Chapter 13

Mediating science

Promotional strategies, media coverage, public belief and decision making*

D. Miller

Science and scientists are increasingly visible in the media. Science is called upon to adjudicate on the risks of modern living, to provide rational and objective commentary, to promote government policy and undermine it, to further the campaigning ends of pressures groups and safeguard the profits of large corporations. Scientists also appear in the mass media of their own volition, promoting their latest findings, attempting to safeguard public health and sometimes pursuing research funding. In short, science appears in a wide variety of guises in the contemporary mass media for a wide variety of reasons.

This paper will review differing ways of understanding the role of the media in communicating science and will argue that a proper understanding of the media necessitates an approach which locates the media in the context of wider formations of power and influence and of historical processes. The main body of the text examines the relationships between the media and other social institutions, the public and with decision making or 'outcomes' in society. But first let us pause to discuss what it means to 'mediate' science.

Mediation

Communication is essential to the reporting and discussion of science in the public domain. If communications were simple mirror image reflections of the reality they attempt to describe, then they would not be a significant subject of study. In practice communication is a means of 'mediating' science. By mediation we mean that to describe any single piece of science or a body of scientific theory, a selection of what to say or write must be made. The account to be given must of necessity be 'selective'. But this does not mean that the account must be inaccurate or misleading. In describing a particular experiment, for example, the colour of the researcher's hair will usually not be regarded as central to the story. At the most basic level, criteria of relevance will be used. Some form of selection will have to be made from all the possible descriptors available. The selection may also involve an attempt at simplification or transla-

*Newly commissioned.

tion depending on the writers' motives for producing the report or on their perception of their audience. We can think here of journalists translating a complex piece of science into a news story, of public health officials presenting scientifically derived information in health education campaigns, or of scientists translating their own or others' work into textbooks or popular science paperbacks. In all these cases we can describe what is happening as a process of mediation.

These types of activity may seem fundamentally different from the business of science proper. But it should be apparent that similar processes are in operation at the heart of the scientific method, not just in terms of writing scientific papers, presenting them at conferences, or submitting grant proposals, but also in the fundamentals of conducting research. Communication and therefore mediation are fundamental to science as they are to all other human endeavours.

The notion of mediation also implies the possibility that communication can be 'distorted', both in the sense of deliberately misleading and in the sense of losing something in translation. But perhaps more important than distortion is that mediation implies agency. Someone does the mediating and does it for particular reasons. One consequence of this is that particular ways of mediating science may be linked to particular interests. For example, Richard Doll has recently argued that the pressures of academic life to secure prestige and research funding can result in the publication of material which might be better left unpublished:

> the pressure to publish to secure funding encourages publication at times when the proper reaction would be to see first if the finding can be confirmed with larger numbers or by another method.
>
> (Doll, 1997: 10)

The point to note about mediation is that it is inescapable in the communication of science, whether at scientific conferences, in expert committees, in scientific journals, in the news, in popular science books, in science fiction, films or other entertainment media (see Collier with Toomey, 1997: Ch. 3 on the process of writing science).

Current commentary on the media and science

The key problem for many commentators on the mediation of science is a lack of public understanding of science. There are a variety of explanations for this 'deficit' model of public understanding, many of which see the public as irrational, emotional or ignorant about science, perhaps because of an intrinsic human inability to understand complex scientific information. Alternatively, some suggest that the public is misinformed. Here the media are charged variously with negative, sensationalist, simplistic or misleading coverage. On occasion the problem is located as a combination of both, as in this comment

from gourmet writer Egon Ronay in a review of a Channel 4 documentary on food safety. The programme, he argued:

> misleadingly coats the pill of intimidation, conceals the obsessiveness of doom-merchants and insidiously turns half-baked theories into received wisdom. . . . The television ridden British public, slumped in sofas and vulnerable to prettily presented generalisations, needs to be forewarned to take the diet to be dished out . . . with thousands of grains of salt.
> (*The Sunday Times*, 8 March 1992)

A less common approach is to acknowledge that some of the problems of communicating science may be to do with the communicators themselves. One example is an editorial in the *British Medical Journal* by editor Richard Smith, criticising some scientists for being naive in their dealings with journalists and others for simplifying and distorting science to further their own interests in research. Such scientists 'do nothing for the public understanding of science by making statements that can be used to endorse the suggestion that the eradication of genetic disease is something not much more complicated than Lego™' (Smith, 1992: 730).

It is plainly the case that some scientists are better at communicating with the media than others and there clearly are occasions on which the media are responsible for particular types of distortion or parts of the public are misled or misunderstand elements of science. It is well known that the size, scope and length of issues on the media agenda does not mirror their objective severity measured in terms of human misery or death or scientific risk assessment procedures. For example, Figure 13.1 compares British press coverage of BSE with officially confirmed cases of BSE. As can be seen the first major peak in press coverage in 1990 occurred at a time when there were relatively few cases, and the second peak, in 1996, occurred after the peak of cases had passed. But rather than bemoan the disjunction between the media and official assessments, it seems more productive to try to understand why this is the case.

The circuit of mass communication

The mediation of science is a complex phenomenon which involves a large number of contending and co-operating social factors and groups. These include institutions and corporations, media organisations, a range of publics, and policy, cultural and political outcomes. However, the communication of science is often examined from the vantage point of only one part of the 'circuit of communication' (Miller *et al.*, 1998). Thus we find discussions of the coverage of particular issues, examinations of 'lay perspectives' or public opinion, or attempts to evaluate the communication strategies of particular organisations. But we cannot properly understand the actual behaviour of 'experts', the media or the public in isolation. Instead they need to be examined in the context of

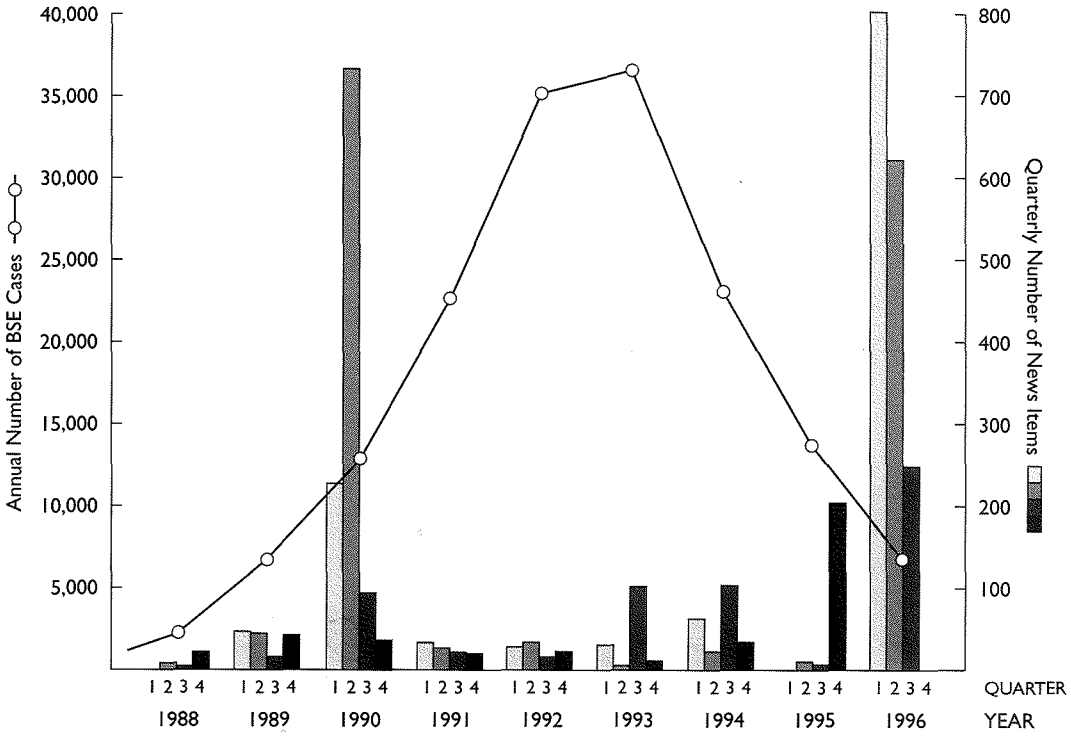

Figure 13.1 Comparison of the press coverage of BSE with officially reported cases.

their interactions with each other. The suggestion in this paper is that we look at the communication of science in a more complex fashion as the product of an interaction between four sets of actors:

1 *Social and political institutions*: a vast range of organisations in civil society, including government, business, interest groups, universities and scientific research institutes.
2 *The media*: the press, radio and television news, current affairs and documentary programmes, science programming, talk shows, popular and professional scientific magazines and journals, popular books on science, and women's and men's magazines, which routinely include advice on matters of science and medicine. Fictional forms include novels (including the genre of science fiction), feature films, television and radio plays, drama serials, and soap opera.
3 *The public*: stratified in terms of class, gender, race/ethnicity, nationality, sexual identity and age as well as by professional and political commitments and social experience.
4 *Decision makers*: in local, national and supranational government as well as in business organisations, interest groups, universities and scientific institutes.

These four sets of actors can be conceived of as relating to each other in a relatively static and one-dimensional way. For instance, social institutions communicate with the media which reports what they say, with a particular impact on the public, to which decision makers respond. However, if we see the relationship between these analytical types as interactive and dynamic we can begin to understand the way in which issues rise and fall on the public agenda. It is important to see the process of communication as a circuit which is multidirectional in that there can be all sorts of direct relationships between any two of the elements of the circuit (see Figure 13.2).

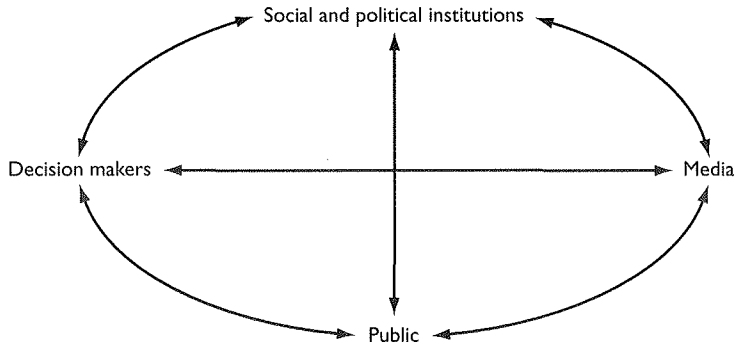

Figure 13.2 The circuit of mass communication.

My argument is first that each of the different elements of the circuit need sustained analysis which is sensitive to variation as well as similarity (e.g. not an assumption that media coverage or public opinion is homogeneous). There is a need to trace the differing pathways between different elements of the circuit. We need to ask not just what is said by science communicators or the media or believed by the public, but why. Examining only part of the circuit directly runs the risk of over- or underplaying the importance of the area studied or of other areas. Thus to examine only public perceptions or the genesis of scientific advice, or the preparation of communication campaigns, misses the interactive and mutually constitutive relations between the various moments of communication. In other words, there is a need to understand the dynamic relations between different elements of the circuit as well as examining the content of the different moments in order to build up a better picture of the circuit of science communication.

Given this model, it becomes easier to explain the rise and fall of scientific issues in the media and on the public and policy-making agenda. The next four sections examine the different elements of the circuit and how they relate to each other.

Social and political institutions

Without sources of information, there would be no news. Social institutions of all types increasingly understand the value of planning media strategies to manage their image in the media and with key publics (Miller, 1998). Equally, the value of keeping an organisation out of the news is also increasingly recognised, particularly in areas of science where there is significant political controversy. In 1997, a leaked briefing document prepared by PR multinational Burson Marstellar for a leading biotechnology firm advised that the best way to gain acceptance for genetically modified foods was by staying 'off the killing fields' of the environment and human health, since the industry 'cannot be expected to prevail in public opposition to adversarial voices on these issues' (Burson Marstellar, 1997: 3–4).

All sorts of organisations now have press offices and engage in public relations activities. Government departments have large information divisions responsible for protecting the image of their department and publishing large amounts of information every day. Research councils, corporate bodies and interest groups also employ PR staff. In addition, in the last 20 years the PR industry has become increasingly significant in attempting to shape the news. Scientific institutes have increasingly turned to the PR industry for help in managing their media profile. For example, the Roslyn Institute hired a PR consultant in 1997 to advise on the presentation of the story of 'Dolly' the cloned sheep. Equally, scientific findings can be promoted by PR companies working for industrial interests, gaining them a higher profile than might otherwise be the case. In 1991, interim non-peer-reviewed findings of the MRC Epidemiology

Unit 'Caerphilly study', which apparently cast doubt on the well-known hypothesis that there is a link between saturated fat consumption and coronary heart disease, were promoted by a PR company working for the Butter Council (Connor, 1991). On the other hand, industry interests can also attempt to sideline research which threatens their interests. John Yudkin, nutritionist and a leading expert on dietary sugars, has written of the attempts by the sugar industry to undermine and discredit his work. He concluded that the public were 'being misled by propaganda designed to promote commercial interests in a way that you thought only existed in bad B films' (Yudkin, 1986: 167; for further material on the PR industry and science/the environment see Nelson, 1989; Rowell, 1996; Stauber and Rampton, 1995).

Social institutions supply information to the media in the form of 'information subsidies' (Gandy, 1982). This means that 'resource-rich' organisations (such as government departments, large corporations and some scientific endeavours) start with an important advantage in the competition for access to the media and decision making.

Presenting and promoting science

One key problem for science communicators attempting to improve public understanding of science is the provisional nature of scientific knowledge. There is a tendency for scientists or presenters of science to represent it as a generator of certainty, in which:

> uncertainties and ambiguities are the result of incompetence of the scientists, or inadequacy of the apparatus, or of the limited tests conducted so far. Residual uncertainties will be eliminated by future tests.
>
> (Collins, 1987: 710)

However, divisions between scientists can make unambiguous statements difficult. In practice, government operates a system of expert advisory committees to distil the best scientific advice. Such committees are subject to a number of limitations. In the first place, prospective 'experts' are, according to one former member, carefully 'vetted' on their 'general views and philosophy of life' in addition to their scientific qualifications (Lacey, 1994). The committees are also the subject of strict secrecy and are attended by a variety of civil servants, whose interventions can be significant. In the case of BSE, the first chair of the advisory committee, Sir Richard Southwood, has publicly acknowledged that some of the contents of their report reflected their judgement of what the ministry would accept, rather than their unvarnished scientific judgement (Miller, in press). Even then, the Ministry of Agriculture delayed the report for seven months while its emphasis was changed (*ibid.*). Furthermore, a number of questions have been raised about the commercial interests of scientists in advisory committees. Many members of expert committees have a financial relationship with relevant business

corporations in the form of research grants or consultancies. In some cases, scientists who are actually employed by companies sit on the committees (Abraham, 1995). Furthermore, in recent times, as a result of government policy changes, scientific institutes have become more dependent on commercial funding and many have been transformed into business ventures, with directors of research becoming chief executives (Cannon, 1987; Pain, 1997). These processes decrease the already dwindling number of 'independent' scientists (Miller, in press; Nowotny, 1981).

Moreover, partly because of the limitations of the process of extracting advice, the judgements of advisory committees can be called into question, particularly if appropriately qualified scientists are willing to talk to the media. Thus even where there is genuine agreement among government advisors, unambiguous public statements may be forced to compete with dissenting voices, fostering the impression of ambiguity and uncertainty.

Translating science for public consumption

The process of translating scientific advice into official reports, press releases and health education campaigns is also potentially tricky since it brings all sorts of calculations about communication effectiveness into play. This can work in two ways. First, calculations about what the media or the public might make of particular statements are necessarily involved in science communication, but this can be at the expense of accuracy or of denying uncertainty, as in absolute statements between 1990 and 1995 about the lack of risk from BSE. Second, calculations about what is politically possible can also impinge on government attempts at science communication. One example is the agonising in the Department of Health (and wider in government) in 1985–87 about whether explicit AIDS information was politically as well as medically desirable (Miller *et al.*, 1998).

Such problems are given greater complexity with the involvement of a wide range of different professionals in the production of science-based information. This applies to media relations but can be even more crucial to health education material. For example, in the AIDS campaign a wide range of professional groupings were centrally involved (ministers, administrative civil servants, medical civil servants, information officers, market researchers, advertisers, health educators, expert advisors, etc.). Many of these groupings tended to have opposed conceptions of communication planning and effectiveness, together with differing sensitivities as to what was politically possible. Furthermore, division between professional communicators, who favoured fear arousal campaigns and 'impact' in advertising, often clashed with health educators, who favoured sensitivity and positive alternatives to penetrative sex.

Science communication is sometimes officially stated to be a technical process. In practice, it can involve a complex web of interlocking disputes and alliances, which sometimes result in the communication of messages that

as a result of compromises and political interventions are contradictory, vague or contain little useful information and with which none of those involved are satisfied (*ibid.*; see also Farrant and Russell, 1986).

Competition and co-operation in media strategies

Once the message is agreed, there are all sorts of further obstacles to surmount. These include competition with opposing interests as well as co-operation with other interests and the formation of alliances. Science communication strategies may be hampered by conflicting interests inside government, either within or between departments, as well as conflicts within or between scientific disciplines. This is especially the case if such interests 'go public', even in the minimal sense of off-the-record briefings. We can point to the controversy within government over *Salmonella enteritidis* PT4 in 1988/89 or the debates within science over the causation of AIDS or coronary heart disease (Miller and Reilly, 1995). This is not only important in that it indicates conflict in government or science, but also because this will become an added reason for media interest.

The strategies formulated by social institutions for influencing the media and decision making are forced to compete with those of other organisations (whether they be scientific establishments, government departments, business ventures or pressure groups). This is important for two reasons. First, there can be a wide range of information available to the public with which a particular science-based communication strategy has to compete. Furthermore, there are a variety of organisations engaged in communication on science-related issues, which may have diverging reasons for and interests in managing risk (e.g. to protect corporate reputation, increase sales, further campaigning demands, raise research funds or even personal profiles, etc.). This is an inevitable part of our culture, and there is no intrinsic reason why information emanating from scientific establishments or government should be believed above that of competing interests. One implication of this is that scientists themselves (even those not working for industry interests) are players in competition for media space and public sympathy, rather than simply disinterested suppliers of information.

Co-operation and the building of coalitions are also important in that a broad consensus in a particular policy arena makes communication efforts much more likely to succeed. The coalition built around public health interests on AIDS in 1985–1989 is a key example of such co-operation, which was effective in policy terms (Miller *et al.*, 1998).

Media organisations

Much discussion of science communication tends to see the role of the media as a predominantly negative one. The media are dismissed as a homogeneous bloc whose penchant for sensation and irresponsibility are an obstacle to rational science communication. However, it can be suggested that the media are

neither uniform nor consistently negative either in relation to the interests of science and scientists or in relation to the public interest. There are a number of key media factors which explain the form taken by particular media outlets.

Political economy of the media

In the first instance, the economics of the media industries is an important influence on how they report the world. The balance between public service media and commercial operations is of prime importance. In recent years, there has been a movement towards the commercialisation of broadcasting in a number of Western countries. In Britain, this has led to a slackening of public service controls on output. One specific result in relation to science programming is that by the mid-1990s the main commercial channel in Britain, ITV, had ceased to broadcast any science-related series. Furthermore, the private ownership of media corporations and the trends towards monopoly of transnational corporations have meant a decline in serious debate about the role of science in the public sphere.

The existence of advertising is an additional factor in newspapers and on commercial television. The content of advertising is determined (within certain limits) by the motive of selling products. This is quite different from a public service motivation and it means that there can often be a contradiction between the messages given about products in advertising and those in editorial coverage. However, given that advertising revenue is what funds commercial television there is a sense in which audiences themselves rather than television programmes 'are the primary commodity. The economics of commercial broadcasting revolves around the exchange of audiences for advertising revenue' (Golding and Murdock, 1991: 20).

So the need to secure large audiences promotes the production of familiar programming and limits the production of innovative, risky or critical programmes. 'Hence', as Golding and Murdock argue, 'the audience's position as a commodity serves to reduce the overall diversity of programming and ensure that it confirms established mores and assumptions far more often than it challenges them' (*ibid.*: 20). This is one factor which tends to mean that mainstream natural science is portrayed relatively favourably in the media. 'Science and medicine still have a unique social authority, as if they somehow bypass social, political, economic and emotional factors: we seem to believe that science is thought with the thinkers removed – as if that were possible' (Karpf, 1993). This tendency means that scientific sources have a very great credibility for the media and in a general sense mainstream science is able to secure very favourable coverage in the media. However, this credibility and prestige can be compromised or undermined by a number of factors, some of which are noted above and others are noted below.

Heterogeneity

Media institutions are not simply the instruments of either government, business, scientists or pressure groups. They have their own interests and agendas. Newspapers are run as a business, but this does not mean that they simply go for the story which will bring in the most readers. Newspapers are carefully targeted at particular social groupings, and stories in the papers will, to some extent, reflect the 'personality' of the paper. Despite recent changes in broadcasting regulation, television and radio do still retain a significant public service ethos. This can mean that some sections of the broadcast media consider their role as an educative one and accordingly their programmes will reflect the dominant trends in medical thinking in relation to diet. With its responsibility for 'minority' programming, Channel 4 is more likely to broadcast contending alternative views on science issues. An analysis of factual and fictional programming on AIDS (between 1983 and 1991) found that the dominant account of AIDS was derived from the medical/scientific orthodoxy, but that there were more spaces to explore alternatives in more 'open' programme formats such as documentaries, films and soap operas, as in the ongoing story line in *Eastenders*, where central character Mark Fowler has known he is HIV-positive since 1990. However, the most limited accounts of AIDS, which gave most credibility to 'hard' sciences such as immunology and virology and downplayed softer disciplines such as epidemiology and social science and the insights of clinicians, were on science programmes such as *Horizon* (Miller *et al.*, 1998: Chapter 5).

Media institutions do pursue readers with a variety of crude and not so crude techniques but there are clear differences in the types of material which appear both within and between media. There are distinctive approaches to some science-related issues in particular newspaper and television outlets. For example, on AIDS and on coronary heart disease (CHD), the papers most likely to take a line critical of the dominant scientific view were particular tabloids and particular right-wing broadsheets. *The Sunday Times* and *The Sun* both criticised the scientific orthodoxy on AIDS between 1989 and 1995. *The Sunday Times* and a wider range of tabloids have also been keen to publicise data which cast doubt on the scientific orthodoxy linking dietary fats to coronary heart disease, as in headlines such as:

> Butter 'can slice heart attack risk'
>
> (*Daily Express*, 27 February 1991)

> Eat, Drink and be Merry . . . It could Save your Life
>
> (*Daily Mirror*, 23 December 1991)

> Fatty food not a Killer
>
> (*Daily Express*, 23 December 1991)

By contrast, such perspectives on both AIDS and CHD tend to be downplayed or 'exposed' as misleading in the liberal broadsheets and tend not to be covered by television news (Miller *et al.*, 1998; Macintyre *et al.*, 1998).

But the overall 'line' of a paper is subject to both change and contest from within. For example, specialist correspondents have a distinctive role on both broadsheet and mid-market tabloid papers. Medical and scientific reporters tend to be very knowledgeable about their areas of responsibility. This can mean both that they adopt an advocate role for key sources in the medical and scientific community and that they can spot news management activities by their sources more quickly than their non-specialist colleagues. Accordingly, their coverage will tend to differ from that of freelancers or of political correspondents, who are drafted in when the story leaves the specialist pages of the paper and becomes a major political issue.

The quasi-advocate role of specialist reporters towards senior sources in the scientific world, official sources in government and their dependence on prestigious medical and scientific journals (*The Lancet*, *British Medical Journal*, *Science*, *Nature*) can mean that they come into conflict with their editorial hierarchy over which stories to cover and how to cover them. Pressure can be exerted on specialists to write up stories which they think are unimportant if they are being carried in other papers. Similarly, where the editorial line of a paper differs from the approach fostered by leading scientific and government sources, specialists can face immense pressure to change the tone and content of what they write. This is especially the case with specialists on right-wing tabloid papers and was a particular issue in relation to AIDS coverage (see Miller and Williams, 1993).

News content and news values

Science tends to make front-page news when scientific advances are made or disputes in science emerge. Furthermore news values favour short-term and dramatic issues over longer-term stories. However, science-related stories rarely become major public issues dominating headlines for days or weeks unless they involve 'matters of state' – that is major political involvement. This can be seen by comparing the profile of coronary heart disease with food safety, remembering that CHD kills many more people each year than food poisoning. Between January 1988 and the end of 1992, BBC television network news broadcast 128 items on food safety, and between 1973 and 1991 food safety stories made the front page of *The Times* and *The Sunday Times* 90 times. By contrast, CHD appeared only 25 times on BBC TV news and on the front page of *The Times* and *The Sunday Times* on only ten occasions (Macintyre *et al.*, 1998).

It is now commonplace for sections of the news media to report on the real and perceived motives of government communication, as in the fixation on 'spin doctors'. Here divisions or excessive secrecy (or the perception of them) within government departments are very important. In the case of patulin in apple

juice, secrecy was a key element in the 'news value' of the story. There were a total of 41 items in the British national press on patulin, 30 of which (73 percent) were chiefly about government secrecy. With *salmonella*, the key issue was the perceived division between MAFF and the Department of Health, which became apparent since officials were briefing against each other (Miller and Reilly, 1995).

News values across the media do tend to attach a high importance to controversy, division and secrecy. Plainly this is all rather galling to the prospective science communicator, who may have little control over the wider environment within which they are situated. It can also be argued that the importance attached to such news values inhibits rational discussion of the communication of science. However, the self-interested pursuit of such news values as a means to maximise audiences may sometimes coincide with the public interest in making government or science more transparent, even if in an unintentional, distorted or sensationalist way.

The public

A major problem for critics of the malign influence of the media on science communication, or those who bewail public ignorance or misunderstanding of science, is their assumption that the impact of the media is straightforward and direct. Consumers and especially children and other groups perceived as vulnerable (such as 'housewives') are thought to be particularly at risk from media messages. In much analysis, 'scientific' knowledge is counterposed with public or 'lay' knowledge or belief. More often the terminology used is scientific 'fact' versus public 'perception'. The problem is then located as a lack of public knowledge or understanding. In some versions of the argument this is even claimed to be due to 'human intellectual limitations' (Covello, 1983: 287). Curiously though, scientists, social scientists and risk analysts (or sometimes just 'experts') are not thought to be subject to such limitations. This type of approach, which can be described as the 'deficit' model of public understanding, has been increasingly discredited in recent years (see Davison, 1989, Davison *et al.*, 1989; 1992; Kitzinger 1990; 1993; Macintyre *et al.*, 1998; Miller *et al.*, 1998; Wynne, 1996).

The problem is that people do not passively absorb everything that is beamed from their television set. Instead they interpret and contextualise. Public views are not formed from thin air. Equally, they are not simply dictated by the media or ministerial pronouncements or by lay 'perspectives' or 'cultures'. Judgements are made according to the information available from the media, education, friends and family and other sources and evaluated against previous experience and information. Experience is patterned by class, ethnicity, gender, nationality, region and age as well as by personal experience and evaluated by means of logical processes. Furthermore, in the context of the argument in this chapter about the circuit of mass communication it is misleading to examine the content of public belief to find out *what* people think about science or the degree to

which they 'trust' scientists or the government without an analysis of the sources of beliefs and their links with the circulation of information and opinion in society in general and the media in particular.

Media *effects*

The first thing to note about the impact of the media on public beliefs is that there are occasions on which the media have strong effects on public beliefs about the world. Research on AIDS suggests that the government message that HIV is a threat to heterosexuals was widely believed by the public (Kitzinger, 1993; Miller *et al.*, 1998). In the case of the media coverage around *salmonella* in 1988/89 and BSE in 1990, 1996 and 1997, there were sharp changes in public belief and behaviour, resulting in sales of eggs and beef dropping sharply. Similarly, consumption of sugar from the bowl fell and sales of semi-skimmed milk and brown/wholemeal bread rose in the 1980s in response to health advice. However, impacts on belief do not automatically translate into behavioural change, as the case of AIDS shows. Although condom purchases did increase, there were a number of obstacles to condom use which meant that changes in behaviour were difficult to put into practice (*ibid.*).

What these examples and other research show is that people are familiar with scientific advice on risk and safety. This undermines those approaches which stress public ignorance or irrationality. However, familiarity with scientific or medical advice does not straightforwardly lead to its acceptance. To some extent this will relate to whether there are divisions in scientific or political knowledge and whether alternative explanations are widely available in the media, but it will also reflect the knowledge, experience and evaluative processes of members of the public.

The social patterning of media effects

Media information is evaluated and interpreted in the context of previous information and experience. Experience and information vary according to the social stratification of contemporary societies. Class, gender, sexual identity, ethnicity, national identity, occupation and age, together with other demographic factors, can influence the frameworks within which people interpret media messages. In a study of responses to health advice, one element of experience which people used to filter healthy eating advice was their own material circumstances. For working-class respondents health education advice was perceived as 'middle-class'. As one put it:

> We all know what to do and basically would get on with it. . . . I'd love to eat good food all the time, but I have five mouths to feed on one income. . . . That should be recognised by those who are handing out all that advice.
>
> (cited in Macintyre *et al.*, 1998)

Personal *experience*

Another key element that influences the evaluation of media information is personal experience. Research on public responses to food scares found that having heart disease, or knowing someone who had experienced food poisoning, can have a dramatic impact on the evaluation of relevant media information. One group of work mates had all given up eating eggs (and had not returned to them) because a colleague had been seriously ill with food poisoning. A lack of such experience was also often given as reason for not believing dietary advice. Furthermore, alternative information, especially from known and trusted sources, often overwhelmed media accounts of risk. Having a butcher as a relative was a key factor for one young man in ignoring publicity about BSE in 1990:

> I just didn't pay any attention to it at all and now that I think about it, that was definitely because my uncle is a butcher and he said it was a lot of nonsense and that meat was perfectly safe. I assumed he would know if there really was a problem and he wouldn't tell lies.
>
> (cited in Macintyre *et al.*, 1998)

Similarly in research on AIDS, personal contact or acquaintance with gay men, sex workers or intravenous drug users could undermine discriminatory media messages. One hospital doctor related her own experience:

> Before I worked here I always thought I'd know a prostitute on sight, but I don't. No way, and that surprised me. . . . They don't all have dyed blonde hair and short skirts.
>
> (cited in Miller *et al.*, 1998: 199)

However, the influence of personal experience can also vary according to how it is perceived and integrated into other aspects of people's shared understandings in particular contexts. Knowing someone who has experienced coronary heart disease or food poisoning does not necessarily lead to changes in beliefs or behaviour (Macintyre *et al.*, 1998).

The media can make people think about the science-related issues that they report. They can 'set the agenda' for public discussion. Moreover, the media can also influence public understanding, public belief and even behaviour. Importantly, however, people do also interpret, evaluate and make judgements about media information, which affect how much and in what ways they incorporate media messages about science, risk and safety in their beliefs and behaviour.

Analysing the sources of public belief is important because it is a way of linking the elements of the circuit of communication with beliefs. Those approaches which simply examine the content of public belief are, therefore, liable to be limited in their explanatory power. Although polls show trust in

government as low, in fact there are times when people (even those who say they distrust the government or the media) do believe what they are told. It is, therefore, misleading to try to redeem public perceptions as rational without an analysis of how and why people make judgements. Trust in government is not a stable or uniform filter through which new information is strained, but varies. It seems likely that it is related to the specifics of the information content and the other sources which make it credible. The extent to which political disputes about risk are at the centre of public debate is important here. We can compare the public response to AIDS and BSE in this context. The significant loss of public trust over BSE was not paralleled in the case of AIDS, where a significant media and policy consensus developed that HIV was a serious threat to heterosexuals and where discrimination against so called 'high-risk groups' was discouraged. Both of these messages were widely accepted by the public. Stated trust in government may, therefore not be a reliable indicator of public belief and response. An example from research on food scares might illustrate the point. The respondent started by saying that she did not know much about salmonella but then proceeded to rattle off the official advice about cooking eggs. When asked how she knew, she responded:

> I don't know really, I suppose it just seems like common sense. But . . . I must have got it from somewhere. . . . I suppose I picked up a lot of things from the magazines that I read and there were a lot of people saying things on TV about how to cook eggs. . . . Isn't that funny, I just thought I'd always done that naturally.
>
> (cited in Macintyre *et al.*, 1998)

This example seems to show the way in which – without being aware of it – the media can be deeply implicated in influencing our everyday conceptions of the world. Those approaches which attempt to analyse risk perception in terms of psychological tendencies such as 'optimistic bias' tend to underestimate the significance of mediation in risk communication, concentrating instead on individual psychological processes. There is a need to examine where information and ideas come from and how these are processed, rather than assuming that events in the world are transparently available to human perception. Equally, some approaches that focus on 'lay perspectives' tend not to examine them in the context of the circulation of information and values in society.

The argument developed here suggests that the media are important in forming, sustaining and changing public opinion, but in the context of the circuit of mass communication, this is not the end of the matter. The next question which arises centres on the role of the media and public opinion in influencing decision making. Considered by itself without any conception of connections with wider formations of power and influence, public opinion is a relatively trivial matter. The public understanding of science is not deemed important simply because it is seen in an abstract way to be 'a good thing' to

foster public understanding, but because it is (at least implicitly) assumed to have wider consequences for society and democracy. Yet the links between public opinion and decision making and outcomes in society have been remarkably under-researched. The next section examines some of the key effects which public opinion and the media can have on decision making.

Decision makers

The media have a clear indirect influence on policy making in that they can influence public beliefs and behaviour, to which decision makers have to respond. The clearest examples are the changes in purchasing behaviour consequent on media coverage, such as the effect of the salmonella and BSE crises on egg and beef sales. But we can also think of changes in behaviour over the longer term that have been intentionally prompted by government risk communication, such as the increase in sales of semi-skimmed milk and the decrease in consumption of sugar from the bowl, which were prompted by health education advice on the risks of dietary fats and sugars. Public opinion (or crucially *perceptions* of public opinion) can drive policy and decision making and nudge decision makers or ministers into decisions they would not otherwise have made. But policy makers can ignore public concern on some issues, particularly if opposition is not mobilised (for discussions of the role of the media in health policy see Berridge, 1991; Otten, 1992; Walsh-Childers, 1994; see also Cracknell, 1993).

Risk communicators, scientists, decision makers and other policy actors are members of the general public and consume media representations routinely. As such they can be influenced in the same ways as the rest of us. However, decision makers can also be specifically targeted by both risk communicators and journalists. There is a sense in which much political debate in the media is debate between elites to which the rest of us can listen in if we wish. There are stories in the media that are intended by those who disclose them to reach very small numbers of people, such as senior members of a particular government committee or a particular government minister. Thinking about the media in this way should make it apparent that the media can play an intimate and direct role in policy making. For example, during the early period of the AIDS crisis key clinicians seeing the bulk of new cases of HIV infection used the media to put pressure on policy makers, even though they themselves were on official committees (Miller *et al.*, 1998). The media can also influence policy indirectly by mediating supposed or actual public pressure to decision makers. During the AIDS crisis, tabloid reporting of public opinion did sometimes influence decision makers' assessments of what was possible in policy terms (*ibid.*).

Moreover, policy makers and experts have differing interests in media coverage and impacts work differently in different areas. Proposed cut-backs and redundancies in scientific institutes or government bodies have been put on hold or reversed following news coverage of particular risks. Coverage of issues

such as AIDS and the 'flesh-eating bug' had consequences for risk assessment and surveillance personnel at, for example, the Public Health Laboratory Service. Holding on to staff who would otherwise have been made redundant can even be the case when an organisation has done its best to play down the significance of a particular scare, such as in the case of the 'flesh-eating bug'.

On the other hand, scientists working in specialisms which suddenly become big news can welcome the attention and use it to encourage the funding of research. The 'flesh-eating bug' provided such an opportunity for Professor Hugh Pennington, who used it to lobby for research funds, although in this particular case he was unsuccessful.

Impacts on science

This last example is suggestive of some of the kinds of impact which media reporting might have on science. We can point to impacts on the availability of research funds, impacts on the type of research which is done and how it is done and impacts on the standing of the scientist with the public, and perhaps more importantly with her/his peers. Media reporting of apparently new risks may prompt the allocation of specific research funds to new or neglected branches of science or in providing services to cope with public health implications. Usually, but not always, part of the pressure to allocate funds will include advocacy from scientists, perhaps exerted through the media as well as through the normal decision-making apparatus. A clear example of the success of such a tactic was the attempts by leading AIDS clinicians to pressure the government to provide funding for health education and service provision. As one leading doctor put it

> I think that those early media interventions were very effective – not in getting money personally for research or anything – but in getting money put into health education and into services. But it took a hell of a long time.
>
> (cited in Miller *et al.*, 1998: 130)

But appearing in the media can also impact on the standing of scientists or clinicians amongst their peers:

> It is still the case that some scientists look down on colleagues who 'go public'. They give a number of reasons: if a scientist has something to say, he or she should write it up in the proper manner, submit it for peer review and then wait a year for it to be published; a medium as trivial as television is no place for something as important as science; scientists should be self-deprecating and dedicated to their work – they should have neither the time nor the inclination to blow their own trumpets . . . the rewards of a media career can compromise scientific objectivity.
>
> (Shortland and Gregory, 1991: 5)

We can see then that the media and public opinion can have impacts on decision making in the sense of governmental and regulatory policy making, but also in the sense that all organisations, be they corporate organisations, pressure groups or scientific research establishments, have to be aware of the public dimensions of their work. It is at this point that the circuit of communication comes full circle and the public context of an organisation's environment feeds into the planning of promotional strategies and media relations. Such planning will confront and try to incorporate changes in the relationships between the four elements of the circuit of communication brought about by its previous cycles.

The resolution of public issues

Public issues decline when there is some sort of resolution of the perceived problem in the public arena. This does not mean that the problem itself is necessarily addressed, simply that the contradictions which made the story news are resolved. Thus in relation to the salmonella issue in 1988/89, the departure of junior minister Edwina Currie and the compensation granted to producers, together with a reorientation in the media, which blamed consumers rather than producers, killed the story. *Salmonella enteritidis* PT4 poisoning, however, has continued to rise (Miller and Reilly, 1995). By contrast, the first emergence of BSE in 1990 was only partially resolved, with the result that it returned to the public agenda periodically between 1990 and 1995 and then spectacularly in March 1996 and December 1997.

Concluding remarks

The complexity of the interactions between science, industry, pressure groups, government, the media, the public and decision making should make it clear that to simply blame the media is inappropriate. Instead we need to analyse the activities of the groups of actors and the interactions between them that constitute the circuit of mass communication in relation to science.

Whether we like it or not, communicating science will always be bound up with political disputes and struggles over the distribution of resources. There is no neutral or objective way of communicating science, but truth and accuracy ought to be our guide. Furthermore, assumptions and normative commitments can be made explicit and struggled for in the contests over scientific knowledge and decision making. These struggles and contests constitute the key way in which science participates in the public sphere and one of the central mechanisms by which the social distribution of harms and benefits is reproduced, ameliorated or transformed.

References

Abraham, J. (1995). *Science, Politics and the Pharmaceutical Industry: Controversy and Bias in Drug Regulation*, London: UCL Press.

Berridge, V. (1991). 'AIDS, the media and health policy' *Health Education Journal*, 50: 179–85.

Burson Marstellar (1997). *Communications Programmes for Europabio*, Prepared by Burson Marstellar Government and Public Affairs, January.

Cannon, G. (1987). *The Politics of Food*, London: Century.

Collier, J.H. with Toomey, D.M. (1997). *Scientific and Technical Communication: Theory, Practice and Policy*, Thousand Oaks, Calif.: Sage.

Collins, H.M., (1987). 'Certainty and the public understanding of science: science on television'. *Social Studies of Science*, 17: 689–713.

Connor, S. (1991). 'Scientists protest at butter's PR boost', *The Independent on Sunday*, 10 March.

Covello, V. (1983). 'The perception of technological risks: a literature review', *Technological Forecasting and Social Change*, 23: 285–97.

Cracknell, J. (1993). 'Issue arenas, pressure groups and environmental agenda', in A. Hansen (ed.) *The Mass Media and Environmental Issues*, Leicester: Leicester University Press.

Davison, C. (1989). 'Eggs and the sceptical eater', *New Scientist*, 1655 (11 March): 45–9.

Davison, C., Frankel, S. and Davey-Smith, G. (1989). 'Inheriting heart trouble; the relevance of common sense ideas to preventive measures', *Health Education Research: Theory and Practice*, 4: 329–40.

Davison, C., Frankel, S. and Davey Smith, G. (1992). 'The limits of lifestyle: re-assessing "fatalism" in the popular culture of illness prevention', *Social Science and Medicine*, 34 (6): 675–85.

Doll, R. (1997). 'Weak associations in epidemiology', *Radiological Protection Bulletin*, 192 (10 August).

Farrant W. and Russell, J. (1986). 'The politics of health information: *Beating heart disease* as a case study in the production of Health Education Council Publications', Bedford Way Papers No. 28, London: Institute of Education.

Gandy, O. (1982) *Beyond Agenda-Setting: Information Subsidies and Public Policy*, New York: Ablex.

Golding, P. and Murdock, G. (1991). 'Culture, communications and political economy' in J. Curran and M. Gurevitch (eds) *Mass Media and Society*, London: Edward Arnold.

Karpf, A. (1993). 'On medical journalism', *Observer Magazine*, 15 August: 45.

Kitzinger, J. (1990). 'Audience understandings of AIDS media messages: a discussion of methods,' *Sociology of Health & Illness*, 12 (3): 319–35.

Kitzinger, J. (1993). 'Understanding AIDS – media messages and what people know about Acquired Immune Deficiency Syndrome', in J. Eldridge (ed.) *Getting the Message*, London: Routledge, 271–304.

Lacey, R. (1994). *Mad Cow Disease: The History of BSE in Britain*, St Helier, Jersey: Gypsela.

Macintyre, S. (1995). 'The public understanding of science or the scientific understanding of the public? A review of the social context of the new genetics', *Public Understanding of Science*, 4; 223–32.

Macintyre, S., Reilly, J., Miller, D. and Eldridge, J. (1998). 'Food, choice, food scares

and health: the role of the media', in A. Murcott (ed.) *The Nation's Diet*, London: Addison Wesley Longman.

Miller, D. (1995). 'Introducing the "gay gene": media and scientific representations', *Public Understanding of Science*, 4: 264–84.

Miller, D. (1998). 'Promotional strategies and media power', in A. Briggs and P. Cobley (eds) *The Media: An Introduction*, London: Longman.

Miller, D. (in press) 'Risk, science and policy: definitional struggles, information management and media', *Social Science and Medicine*, Special issue on Science Speaks to Policy.

Miller, D. and Philo, G. (1995). 'Communicating change in the NHS: A review of health communication campaigns, media coverage of health care issues and the process of public opinion and belief formation', report for the Communication Directorate of the NHS Executive, Leeds.

Miller, D. and Reilly, J. (1995). 'Making an issue of food safety: the media, pressure groups and the public sphere', in D. Maurer and J. Sobal (eds) *Eating Agendas: Food, Eating and Nutrition as Social Problems*, New York: Aldine de Gruyter, 305–36.

Miller, D. and Williams, K. (1993). 'Negotiating HIV/AIDS information: agendas, media strategies and the news', in Glasgow University Media Group, *Getting the Message*, London: Routledge.

Miller, D., Kitzinger, J., Williams, K. and Beharrell, P. (1998). *The Circuit of Mass Communication: Media Strategies, Representation and Audience Reception in the AIDS Crisis*, London: Sage.

Nelson, J. (1989). *Sultans of Sleaze: Public Relations and the Media*, Toronto: Between the Lines.

Nowotny, H. (1981). 'Experts and their expertise: on the changing relationship between experts and their publics', *Bulletin of the Science and Technology Society*, 1: 235–41.

Otten, A. (1992). 'The influence of the mass media on health policy', *Health Affairs*, 11 (4): 111–18.

Pain, S. (1997). 'When the price is wrong', *Guardian Online*, 27 February: 2–3.

Rowell, A. (1996). *Green Backlash: Global Subversion of the Environmental Movement*, London: Routledge.

Shortland M. and Gregory, J. (1991). *Communicating Science: A Handbook*, London: Longman.

Smith, R. (1992). 'Hype from journalists and scientists: an unholy alliance', *British Medical Journal*, 21 March, 304: 730.

Stauber, J.C. and Rampton, S. (1995). *Toxic Sludge is Good for You: Lies, Damn Lies and the Public Relations Industry*, Monroe, Maine: Common Courage.

Walsh-Childers, K. (1994). '"A Death in the Family" – A case study of newspaper influence on health policy development', *Journalism Quarterly*, 71 (4): 820–29.

Wynne, B. (1996). 'Misunderstood misunderstandings: social identities and public uptake of science', in A. Irwin and B. Wynne (eds) *Misunderstanding Science? The Public Reconstruction of Science and Technology*, Cambridge: Cambridge University Press, 19–46.

Yudkin, J. (1986). *Pure, White and Deadly*, London: Penguin.