the talk around the country to a similar standard.

## Mode four: common knowledge

Going into 2020, the talk was again rewritten, largely due to Extinction Rebellion having to move their activities online during the pandemic. Version 5 demonstrates yet another mode of science communication (version 4 is not looked at in this study but has characteristics of both the third and fifth versions). The editors of version 5 really concentrated their focus on recruitment:

> "we think that the talk needs to recruit every [slide]… and almost every word in fact, definitely every sentence has been scrutinized on that basis, whether it recruits or not. If it's interesting or clever but doesn't recruit then it gets eliminated & if it recruits then it stays."

Part of the reason for this was the need to adopt a format that was more suited for online meetings, as the pandemic meant that in-person meetings became impossible. It was felt that the talk was much too long for such a medium, and the slide deck was reduced by half. This reduction was also a response to feedback from the talk speakers. As was explained in the training video accompanying the roll out of version 5:

> "We had a lot, a lot, of feedback that the science was way too heavy for people for that kind of talk. So you'll see we've really scaled back the science quite a bit on this, and that was the vast majority of feedback that we got from people that the science was just more in depth than what people want" - HFE v.5 Training.

As one of the editors put it:

> "do you have to go into the albedo effect, into the permafrost and the methane release and all of those science bits, which are so interesting and so devastating, but do they recruit?"

Another key reason that the editors decided that they could afford to considerably reduce the prominence of science in the talk was the strong feeling on the team that public awareness about climate science has grown considerably since Extinction Rebellion first launched:

> "Some people have said we don't need to talk about the climate crisis because people already know about the climate crisis, and it's true. In a recent poll 81% of British people said that we are in a climate crisis, which I think is testament to the work Extinction Rebellion have done. … So it's still in there but we've lowered the emphasis on it" - HFE v.5 Training.

From the perspective of the editorial team of version 5:

> "The purpose of the talk has evolved, I think the aim was always to recruit, but I think initially when it was first done… it was there to educate and inform and in the two and half years of its evolution it has become less and less about informing and more and more about recruiting."

Therefore, whilst the talk still follows the two-part structure inherited from the original, there are now only a couple of slides

each on the science of climate change and biodiversity loss. There is little by way of detail or explanation; rather, it is mostly presented as a reminder of what is regarded as common knowledge or "*clear and non-controversial science*" (HFE v.5), summarized by a few alarming factoids, fact-checked by the editorial team, with sources and details included in the speaker notes in case of any questions. As with the first version of the talk, only a single chart is shown in the whole presentation. A hockey stick graph depicting the increase of carbon dioxide over the past 2,000 years, and the presenter explains that "*scientists have spent decades debating and trying to find out if there is any other cause other than rising $CO_2$ levels to the rising of the temperature, and all the other causes have been substantially ruled out*" (HFE v.5), but no great effort is taken to explain the process of how scientific knowledge is produced and consolidated as was done in some of the earlier versions.

But this shift toward less focus on the science also reflected a shift in the perceived target audience as well as how the talk seeks to recruit them. Instead of trying to trigger an existential moral crisis in "upstanding" persons from across the political spectrum who may have known little about the climate and ecological crisis (as the original talks sought to), the editors of the fifth version sought to reach a specific segment of easy-to-reach recruits from amongst climate-conscious progressives. As explained in the interview:

> "*We have to expect [the audience] are ripe for conversion, just how much lecturing do you need to do? I think you can be very much to the point…*"

This partly manifests through stoking feelings of anger and indignation in the audience and directing that at government and corporations:

> "*So even when we show world leaders, which is a very bland image we make it very emotive by evoking **rage** in the listener, saying look these are the guys who are fucking it up for us.*"

This shift from fear and grief to anger and blame is more typical of justice-based social movements ([Jasper, 2018](#)). There are other ways in which the talk also reflects this shift in Extinction Rebellion to align itself with other justice-based movements and look for intersections between struggles. Rather than focusing on personal ethics and moral responsibility as the original versions do, in an effort to create a universalist message that can appeal across the political spectrum, the editors of the most recent version are more comfortable adopting the language of broader left-wing political movements:

"*rather than ethics I would like to talk about justice & that's the language of the movement of course. Environmental justice, racial justice, gender justice, all of these justices hanging together & one not really working without the othe*r".

The talk also focuses on identifying the roots of the crisis and describes in more detail the ways in which, for example, government subsidies, or corporate lobbying, are driving the environmental destruction. "*A big shift… is that we are trying to systematize it… calling out the system that has got us to this point and calling out the greenwash*" - HFE v.5 Training. Much of the first part of the talk is therefore about reframing the discussion to highlight the ways in which this is the fault of systematic failure and that individualized responses are not enough to address this.

Redirecting the conversation from climate impacts to social causes is seen as more likely to persuade people to join the movement:

> "*… in terms of the climate emergency, I don't think [the audience] need persuasion. What we are trying to do is open their eyes to what they can do. It's to give them agency… and also that they have community that they can belong to, because these are all like-minded people. You're joining a team, a group of people who think the same as you…*"

A particularly notable difference is that the role of arrest in the movement is dramatically downplayed compared to the earlier versions. This is deliberate and is done so as not to put off potential recruits, based on the view that the population segments who were already open to Extinction Rebellion's earlier messaging have likely already been reached. This shift also reflects a shift in Extinction Rebellion's tactics away from the original Civil Resistance model developed by Hallam.

> "*All the more radicalized elements of our movement who wanted to join and be arrested have already joined and so the next layer are the people who want to join and who don't necessarily want to get arrested and we need to enable them to join and not pressure them into getting arrested… It's toning it down to a point where they can imagine being part of the movement without being immediately threatened with arrest.*"

This is regarded as necessary for the movement to keep growing and reach their target demographics:

> "*Basically, what is happening is that the movement is broadening … and we're reaching out to less and less radical people as we grow, and arguably if we want critical mass we have got to reach out of our bubble of radical people otherwise you just don't get the mass you just get the radicals.*"

In summary, this latest version still has loosely the same structure but adopts yet another different mode of scientific communication. This mode is designed to fit the shorter format needed for online meetings favored during the pandemic and to appeal to a largely receptive audience whose awareness of the climate crisis has already been raised. This mode has the following key characteristics:

a) It presents claims about the climate crisis as common knowledge and assumes a reasonably high degree of scientific awareness in the audience.
b) It does not go into detail about the reliability of scientific claims and why we should or should not trust them.
c) The focus is less on detailing the impacts of the climate emergency and much more on outlining a particular understanding of the root causes of the crisis and the evidence for that position, e.g., highlighting the scale of continued government investment in fossil fuel extraction.

d) It avoids complexity and uncertainty, e.g., does not mention concepts like tipping points.

This mode allows the presenters to draw on the authority of science and stress the scientific grounding of the group's concerns to win the trust of the audience. Assuming a shared understanding and keeping the initial scientific introduction brief allows the presenter to focus on messages aimed at lowering the barriers to entry for potential recruits in the audience. Whilst allowing for more space to set out a "systemized" understanding of the root causes of the crisis and why that necessitates a collective political response in the pursuit of climate justice, it is hoped that this will help broaden the movement beyond its core group of more radical supporters and enable them to recruit a wider membership; in doing so, the group abandons the founding idea that it is "beyond politics".

## Discussion

This longitudinal study of Extinction Rebellion's recruitment talk demonstrates how, even over just a few years, a variety of different modes of science communication were used by the movement and shows how dynamic social movement science communication can be. The fundamental approach of the group's talk built on past efforts at climate communication focused on the need for action in response to scientific warnings and was driven by a desire to appeal to objective universal truths (c.f. Yearly, 2009) as part of their effort to go "*beyond politics*" and inspire a collective project premised on the notion that saving ourselves is not about being on the left or on the right of the political spectrum. Despite this appeal to a universal "scientific truth", the initial version presented a critical view of mainstream scientific discourse, but over time the talk's content has tended to hold closer to the scientific mainstream and deliberately became less distressing for the audience in an effort to reach a wider target demographic.

It is apparent that many factors shape the mode of science communication employed, with the final outcome primarily being a consequence of differences in the editors' creative vision and their mental models for how they seek to recruit new members based on alternative theories of climate communication and social movement mobilization. Alterations were also a response to evolution of the strategic aims of the movement and developments in the wider communication environment and rapidly changing public discourse about the climate crisis. A further constraint was the capabilities of those delivering the talk, who required versions they felt comfortable presenting. The characteristics of the different modes of science communication identified are summarized in Table 2.

All the versions of the talk seek to draw on the moral authority of science to support the Extinction Rebellion's cause (c.f. Yearly, 2009; Soßdorf and Burgi, 2022), but we see that in each of the versions the movement situates itself differently with respect to mainstream scientific accounts, such as that given by the IPCC. Initially, the movement seeks to orient itself as taking a radical position that is critical of the mainstream scientific debate. At this stage, the movement is using science as a "backstop", and the implication is that the scientific consensus predictions are

actually the "best-case scenario" we can hope for. Because the scientific establishment is regarded as conservative and politically compromised, it is argued that the reality of the situation is that things are in fact much worse than the mainstream scientific view would lead us to understand. One possible interpretation is that this choice to stress their skepticism of the scientific establishment could be a strategic choice (Fähnrich, 2018) that serves to distinguish the newly formed group from the wider climate movement so as to excite the interest of "*those disillusioned with normal 'environmental' activism*" (McNearn, 2019).

However, as the movement grew, it strategically sought to align itself more closely with the scientific community; it therefore mostly dropped its earlier critique and presented the mainstream view as a sufficiently compelling justification for its actions. This turnaround in part reflects the wider shift in mainstream discourse as to the level of urgency with which scientists are conversing about these issues. Many scientists swiftly adopted the emergency framing advocated by Extinction Rebellion, e.g., the "World Scientists" Warning of a Climate Emergency (Ripple et al., 2020). It also reflects the increased scrutiny that the movement came under. By stressing that their position was shared with that held by mainstream scientists, Extinction Rebellion sought to gain public acceptance and credibility by stressing that they were grounding their cause in certified scientific knowledge (Rödder and Pavenstädt, 2022). The editors interviewed for this research also desired a simpler and less unsettling narrative for potential recruits.

By demarcating what scientific claims the audience should be paying attention to, Extinction Rebellion can be understood to be involved in a form of boundary work (Gieryn, 1983, 1999), distinguishing between scientific claims that are seen to be "telling the truth" and science that is said to be compromised for psychological, sociological, or political reasons. The precautionary principle was also initially invoked as a reason to distrust statements of scientific consensus. This process of "exclusion" of contrary scientific evidence has been observed in analyses of other environmental justice groups and their relationship to science (Huang, 2012). We see that, as the talk develops, this boundary is constantly shifting, and over the different iterations, it moves from "excluding" and being mistrusting of the IPCC consensus position to "expanding" to include it and upholding it as the most rigorous scientific position. We also see worst-case scenarios and topics, such as tipping point cascades or aerosol masking, go from initially being included as "sound science" that needs careful attention to being excluded as the topics were deemed to lack sufficient univocality from the scientific community to be considered "sound science".

Importantly, to enact this boundary work, Extinction Rebellion needed to go beyond communicating about specific scientific claims to also equip the audience with an understanding of the processes of how scientific consensus is built and the social forces that affect scientific processes, so they could see why, in Extinction Rebellion's view, they should trust or be skeptical of particular claims. We therefore see that in the first three modes of science communication, Extinction Rebellion is engaged not only in communicating forms of scientific literacy but also a view of how science works (Durant, 1994). In contrast, the fourth mode simply asserts the existence of the crisis and treats it as incontestable common knowledge.

TABLE 2  A summary of the commonalities and differences between the different modes of science communication used in versions of the talk.

| Talk version | Presents mainstream science as conservative | Acknowledges scientific uncertainty | Explains basic scientific concepts in detail | Assumes background scientific understanding | Focus on impacts rather than causes |
|---|---|---|---|---|---|
| Version 1 | Yes | No | No | No | Yes |
| Version 2 | Yes | Yes | No | No | Yes |
| Version 3 | No | No | Yes | No | Yes |
| Version 5 | No | No | No | Yes | No |

However, Extinction Rebellion's approach to "telling the truth" is not a simple linear "information deficit model" style of communicating, whereby merely explaining the "scientific facts" is believed to convince the audience of the need to act (Suldovsky, 2017; Hinks and Rödder, 2023). Whilst all the editors interviewed for this study were adamant that it was an ethical necessity that the citizenry needed to be told what they regard to be the unvarnished truth about the actual state of the environment (c.f. Soßdorf and Burgi, 2022), they were all clear that they were trying to motivate the audience, not through information alone, but through promoting an emotional reaction and presenting a stark ethical choice. Perhaps more than any scientific truth, the talk was intended to communicate a "moral truth" to receptive audience members, which they should act to transform the destructive and "evil" social systems responsible for causing the climate and ecological crises. That anticipation of the destruction of things we cherish *demands* action.

Crucially, Extinction Rebellion sees an emotional reckoning, what some have termed an "ecophany" (Scobie, 2022), as a key part of what brings people into the movement. This is often born out of a sense of disillusionment with the existing environmental governance system or even deeper feelings of despair at the loss and destruction they see unfolding and anticipate ahead. Cassegård and Thörn (2018) have termed this emerging phenomenon a "Post-apocalyptic environmentalism". Perhaps paradoxically, many Extinction Rebellion activists appear to find a form of radical hope in this despair (Friberg, 2022). As Stuart (2020), who conducted in-depth interviews with dozens of Extinction Rebellion activists about their emotional motivations for joining the movement, explained, "*there is a shared identity formed over loss, hope from despair, anti-system sentiments, and a desire to change society for the better in any way still possible. This form of activism focuses on doing what is right rather than attaining the desired outcomes… [these] activists who are knowledgeable and honest with themselves embrace loss, grief, and even despair. From these emotions a radical hope can emerge motivating activists to save what is left.*"

However, it is an open question how successful an attempt to generalize such an emotional reaction in the wider public would be and if a movement could grow to reach the "critical mass" needed for social change through activating people in this way. Especially given that many of the fundamental reasons why people disagree about climate change come down to differences in values and worldview rather than scientific understanding (Hulme, 2009; Corner and Clarke, 2016; Hinks and Rödder, 2023). The perceived need to reach people, beyond the environmental bubble, who are

perhaps not yet open to embracing despair could be one reason why the talks have tended over time to focus less on worst-case scenarios and frame the science in less deliberately frightening ways, as well as to downplay the need for self-sacrifice and risk of arrest as a key reason to join the movement in favor of on-boarding the "low-hanging fruit" demographic that increasingly became the focus.

The author of the first version of the talk makes it clear that he regards this shift as misguided and that the original intent of the talk, which was rooted in a particular theory of change and a specific approach to recruitment based on seeking out "upstanders", has been lost. Since parting ways with Extinction Rebellion, Hallam (2021), in his view, explained in a social media post that the:

> "'*tell the truth' sections were taken out by the middle class liberal 'let's not upset people' regime that soon took over XR. But taking things out of talks which upset you does not stop them from happening… XR has to start telling the public what is really going to be happening with the raw passion and emotion it demands.*"

This disagreement hangs on which perspective is taken regarding the question of what the purpose of the Heading for Extinction talk actually is. Is it to offer a logical, if emotional, argument and set out a clearly evidenced and scientifically rigorous set of reasons for why one should consider joining Extinction Rebellion, or is it to try and hold up a metaphorical mirror to the audience and ask them if they can live with themselves if they do not step up and act, in the aim of persuading enough people to willingly go to prison? Or as Hallam (2019b) put it:

> "*Rebellions are created because some people have had enough. They are over it and don't care if they are successful or not. It's sublime madness. It's the only thing which will save us now.*"

## Conclusion

A key aspect of the different modes of communication is how they enable the group to carry out boundary work, with which to either expand or exclude scientific views the group perceive as either aligning with, or running counter to, their political goals. Therefore, what it means to "tell the truth" changes over time between the versions.

This raises thorny questions that would benefit from future research about the role that science does and should play in the communication of social movements. For example, how best can social movements concerned with risk assessment and climate justice voice a critique of scientific reticence and conservatism whilst maintaining credibility in popular discourse? Can movements aim to draw on "universal" scientific arguments, or must they always be grounded in "specific" political struggles for justice? To what extent is post-apocalyptic environmentalism a sustainable political project from which to bring about rapid social change? A potentially useful comparison might be the evolution of other grassroots climate science communication talks used by the climate movement, for example, those used by Al Gore's "Climate Reality Project".

We also need to ask how we are best to understand the interplay between moral and scientific truths in motivating activism? As it is clear from the analysis, the "truth" being told is in fact more of a moral truth that is experienced emotionally than a factual truth understood intellectually. However, the two are intimately related via the concept of radical hope. Whereby, an unflinching acceptance of a particular scientific understanding of the climate and ecological crisis is accompanied by an openness to experience negative emotional states brought up by this realization, and it is from this state that new possibilities for radical action then emerge.

## Data availability statement

The datasets presented in this article are not readily available because the data cannot be shared for reasons of confidentiality in line with the ethical approval for the study. Requests to access the datasets should be directed to thierryat@cardiff.ac.uk.

## Ethics statement

The studies involving humans were approved by Cardiff University School of Social Science Research Ethics Committee. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

## Author contributions

AT designed this research, conducted the analysis, and wrote the manuscript.

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## Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Publisher's note

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