

### 3 MESSAGES AND HEURISTICS: HOW AUDIENCES FORM ATTITUDES ABOUT EMERGING TECHNOLOGIES

How do people form opinions about scientific issues? It is, suggests **Dietram A Scheufele**, unrealistic to expect people to sift through masses of information to draw up a reasoned conclusion. We are mostly ‘cognitive misers’, drawing upon a minimum amount of information. What is crucial is how an issue is ‘framed’ – the context in which it is communicated and how it fits with people’s pre-existing thinking. Understanding these aspects is crucial to effective science communication.

Many of the academic debates about how citizens form attitudes about scientific issues come down to a conflict between ideals and realities. On one side, many of the recent public outreach efforts are based on somewhat idealistic views about a ‘scientific citizen’ who forms attitudes based on an in-depth understanding of scientific controversies, or should do. On the other, we have decades of research in social psychology, political science and risk communication that suggests that knowledge plays a marginal role at best in shaping people’s opinions and attitudes about science and technology. In fact, many researchers have suggested that the way media present an issue, and people’s value systems and predispositions, play a much greater role in shaping citizens’ attitudes toward new technologies.

#### Scientific literacy versus low-information rationality

The two models that have come to represent this tension between ideals and realities have been labeled *science-literacy* or *knowledge-deficit* models on the one hand, and models based on *low-information rationality* on the other hand.

**Knowledge-deficit models** assume that audiences can and should acquire as much information as possible about new technologies. Their adherents therefore often attribute the lack of public support for emerging technologies to lack of information among the public. As a result, many researchers and practitioners in this area also argue that a more informed public would be more supportive of scientific enquiry and of emerging technologies, such as nanotechnology or agricultural biotechnology.

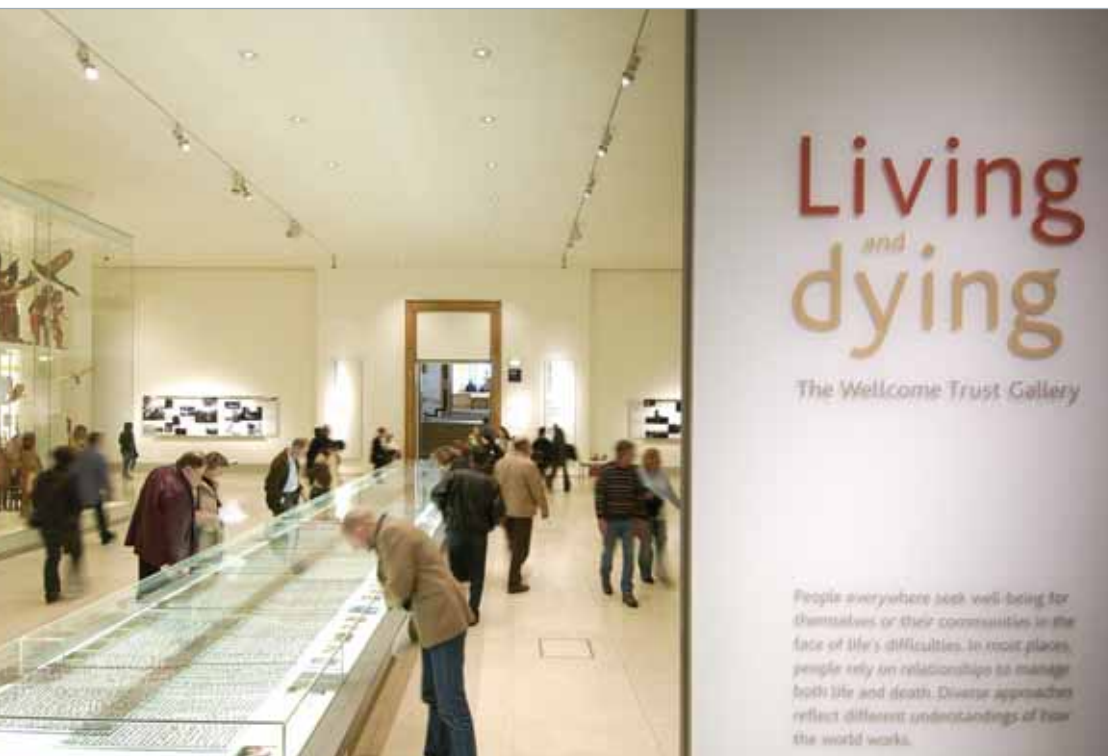
Unfortunately, knowledge-deficit models are problematic for a number of reasons. First, empirical support for the relationship between information and attitudes toward scientific issues is mixed at best. Over time, different researchers identified both positive and negative links between levels of knowledge among the public and citizens’ attitudes toward science. And the most recent updates on this literature seem to suggest that the relationship disappears after we control for spurious and intervening factors, such as deference toward scientific authority, trust in scientists, and how obtrusive the issue is.<sup>1</sup> Second, and more importantly, research in social psychology, communication and political science has long suggested that citizens rely on influences such as ideological predispositions or cues from mass media when making decisions, and therefore use only as much information as necessary when forming attitudes about scientific issues.<sup>2</sup>

#### Decades of research suggests that knowledge plays a marginal role at best in shaping people’s opinions and attitudes about science and technology.

This idea is often referred to as **low-information rationality**, a term coined by political scientist Sam Popkin.<sup>3</sup> The concept of low-information rationality is based on the assumption that human beings are cognitive misers and minimise the economic costs of making decisions and forming attitudes. Most citizens will therefore not bother to develop an in-depth understanding of scientific issues, which would require significant time and effort. Rather, they collect only as much information as they think is necessary to make any given decision. They rely on *cognitive shortcuts or heuristics* to efficiently sift through large amounts of information and to form attitudes about issues, such as nanotechnology or agricultural biotechnology. And the less expertise citizens have on an issue initially, the more likely they will be to rely on cognitive shortcuts or heuristics. Examples of heuristics include religious or ideological predispositions, cues from mass media about which issues are important or how to interpret them, perceptions of other people’s opinions or trust in scientists.<sup>4</sup>

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As the label ‘low-information rationality’ suggests, these patterns of information-processing make perfect sense for citizens who have to deal with thousands of pieces of new information every day, and we all use them. We spend less cognitive effort in buying toothpaste than we do when picking a new car. And that difference in information-seeking is largely a function of the costs



## THE DRUGS DO WORK

‘Cradle to Grave’, a site-specific art installation housed in the British Museum’s Wellcome Trust Gallery since 2003, takes visitors on a pharmaceutical journey through the lives of an average UK couple. The result provides striking insight into the impact of medications in modern life.

Produced by the Pharmacopoeia partnership, ‘Cradle to Grave’ forms the centrepiece of the Wellcome Trust Gallery. Under one of the largest single pieces of glass to occupy a gallery, the monolithic case houses two pieces of fabric, each 13 metres long – one for the man and

#### ‘CRADLE TO GRAVE’ AND THE WELLCOME TRUST GALLERY AT THE BRITISH MUSEUM

##### Funding

£5.4m (2003, Capital Award to the British Museum); with a £40 000 special commission by the British Museum for ‘Cradle to Grave’

##### Project lead

(‘Cradle to Grave’): Pharmacopoeia, a creative partnership comprising artists Susie Freeman and David Critchley, as well as GP Liz Lee

##### More details

[www.thebritishmuseum.ac.uk/livinganddying/](http://www.thebritishmuseum.ac.uk/livinganddying/)  
[www.cradletograve.org](http://www.cradletograve.org)  
[www.pharmacopoeia-art.net](http://www.pharmacopoeia-art.net)

Left: The *Living and Dying* exhibition at the British Museum.

and benefits involved, of the anticipated use of each product, and of the relevance of each decision for our daily lives. Most citizens, of course, go through some of the exact same considerations when making decisions about emerging technologies.

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**The interplay of media frames and audience schemata**

So how do attitudes change over time, given what we know about people’s patterns of information-processing? The answer, of course, is complicated. But there is one process that is especially relevant to the question of attitude formation about science and technology: the concept of framing.<sup>5,6</sup>

As the term implies, messages are often presented (or framed) in a particular way, and different ways of presenting the same information also influence the way audiences interpret the messages.

A good example is Frank Luntz’s work on framing political messages. Luntz is a commercial pollster who has done extensive work for the Republican Party in the USA. Much of his work is summarised in a memo he first circulated in 1997 among Republican members of Congress called ‘Language of the 21st Century’. Large parts of Luntz’s memo are devoted to how Republican members of Congress should frame messages in order to influence attitudes among voters. When constructing messages about energy policy, for example, Luntz recommends an ‘exploring for energy’ label instead of ‘drilling for oil’. Relabelling or reframing the issue is critical for changing audiences’ interpretations, or what Luntz calls the picture that people paint in their minds. The popular notion of ‘spin’, while used more broadly, often refers to the idea of framing.

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Research in social psychology and communication science supports Luntz’s assumptions. People carry interpretive schemata in their heads as an economical way of making sense of things that happen in the world around them. How a message is framed influences which schemata in people’s minds are activated and therefore how they process information. Framing therefore involves two separate concepts: media frames and audience schemata.

**Media frames** refer to the way journalists, interest groups, policy makers and other players in the policy arena present information. And the reason for the framing is really a secondary concern. For journalists, framing is an important

tool to reduce fairly complicated issues into the format of a news story that audiences will find both interesting and understandable. Special interest groups, on the other hand, use framing as a persuasive tool. For them, framing is an important device for influencing public opinion and shaping public discourse in mass media.

In sum, media frames provide audiences with cognitive shortcuts or heuristics for efficiently processing new information, especially for issues that audience members are not very familiar with. Greenpeace’s attempt to reframe the debate about genetically modified organisms around the ‘Frankenfood’ label, for example, was directly based on this assumption. Even for citizens who knew little about the scientific facts underlying the debate, the ‘Frankenfood’ label provided a convenient interpretive device (or frame) that allowed them to form opinions.

Frames will only be effective, of course, if they resonate with underlying **audience schemata**. These can be religious beliefs, moral values, trust in scientists (or Greenpeace), prior knowledge or any other interpretive schema that people use to make sense of information. And frames will usually play very explicitly to these underlying schemata. The ongoing debate about abortion rights in the USA and many other countries is a good example. A pro-abortion stance could be framed as ‘pro-choice’ or ‘anti-life’. A pro-choice frame tries to evoke schemata related to constitutionally guaranteed freedoms and a woman’s right to choose. A pro-life frame, in contrast, is tailored to fit schemata about unborn life and other religious considerations. A simple terminological difference therefore activates different interpretive schemata and can change the way citizens think about the issue. The way issues and campaigns are framed has been shown have relative broad societal impacts, influencing perceptions of political figures,<sup>7</sup> trust in Government,<sup>8</sup> and perceptions of governmental responsibility for solving social problems.<sup>9</sup>

**How it all fits together...or how attitudes are ‘framed’**

Attitude formation, ultimately, is a competition between frames of public discourse – offered by interest groups, policy makers and mass media – and the value systems and predispositions of citizens. There is a “negotiation of meaning”.<sup>10</sup> In other words, media frames or frames promoted by policy groups offer different ways of looking at the same issue. At the same time, audiences bring their own value systems to the table and use them to interpret these different messages.

The fact that people use these pre-existing schemata as interpretive tools also means, however, that the same media frame may be very effective for one social group but largely ineffective for everyone else. And as a result, the same message

→ one for the woman. Knitted into each piece of fabric is the quantity and type of drugs each will consume in the course of an average lifetime. Based on patient prescribing records and figures detailing the commonest ten medical conditions in the UK, the piece is, in effect, a pharmaceutical diary.

Humanising this multicoloured ‘trip’ through life are various objects and photographs. Like the drugs, the photographs are authentic: handwritten captions adding emotional warmth to these encased strangers.

The Pharmacopoeia partnership owes its existence to Wellcome Trust funding – it was awarded one of the first ever Sciart awards in 1998 and has received other support from the Trust.

The installation, frequently visited by art and medical students, is both a powerful symbol of mortality and a visual insight into the route medicine has taken. The work has also led Pharmacopoeia to find educational outlets, and even a potential collaboration with Pentonville Prison.

The installation is highly popular, frequently stimulating conversations between strangers mesmerised by the sheer volume of pills. It is a graphic representation of the medicalisation of modern life in industrialised countries. As such, it complements well the *Living and Dying* exhibition in which it sits.

*Living and Dying*, the first exhibition in the Wellcome Trust Gallery, scrutinises the ways in which different cultures approach health and wellbeing. ‘Health’ →

**Right: ‘Overnight Bag’, decorated with a variety of contraceptives. Pharmacopoeia**



about a scientific discovery, for instance, may be interpreted very differently by different cross-sections of the audience, depending on their religious beliefs, prior knowledge and other factors.

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For example, in a survey of the US public in late 2004, we asked respondents to indicate their general support for nanotechnology.<sup>11</sup> When we correlated their perceptions of potential benefits with their support for nanotech, we found an interesting pattern. For highly religious respondents, benefit perceptions influenced overall support significantly less than for respondents who reported lower levels of religiosity. Religious respondents used their faith to interpret the potential benefits of nanotechnology.

What does this mean for our understanding of how people form attitudes about scientific issues? The fact that we saw weaker effects of benefit perceptions on attitudes toward nanotechnology among highly religious respondents is probably due to what I would label a ‘perceptual filter’. In other words, citizens use value systems and predispositions to make sense of what they learn about nanotechnology.

**What this means for communication about scientific issues**

Information does still matter, in spite of its limited importance for attitude formation. It matters since every scientific issue has its highly informed and highly interested sub-publics. And input from these sub-publics on the ethical, legal and social issues related to technological innovation can be very important for informing policy decisions.

**Understanding how citizens form attitudes, and then using that understanding for effective public communication about science and technology, is not an option: it is a necessity.**

But we also know from decades of research in political communication that information can be presented and framed in ways that fundamentally change the interpretation among audiences. At this point in the debate about nanotechnology, no frame has really emerged as the predominant one. Some critics of nanotechnology have referred to it as the “asbestos of tomorrow”, alluding to the potential unknown and long-term risks connected with nanoparticles. This metaphor is a highly effective way of using asbestos to evoke an existing interpretive schema that many people share. More importantly, the asbestos frame is difficult to counter since it refers to risks that we will not be aware of until decades down the road.

But even if information is presented in the most neutral way possible, citizens will still use their own perceptual filters to interpret that information. Understanding how citizens form attitudes, and then using that understanding for effective public communication about science and technology, is therefore not an option: it is a necessity. Interest groups, corporate communicators and other players in the policy arena have long used these strategies for successfully communicating with a miserly public that will often form opinions based on very limited information, whether we like it or not. This essay is not a call to engage in propagandistic attempts to sway opinions one way or another. But if scientists want to have their views heard in public debate, they need to understand and use the tools that are available and appropriate for communicating effectively with different audiences.

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*The ideas outlined here are based in part on a recent presentation at the annual convention of the American Association for the Advancement of Science in St Louis, Missouri, USA, and an article in Materials Today magazine.*

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- 11 See note 2 above.

→ is an expression used in the UK to describe how far removed the body is from death. But go elsewhere and the meaning is more equivocal, perhaps incorporating the wellbeing of extended social and family networks. Depending upon the culture, poor health may be perceived as the result of stress, disease or malign spirits. A culture’s interpretation of illness reveals a great deal about its heritage. So what does ‘Cradle to Grave’ tell us about being British?

**Sciart collaborations**

Collaborations between scientists and artists are supported through Sciart grants, part of the Wellcome Trust’s Engaging Science programme. Projects should aim to stimulate fresh thinking and debate in both disciplines. Innovation and experimentation are crucial, but projects should also be accessible to diverse audiences and engage the public in the social, ethical and cultural issues surrounding biomedical science.

[www.wellcome.ac.uk/sciart](http://www.wellcome.ac.uk/sciart)



**Right:** Visitors follow the length of the installation at the Wellcome Trust Gallery.