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Media Discourses and Framing of Risk

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1. Aims

This project was designed to examine the role of media discourse and framing in the construction of risk around emerging technologies. It was part of a series of projects funded by the ESRC under the SCARR network RES-336-25-0001. See www. http://www.kent.ac.uk/scarr/. Our study focussed on three areas: human genetics/stem cell research, genetically modified crops, and nanotechnology.

2. Research methods

Our research involved three main strands: interviews with key players in the debates about new technologies; analysis of six months media coverage; and focus groups with diverse 'publics'

2.1. Consultations interviews with key players

Interviews were conducted with key players in the public debate around stem cell research, GM and nanotechnology in order to set the context for our analysis and map out key concerns. We examined conducted 27 interviews ourselves (interviews conducted by Jenny Kitzinger and Emma Hughes), and also collaborated in reviewing transcripts of another 11 interviews conducted for a related project focused on human cloning (see Haran, et al, 2008).

Interviewees included policy makers, leading scientists and NGO activists in each field. So, for example, our GM interviews included key figures in DEFRA or involved in relevant advisory committees, representatives from Monsanto (a major producer of GM) and CropGen (a pro-Gm communication agency) as well as from Greenpeace, the Soil Association and Friends of the Earth.[i]

2.2. Analysis of media coverage

We collected newspaper articles about human genetics [HG], genetic modification [GM] and nanotechnology for a six month period (January 2004 to June 2004). Our sample covered all national UK newspapers (broadsheet, mid-market, tabloid and Sunday papers). This archive was compiled using manual searches of hard copies in order to enable us to include analysis of pictures and layout (not accessible through the electronic data base Lexis Nexis). This generated a total sample of 641 items.

We also collected all main TV reports about the three areas from the main evening news on BBC 1, BBC2, ITV, Channel 4, Channel 5 and Sky Television. This resulted in an archive of a total of 36 relevant items (26 TV news bulletins about GM, 10 about HG and 0 about nano).

In order to look at diverse media representations the best selling monthly men's and women's magazines were also examined, however this only identified one relevant item - this was an article from the men's magazine 'FHM' about an anti-GM advert which featured a picture of a naked woman with four breasts.

2.3. Focus groups

Sample: Our focus group sample was mainly made up of 'ordinary folk' covering a wide range of demographic variables (age, class, gender, ethnic identity) and covering other dimension we thought might be relevant to the topic under discussion (e.g. rural versus urban for discussion of GM). Most research participants had no particular interest in the topic. However we also included some 'special interest groups' (e.g. workers from a conservation charity discussing GM). Groups were conducted across England and Wales. There were 133 participants. (See Appendix 1).

Group composition: some involved pre-existing groups, some involved strangers. All groups were mixed sex with one exception (the Muslim women's discussion group). The number of participants within each group ranged from 5 to 8.

Group process: The groups were facilitated by either Jenny Kitzinger or Emma Hughes (with the other researcher also present as assistant and observer where possible). Ten groups focussed on GM and 10 on stem cell research.[ii] Most groups were then also invited to discuss the other two technologies as well. This approach – getting the *same* group to discuss the *different* technologies was an adaptation on the original design of our research that we developed after doing the first three groups. It involved extending the length of each focus group from one hour, as originally planned, to two hours. This proved a particularly valuable adaptation as it allowed us to explore how the *same* people shifted ground as they discussed *different* areas.

Research participants were asked to explore what they knew about the science/technology in question, how they knew about it and what they thought about it. They were also invited to work with pictures taken from the TV news coverage of that issue to construct, and critique, a 'typical' news bulletin. See Appendix 2 for facilitation schedule and guide

Analysis of focus group discussions: The focus groups were tape-recorded, fully transcribed and coded in detail. The analysis examined knowledge, sources of information and view of risk and benefit. We also

looked closely at factors influencing different attitudes toward the risk of emerging technology and the way in which concerns were expressed. A second sweep of analysis focussed in detail on themes such as ideas about nature or how people used references to science fiction. The approach adopted was designed to focus less on what people 'think' as if this were a static snap shot than to explore *how* they think, and what they think 'with'. We were also interested in paying attention to the dynamic nature of debate – and how different arguments worked in the group.

Supplementary follow up one-to-one interviews: phone interviews were conducted with 45 of the focus group participants to explore their view of the group discussion and identify anything they wanted to add, and any impact that participating had had on them.

3. Findings

3.1. Findings from the content analysis and consultation interviews

3.1.1. Overview of media coverage

There has been extensive debate in the media about the risks of emerging technologies such as genetic modification of crops, nanotechnology and human genetic research, particularly embryo stem cell work and human cloning.

Each of these area has, at different times, received peaks of coverage addressing issues such as the dangers of GM to human health or the environmental, the threat of 'grey goo' created by self-replicating nanobots, or the ethical challenges and frightening scenarios thrown up by embryo research and the spectre of human cloning.

Our background interviews with key figures in the field (on diverse sides of the debate) highlighted the key messages that they were trying to convey and the media strategies deployed.[iii]

This part of the research also recorded key players' criticisms of media reporting. Typical criticisms focused on the shortage of space and time in the news media to explore the full complexity of issue, the problems of dystopian science fiction dramatisations of risk, and how some reporting by journalists without the appropriate training could be inaccurate and over-simplistic. Interviewees were concerned with the media's tendency to present a 'black and white' contrast and ignore nuanced debate. They also criticised the media's penchant for dramatic headlines and images.

There was evidence of a high degree of 'media-savvy' approaches from key players coming from different perspectives. This was not just true of the critical NGO (although they were sometimes cast by some of our interviewees as very clever, and quite ruthless, in their exploitation of media value). Proponents of new technologies are meeting their opponents with media-savvy techniques too. For example those working to develop embryo stem cell research have developed a series of pro-active strategies to try to develop public and policy support. These include direct interventions from scientists writing in the media, mobilising personal accounts from suffering patients, employing the metaphor of the journey to reify the goal and using terminology which implies the certainty (and moral authority) of hope (see Kitzinger, 2008).

Scientists working to develop each area gave different assessments of how positive coverage had been – GM scientists were extremely critical of coverage, stem cell scientists were much more positive (although still concerned about misleading language or a focus on problematic areas such as human reproductive cloning). Nanotechnology scientists gave a mixed assessment of the profile of their area in the media, but particularly commented on a lack of coverage and recalled, with concern, incidents such as Prince Charles speaking out about the threat of 'grey goo'.

Obviously those with different perspectives on the technology had different assessments of the coverage. For example, representatives of Greenpeace and Friends of the Earth were quite positive about the media's role in the GM debate and felt many of their communication strategies had been effective. By contrast, some of those critical of embryo stem cell research felt the media had 'hyped' the benefits of embryo research, and ignored the potential of 'alternative' approaches such as working with adult stem cells.

Our background interviews with key stakeholders/sources were complemented by our own analysis of the coverage. In order to provide a detailed comparison of how each of these issues is covered we examined coverage for a six month period at the beginning of our project: January to June 2004. Although this time sampling does not give the full picture of the *trajectory* of risk debates, it does enable a systematic comparison within a particular time frame.

Our archive of 6 months press coverage confirmed comments from our interviewees that although both Genetic Modification of crops [GM] and Human Genetics [HG] received extensive press coverage (323 and 279 stories respectively) there were very few stories about nanotechnology (n=39).[iv]

Detailed coding of our press sample also highlighted key differences in the risk profiles of our different topics. The following section compares HG and

GM (with a postscript about nanotechnology because the small number of items makes comparison less meaningful).

The focus of GM reporting during our sample period was on decisions, controversies and protest (e.g. the Farm Scale trials). By contrast, stories about HG focussed on apparent breakthroughs in stem cell/human cloning and medical applications and implications. This included the South Korean breakthrough in human cloning/stem cell research (announced in our sample period but discredited in 2006). The fact that the most high profile stories in our sample concerned cloning and stem cell research led us to concentrate on this as our key area of enquiry when we went on to do focus groups.

Examples of headlines about stem cell research in 2004

"Embryo Science: Cloning Breakthrough opens the door to new treatments – and to a fierce ethical debate." (Independent, 13 February 2004).

"Vatican attacks 'Nazi' cloning" (Daily Mail, February 14 2004)

"What slippery slope?: We have nothing to fear from the cloning of human embryos by South Korean scientist" (Guardian, February 13 2004)

"Dolly Creator: I Will Clone Human Embryo" (Daily Mirror, 22 April 2004),

"UK Scientists Set to Clone First Embryo" (The Sun, 17 June 2004).

Examples of headlines about GM in 2004:

"Revealed: Shocking new evidence of the dangers of GM; Genetically Modified strains have contaminated two-thirds of all crops" (Independent on Sunday, 7 March 2004)

"Dr Frankenstein" (News of the World, 18 January 2004)

"Abandoned: Plan to plant first GM crop in Britain" (Daily Telegraph, 1 April, 2004)

"Study could delay GM crops until 2010" (Guardian, 5 March 2004)

"Ministers ignored public fears over GM" (Daily Mail, 6 May 2004)

3.1.2. Key differences in how HG and GM were framed in the media

There are several key differences how HG and GM are framed.

- Human Genetics was more likely to appear on the science and technology pages (10% of HG articles v 0% of GM articles) and to be covered by the science or health specialist (30% v 6% in GM). By contrast GM was discussed across a wider range of specialisms including by politics, consumer, farming and environment correspondents.
- HG reports were also dominated by the voice of science: 57% of those quoted in the HG reports were identified as scientists, in contrast to just 11% of those quoted in the GM reporting.
- Human genetic coverage was also much less likely to quote sources dedicated to challenging the technology: 6% of the quotes in HG articles came from 'anti' pressure groups, whereas this was true for 28% of the quotes in articles about GM.

Differences were also evident in the overall representation of risk and benefits. HG was presented in a much more positive way than GM.

- HG was more likely to be framed as having benefits which outweighed threats – with a particular emphasis on medical benefits: 62% of HG articles mentioned medical benefit v 6% of GM articles. By contrast, the main benefits of GM were seen to be to corporate interest rather than the consumer.
- Although certain groups were presented as opposed to embryonic stem cell research (e.g. anti-abortionists), the public were often not mentioned or presented as supportive (or, if not, then as misled). By contrast the public were presented as opposed to GM (e.g. "Labour ignored overwhelming public anger and scientific evidence yesterday to surrender Britain's status as a GM-free nation." (Daily Mail, 10 March 2004).
- Although both topics raised questions of democracy and accountability, this was almost twice as likely to be discussed in stories about GM.

Twenty percent of stories about HG raised this issue, but the same was true for 39% of articles about GM.

3.1.3. The framing of nanotechnology

The relatively small numbers of reports about nanotechnology in our sample period makes meaningful quantitative comparison difficult. However nanotechnology reporting sometimes addressed health risk (mentioned in 28% of articles) but more often discussed medical benefit (mentioned in 46% of articles), with additional discussion of consumer benefits too.

Examples of headlines about nanotechnology in 2004

"The revolution in our pockets" (Financial Times, 28January 2004)

"The hi-tech shirt that you'll never have to wash" (Daily Mail, 15 June 2004)

"Civilisation safe as grey goo threat fades" (The Guardian, 9 June 2004)

"Tiny technology that may create huge problems nanotechnology: Andrew Bolger looks at lessons from the history of asbestos and compares the risks business faces from the newer technology" (Financial Times, 2 June 2004)

"Public health scares blighted work on GM products. Now it is nanotech's turn to avoid the same fate" (Financial Times, 15 January 2004).

Nanotechnology was often framed as a science and technology story (13% of reports appearing on the science and technology pages) and dominated by quotes from academic scientists (31% of all quotes) and industry spokespeople (22% of all quotes). Interestingly whereas 'corporate interest' was presented as a reason to be wary of GM, nanotechnology was implicitly associated with consumer sensitive business, able to bring benefits to 'us' – the users.

3.1.4. Key textual framing devices: areas of contest

Additional detailed qualitative analysis, combined with our interviews with sources, highlights some of the nuances that played out in reporting across all three topics. These include contested images of the technology and contrasting terminology as well as other key framing devices ranging from appeals of 'Nature' to ideas about 'Nation'. Each of these are discussed below

Use of visuals: There was contestation between sources around the use of visuals and labels.

- The image of the embryo was a key site of struggle in reporting about embryo research: on the one hand the pre-14 day old object of research could be 'accurately' represented as a tiny blob, on the other hand it was sometimes represented through the image of a much older embryo, an image emphasising its status as a vulnerable human entity and potential baby (e.g. alongside negative comment in the *Daily Mail*).
- Similarly, the image of the agricultural field was a key area of contest in the GM debate. The field of GM crops could be visually encoded as a benign site of plenty, or a site of danger - as signalled by protestors in anti-contamination suits. The latter image was more successfully 'sold' to the media than the former and, as the subsequent section will demonstrate, had a powerful impact on the public image of GM.

Use of labels: Labels were another key area of contest.

- In stem cell research words such as 'blastocyst' compete with the word embryo. The term 'blastocyst' is preferred by some scientists and is intended to draw attention to the pre-14 day old nature of any 'embryo' which is subject to stem cell research. In general, however, journalists preferred to the term 'embryo' as this was a more familiar, evocative and 'reader-friendly' term. Stem cell scientists had more success in their efforts to encourage journalists to take up the term 'therapeutic cloning'. This is a label designed to specify an intended positive outcome and draw a clear line between it and human reproductive cloning.
- Similar battles over language are evident in the GM coverage. For example some of those developing GM object to words such as 'contamination' and 'release'. However, in this case our analysis suggests that those promoting GM have lost the battle for language – a finding confirmed by the views of our interviewees.

Those involved in defending GM felt they had lost the battle for language

"you don't label something for the way that it's made, you label it for what it is. I find it absurd to call it 'contamination'." (Interviewee from cropGEN)

"They use terms like 'deliberate release'. So to anyone reading that, that sounds pretty horrendous, very dodgy but you know all it means is that we've planned to plant a crop outdoors" (Interviewee from Monsanto)

Other key links and associations: Over and above attempts to communicate core terms, images and 'facts', our analysis identified six key framing devices mobilised across all three areas. The key framing devices were:

- appeals to 'Nature'
- attempts to associate the technology with the known or unknown (e.g. GM as simply controlled cross-breeding)
- association with historical templates (e.g. the BSE debacle)
- references to Fiction (e.g. Frankenstein)
- the framing of National interest and identity (e.g. the international 'race' to develop a technology) (See Hughes, 2006)
- the notion of 'crossing boundaries' (e.g. between species or between 'man and machine')

Examples of statements about nature and new technologies

"Nature will fight back in the war over GM crops" (Headline, Express, 11 March 2004)

"Identical twins are clones but happen naturally. Laboratory cloning is a violation of the natural order and a repugnant manipulation of human life." ('Is it wrong to clone humans?" Express, 13 February 2004)

The way in which references are made and rhetoric is mobilised has been subject to detailed analysis across our different types of data (see outputs). Here we would simply note that these devices can be mobilised by those coming at the debate from many different perspectives and worked differently in relation to our three different topics. For example:

- 'Nature' can be seen as perfect or flawed (and the technology as interfering with, or 'correcting' nature)
- Historical templates can associate a new technology with good (e.g. penicillin) or evil (e.g. the nuclear bomb).

Close attention to context can also be revealing and, sometimes, counter-intuitive. For example, fictional references were used in 26% of articles about nanotechnology, 13% of articles about HG and 9% of reports about GM. Policy makers we interviewed identified science fiction references as an obstacle to promoting innovation (e.g. the Grey Goo scenario conjured up in the novel 'Prey'). However, our analysis showed that science fiction references in the media were not necessarily deployed to *promote* fears, but

were often used to caricature, mock and *discredit* such fears. Science fiction also offered positive resources for utopian imaginings too (e.g. of medical treatments or human enhancement associated with nanotechnology).

Examples of articles referencing science fiction

"Movies about cloning make us shudder but the truth may be just as scary: Will sci-fi horror become a reality?" (Sunday Express, 15 February 2004)

"Grey-goo fears 'just fiction'" (The Times, 9 January 2004)

"If you ever had any doubts about Frankenstein Foods read this litany of deceit, cynicism and manipulation" (Daily Mail, 20 February 2004)

"Harvest of the Damned" (Daily Mail, 6 May 2004)

When close attention to text is also linked to data from audiences other nuances and implications can also be identified – see section 4.2.3 below.

4. Findings from study of audience perceptions

4.1. Knowledge and understanding

Our focus group sample was designed to examine a *range* of opinions from as many different perspectives as we could (see 'sampling strategy'). We successfully tapped into a wide range of view points in relation to each of our three areas of enquiry – including people who were very suspicious of, or very hopeful about, each of the topics.

In spite of such diversity there were some themes and patterns evident across the range of groups. It is worth noting, for example, that, in general, most research participants had engaged with, and felt they had some understanding of GM, and at least knew a little about stem cell research. However, many people were at a loss to even define what nanotechnology was about.

In all three cases, however, people were hazy about details and specifics. They knew little about the current state of the science, or its regulation (e.g.

the role of the HFEA in stem cell research). However they were able offer a fairly rich picture about some main issues such as what the technology was 'for' and why it was controversial (at least as far as stem cell research and GM was concerned)

Discussion of stem cell research revolved around embryos and babies. When asked about 'stem cell research' people usually volunteered the link with embryos (rather than thinking about stem cell research with 'adult' cells) or they talked about 'designer babies' and cord blood). Discussion of GM focussed on its use in food products (even although they were asked about 'GM plants/crops' the immediate response usually focussed on GM food).

4.2. Sources of information

4.2.1. The media

The main source of information about stem cell research and GM was news reporting (with the former involving reference to science fiction on occasions – but see section 6 for full discussion of this). When asked to discuss stem cell research people usually referred to reports about the search for stem cell cures, breakthroughs and the search for treatments (e.g. the Christopher Reeve story or 'designer baby' stories). Asked to discuss GM people tended to recall accounts of the planting of GM crops and anti-GM protest.

However, news was a less significant source in relation to nanotechnology. If people knew anything about nanotechnology their impressions were often linked with science fiction. For example, only one individual in one group had ever heard of nanotechnology – asked how he knew about it he simply replied 'I'm a sci-fi geek'. In other groups, asked what they knew about nanotechnology people responded with comments such as: 'on *Star Trek* … they [nanobots] go round and heal the android', or referred to the film '*Fantastic Voyage'* where 'They shrink the submarine… and it goes through the human body'. In this way people often linked nanotechnology to microsurgery and other positive medical benefits'. (See Fig 1)

Fig 1. Summary overview of knowledge/understanding across the 20 focus groups

Knowledge and understandings of (embryo) stem cell research

Main understanding	Stem cell research= about healing/ cure/ treatment/ regeneration Controversial because of the source of stem cells (embryos and/or 'designer babies')
Main perceived risks and benefits	*Benefits: Healing* Risks: Abuse of embryo or Misuse (e.g. reproductive cloning)
Attitude	Majority very positive (as long as safeguards against abuse/misuse were in place). But opposition from those with religious/moral objections to embryonic research.

Knowledge and understandings of GM

Main understanding	GM= Plants/Food that has been 'tampered with' Controversial because of impact on human health and on environment
Main perceived risks and benefits	*Benefits: Crops in third world, Profit for Monsanto. Cheaper/better food* Risks: Human health, Environment
Attitude	Majority negative ('why do we need it?'). However some would accept it if it proved cheaper for them or 'useful for the 3rd world', plus there was some feeling that 'we've all eaten it anyway'.

Knowledge and understandings of nanotechnology

Main understanding	Many people knew little about nanotechnology. Others had just some vague sense of it involving 'very small machines'.
Main perceived risks and benefits	*Benefits: Healing and Consumer convenience* Risks: 'Going wrong' (e.g. self-replication) and Misuse
Attitude	Generally positive (with some caution), although one group expressed particularly strong concern about its use in surveillance

4.2.2. Supplementary sources and some surprises

A range of supplementary resources were also mobilised in discussing all three emerging technologies – these ranged from supermarket labelling or conversations about food (in the case of GM) to experiences of antenatal care, IVF treatment or sickness (stem cell research) or personal experience of 'microsurgery' or technological convergence (Nano) See Fig 2.

Some influence came from unexpected sources. For example an HSBC advert (designed to promote the bank as a global operation sensitive to cultural variation) had made an impression on several research participants. It seemed to have encouraged them to believe that human reproductive cloning would happen soon (or already had happened somewhere in the world). To view this advert see: http://www.youtube.com/watch?v=6pnUt2w9zvU

Similarly the branding of the 'iPod nano' – a well marketed and much desired item of personal technology – seemed to predispose some research toward nanotechnology.

Fig 2. Summary of sources of information about stem cell, GM and nano

	Stem Cell research	GM	Nano
Main sources of information	News reporting	News reporting	Science fiction (combined with some news reporting)
Key memories/ reference points	- *Celebrity campaigners (e.g. Christopher Reeve)* - *Anti-abortion criticism* - *Dolly the Sheep* - *Branson cord blood story* - *'Designer Babies'*	- *Protestors ripping up crops* - *Health scares*	- Uses of nano in '*Star Trek'* and '*The Incredible Voyage*' - Some one-off stories (e.g. of medical promise) - Some recall of Prince Charles' 'grey goo' objections
Supplementary sources	- *Other media e.g. science fiction, an advertisement for the HSBC bank, an episode of Southpark cartoon* - Personal sources e.g. experiences of ill health, IVF and antenatal care	- Supermarkets (action and labelling) - Personal sources e.g. own experience of food	- Personal experience e.g. of health care, and of minaturisation (e.g. nanoipod).

4.2.3. Some unexpected implications of rhetorical appeals

The research highlighted unexpected implications of some rhetoric mobilised by those campaigning for a more critical approach to new technologies. In particular our work suggests there may be problems with some approaches involving appeals to the integrity of Nature or Nation.

- Appeals to nature as a moral arbiter of what is 'right' were made in many of our focus groups, primarily as a way of criticising GM, but were also mobilised against other 'perversions' such as 'unnatural' family formations or 'unnatural acts' (e.g. homosexuality). In one group, for example, concern about promoting a blue tomato or a square melon as normal, segued seamlessly into concern about 'promoting homosexuality'.

- Appeals to national boundaries (as in Friends of the Earth's 'Keep Britain GM free' campaign) were similarly problematic. Detailed analysis of the media's coverage of GM highlighted how it feeds on some of the rhetoric of the asylum debate and that the multiple and subtle connections between the two mean that anti-genetic modification arguments have themselves become imbued with an unintended xenophobia. (see Hughes, 2007). Appeals to national boundaries were also prominent in our focus group discussions with participants focusing on Britain's 'GM' status rather than considering the global context within which Britain is situated. The rhetoric of the asylum debate was less prominent in our focus groups but nonetheless still present.

4.3. Factors influencing attitudes toward the risk of emerging technology

Across most of the 20 focus groups there was a pattern in which GM was viewed with most suspicion, but people tended to be more positive about both nanotechnology and about embryonic stem cell research (with the exception of those with strong religious/moral objections to embryo research on the one had or those who were 'not bothered' about GM on the other).

Examples of 'typical' comments about the three technologies

Stem cell research: "there's a great benefit for mankind but there's a great danger and all. It depends who controls it. […] As long as there's very strict moral, ethical guidelines on everything like, I can't see anything wrong with stem cells"

GM: "[It] has got an element of tampering with it. That's the word I'd always come to, the word I would use. As soon as you think about it is tampering. Somebody somewhere has tampered with that product to either make it longer, make it fresher, or whatever. And by using some form of, to me, non-natural way of doing it half the time, you just don't know the result is, quite honestly"

Nano: "My understanding of [nanotechnology] it's an ultra small computer that has the ability to reproduce itself to a degree or to mend itself. Which can be – it could be - injected in us to help us in transplant disease, could keep arteries clear by zapping away at the bits and pieces if it works"

4.3.1. Classic risk Issue

People's attitude toward the emerging technology related to some classic risk theory. For example it was influenced by:

- Whether they could see a relevant *benefit or threat* (relevant to themselves or people they identified with)
- Whether the risk was irreversible (e.g. once GM 'escapes' it will be uncontainable)
- Whether it could be understood and controlled
- Whether it involved an element of personal choice (e.g. some people explain that they were pro stem cell research because patients can choose whether or not to have stem cell therapy, but people might not be left with the option of non GM food).

Science and technological developments are often seen as generating risks beyond our understanding and control

"Get a puncture, you can fix it. Like this is something that we never going to be able to fix or sort or understand… so - I think it automatically has a big scare factor with it."

4.3.2. Questions about who, why and the process of development

Linked to some of these classic risk perception dimensions were the questions about who was developing the technology, why, who opposed it, and how it was being introduced.

- *Ideas about who is developing the technology and why:* GM suffered from being seen as an invention of corporate industry 'just out for profit' whereas stem cell research was more likely to be linked to medical science and the health service. Similarly nano, if it was not linked to military/police uses, benefited from being linked both to medical science and consumer-sensitive business.
- *View of the opponents of the technology:* Who *opposes* the technology may be as important at who supports it. E.g. for some people opposition to stem cell research from the Pope or President Bush was seen as a good reason to support it.
- *Views on how the innovation is being introduced*: government and industry was criticised for attempting to impose GM on the British public as a fait accompli. Where embryonic stem cell research or cloning was seen as happening 'in secret' or 'behind closed doors' it was similarly criticised
- *Ideas about nation and national boundaries*: in particular GM was seen as US invasion, and sometimes discussed as an attack on the unique British countryside (see Hughes, 2006).

In addition to such key questions the way in which people discussed each technology, and the way debate evolved, was linked to 'branding' and 'clusters of association'.

4.3.3. Branding and clusters of association

- *Basic branding*: GM's association with food mobilised a different set of concerns than stem cell and nano's link with medicine
- *Clusters of associations:* GM was, for some people, associated with junk food, e-numbers, preservatives etc. (a discourse of degradation). Stem cell research was associated with vaccines and organ transplants and nano with keyhole surgery and neat little mobile phone (and a discourse of progress)

4.4. How people negotiating 'instinctive' reactions

The scientists and policy makers we interviewed, and our focus group research participants, sometimes spoke of 'instinctive' reactions influencing responses to emerging technologies. Our work across the three different

areas highlighted how, although such 'instincts' may come into play, they are culturally negotiated in different ways in relation to each technology.

- **The natural and unnatural:** 'Nature' featured prominently in many of our discussions. However, it was striking that although the 'unnaturalness' of GM was often seen as a reason to oppose it, the 'unnaturalness' of stem cell research did not usually trouble people in the same way. If stem cell research was identified by any individual within a group as 'unnatural' other group members often countered that nature was 'flawed' and that there was a long history of tampering with nature for good in medicine.

- **The 'Yuk' Factor:** A 'yuk factor' seemed evident in some discussion of each technology – sometimes summarised by reference to the famous image of a human ear growing on the back of a mouse. Our research participants talks of visceral reactions of getting 'goose bumps' or feeling sick at the 'creepy' aspects of some science and technology. However, what was striking was that while the 'yuk factor' of frog genes in potatoes etc was uncritically presented as reason for resistance in discussion of GM, this was not true in discussion of stem cell research. In discussing stem cell people were more willing to deconstruct their own 'instinctive' disgust.

- **Fear of the unknown:** Concern about the 'unknowns' were often used to oppose GM in our focus groups, but less likely to be seen as a reason for stopping stem cell research or nanotechnology. In relation to stem cell research, in particular, people were more likely to declare that you have take risks in order to get benefits. Whereas GM was 'opening Pandora's box of troubles (with no investment in the 'hope' that might be at the bottom) – in stem cell the focus was on the hope that might be accessed.

4.5. Common concerns around emerging technologies

Across all three areas there were some common concerns (closely linked to classic risk theory). These, in part, concerned the image of science (e.g. scientists as endlessly curious and pushing boundaries, and perhaps disconnected from practical, real world concerns). However, concerns about science itself were peripheral compared to concerns about the context in which science was being conducted. Common concerns focused on questions around:

- Slippery slope (where will this *lead?*)
- *Unknown consequences (do they know what will happen?)*
- *Deliberate misuse (if it is not inherently 'abusive' then someone, somewhere, will abuse)*

Some concerns about risk are linked to an image of scientists

"I think there's always a problem with scientists that they feel as if they've got to carry on exploring until they run out of ideas and the nuclear scientists were a good example. They had to develop the nuclear bomb because they knew how and then the consequences follow. You know a scientist is never going to say 'enough's enough I'm not going any further because I think it will be detrimental to mankind'."

Such questions were often expressed or explored through historical templates (see Kitzinger, 2004). Some templates reference other science/technology, but other templates are drawn from a much wider repertoire. These templates highlighted:

- *Unpredicted consequences e.g. using the analogy of thalidomide, leaking breast implants or asbestos*
- *Environmental problems created by human action e.g. global warming*
- *Policy problems e.g. recalling the BSE debacle*
- Problems of global competition and global policing e.g. the arms race, or 'rogue states'
- Inequalities e.g. in access to drug treatments ('the postcode lottery', and reference to the anti-cancer drug, herceptin) or a trade in human organs
- *Problematic uses of scientific advances e.g. the atomic bomb*
- *Deliberate abuses e.g. Nazi eugenics*
- *Wider political scandals/problems e.g. The Iraq war*

These concern were rooted less in a worry about 'science' per se than in distrust of the *economic* and *political* context.

4.6. Variation, experience and identity

The above discussion has drawn attention to common and dominant themes that reoccurred across groups. However, it is important to note variation too and highlight the impact of diverse social experiences, identities and personal encounters.

Some of these relate to demographical variable such as age – for example it was noteworthy that the group which was most positive, and least concerned, about emerging technologies was a group of teenagers (although, of course,

this finding would have to be explored through quantitative methods to validate it). It was also noticeable that the most critical perspectives on stem cell research were voiced by Catholic research participants. However, Catholic research participants were certainly not unanimous on this point. As one commented in her interview after the focus group: 'My child would come first, before my religion, every time. I'd do anything possible to save him'. (Group 20, interviewee 43)

Over and above this it was clear that all of the above issues interacted with people's own identities and experiences of citizenship. For example, it is noteworthy that the research participants who expressed strong reservations about how nanotechnology might be used in surveillance were all Muslim. They explicitly linked their concerns with their experiences of being Muslim in a post 9/11 world.

It should also be noted that views of each technology could be refracted through personal biographies in complex and contradictory ways, involving shifts and ambivalence. One man, for example, revealed a complex and multi-layered experience of science through a variety of work experiences. He had been employed as a security guard at a refuse disposal site until it had been closed down when an activist campaign raised complaints about the levels of toxicity at the site. He stated: 'I was doing the security up there like and there were some right head bangers coming (demonstrating), but they shut it down so they had their point proven like. He explained that this had dented his faith in official risk assessors and made him believe that activists may raise reasonable suspicions. However, since losing his job at the disposal site, he had become largely dependent for his income on working as a drugs trials subject. He observed that this was a position which meant that he had to trust the scientists absolutely, as he was putting his life in their hands. His feelings about the promise science might offer were further complicated by the fact that he was also a carer for a relative with chronic arthritis. (See Henwood et al., 2008)

5. The role of the news media in (re)sourcing discussion

Information from the news media, even about a very new issue, inevitably enters a pre-existing network of information about the nature of the world around us. People relate novel information to pre-existing ideas about science and technology, politics and power.

Picking out 'media influence' from this context is difficult. Our research confirms other media studies work in suggesting that people choose what they consume and may recall what fits with their own prior opinions, that they consume in a patchwork way, rarely give the news their undivided attention

and end up with general impressions drawn from an array of headlines, images, and fragments of fact (Horlick-Jones et al., 2007). Our research also confirms how people bring information from the media into dialogue with a range of personal experience, social contexts and identities.

However, our research on GM and stem cell research highlights the media as a vital source of general impressions with similar stories being recalled across a wide range of groups. For example the activism of celebrities was key to the stem cell story. One research participant commented: 'The only thing I know about stem cell is Christopher Reeve said he was going to walk again through stem cells.' Another observed: 'I wouldn't never have heard of it if I hadn't heard that Michael J. Fox talking about it.'

The focus group data also suggest the power of visuals – from the oft recalled image of the ear on the mouse – to images representing the specific areas we were discussing. One woman, for example, remembered something about nanotechnology because she had been struck by an arresting image in the news:

> I remember seeing this graphic in a newspaper and it was of a tiny robot working on this big strand of DNA and I thought how can a robot be the same size as something that's essentially a few molecules stuck together?

Overall, our research highlights the importance of the news media in:

- furnishing people's general impressions of a topic[v]
- mapping out the key players and issues
- introducing ideas about the main risks and benefits
- structuring the debate[vi]
- defining the 'pro' and 'anti' sides[vii]
- presenting vivid and memorable images (e.g. anti-GM protestors in white suites or the image of a tiny robot working on cancer cells)
- engaging people's imaginative identification (e.g. with suffering patients)

When it comes to complex science/technology stories, people are often more interested in 'why' than 'how', and 'who' than 'what'. Indeed, research participants sometimes explicitly commented that they were unqualified to understand the science, so had to take a position on the basis of trust in the motivation and nature of those developing the technology. Thus they take from the media

- '*why*' (the science is done) rather than 'how' (it is done)
- '*who*' (is doing it) rather than 'what' (it involves)

Our research also clearly demonstrates that gaps in the media debate are echoed in discussions in the focus groups. For example, concerns about the implications of R&D expense of GM, or potential risks to egg donors in stem cell research, are marginal in media reports and this lack of attention is echoed in focus groups discussions.

6. A reflection on the role of fiction

Finally we would like specifically to focus on the role of fiction – as this is a concern often raised by scientists and policy makers. Key stakeholders we interviewed often protested against the way in which journalists conjure up imagery such as Frankenstein in their reporting and expressed concern that fiction, especially science fiction, contributed to the public fear of, and resistance to, scientific and technological innovation. (see Kitzinger, under review).

In order to test this hypothesis we systematically coded every reference to fiction in our focus groups. We found that fictional imagery and metaphors are important resources in talk, (indeed they can be a primary source of an image of a technology such as nano). In addition to generic references to 'Frankenstein' references were made to films such as *The Island* (farming human clones for their organs), *Godsend* (bereaved parents cloning dead son) and *Sixth Sense* (clones as blanks) as well as '*Star Trek'* and '*The Incredible Voyage'* (images of nanotechonolgy).

A few research participants (in one group) were strongly influenced by science fiction in their initial assessment of cloning/stem cell research, in the absence of any other information or associations. Similarly nanotechnology was, for some people, something they had only ever encountered in fictional films/programmes. However, for most research participants the role of fiction had to be considered alongside, and in interaction with, news reporting. It is important to reflect on the following issues:

6.1. Science fiction and 'knowledge'

- Fiction may subtly resource the imagination. However, people talk differently about information from the news (which they predominantly treat as 'truth') and ideas explored in fiction. We found only one example of clear confusion about whether or not a particular fictional film had been based on reality.
- Our research participants did not use fiction as 'information'. Indeed, the more people referred to science fiction in our focus groups the *less* they thought they knew.[viii]

6.2. Interpreting how such references to fiction operate in debate

- Fictional references are used in debate with distance, humour, and irony as well as with conviction. A simple 'count' of references to science fiction should not be used as evidence of its influence in shaping debate.
- Science fiction can discredit rather than credit fears. People policed themselves, and each other, when they started to sound 'gullible' or as if they were influence by fiction. For example one man reflected on his own concerns: 'It sounds stupid' because 'it sounds like a film'.
- People warrant their concerns about the future of science and technology with examples from facts from history and news reporting, rather than fictional story lines. Within our focus groups there were more references to the Iraq war than to 1984, Brave New World or Frankenstein as a rationale for concern.

6.3. Negotiating fictional imagery in context in relation to different emerging technologies

- The *extent* to which science fiction is used to resource talk about an emerging technology varies by the type of technology. For example, fiction is a much more prominent reference point in discussions of nanotechnology than GM. It is noticeable that the only GM specific fictions mentioned in our groups were 'The Day of the Triffids' and, on three occasions, 'Jack and The Bean Stalk'! The *type* of image resourced by science fiction also varies by topic (e.g. nanotechnology has a much more positive fictional image than cloning)
- Science fiction does not just promote negative *fears*, it may equally resource positive *hopes* about the future of science and technology (especially nanotechnology). We also found that even 'Frankenstein' science can be positively associated with medical advances (such as limb transplants).
- People may simply reiterate a negative 'Frankenstein image' without question in support of their argument, or they may struggle to *overcome* negative fictional associations if they are convinced of the benefits of a technology because, for example, they link it with consumer or health benefits.
- Images such as Frankenstein may more obviously link to some forms of science (e.g. life sciences) than others. However, the extent to which it is mobilised as a negative force against a technology varies. This has less to do with fiction, or fundamental ideas about the nature of the science, than the initial branding and framing of that technology in the news media. Once initial basic ideas have been conveyed (e.g. that 'therapeutic cloning' is different from 'reproductive cloning') then the science fiction image of the technology is less important than the social and political context in which it is placed by reports concerning, for example, who is developing the technology, why they are developing it, and who will benefit from it.

Our findings suggest that when policy makers and scientists bemoan the impact of fictional representations their concerns may only apply to a small minority of 'the public'. The way in which they focus on the damaging influence of fiction can also:

- underestimate the *complexity* of those fictional representations.
- side-step the '*fictional' element* of the competing 'facts' about the future that are promoted to support an innovations such as stem cell research (see Kitzinger and Williams, 2005)
- ignore the *complexity of audience readings*
- dismiss the *other bases for public concerns* (rooted in broader understandings of the socio-political economy and drawing on 'factual' historical events).

(For further discussion of how people use science fiction in discussions of new technologies see Hughes and Kitzinger, 2008)

7. Conclusion

Our research highlights the complex way in which debates about risk are framed and negotiated. We have highlighted the 'work' that goes into not just 'amplifying' risk but positioning it in a web of structures and associations. In assessing the risk of science and technology far more is at stake that the 'scientific facts' – and the media have a crucial role to play in contributing to the range of available discourses. Crucially our research highlights that people display both a keen ability to *differentiate* (e.g. between the 'unnaturalness' of GM and stem cell research) and to *make links* (e.g. between their concerns about science and broader concerns such as the Iraq war). Debates about the risk of new technologies are not just about 'science' as if this were an isolated endeavour but are interwoven with issues about the economy, local and global power relations and concepts such as fairness or justice. In this context issues such as 'branding' and 'clusters of association' and *who* is doing the science and *why* become crucial reference points in public debate.

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Appendix 1: overview of focus group participants

Total number of participants: 133

Category	**Category Group**	**Number of Participants**
Sex:	Female	76
	Male	57
Age:	16-19	17
	20-25	17
	26-35	31
	36-50	37
	51-65	21
	66+	10
Ethnicity:	'White'	111
	'Black'/ African/ Black Caribbean/ North African	14
	Asian / Indian/ Bangladeshi	8

Appendix 2: Example of focus group schedule

[2 hours session focussing primarily on stem cell research]

Welcome and introduction

Thank-you for attending [help yourself to sandwiches – it's a long session so I'll give you a break in the middle]

Distribute name stickers [explain - makes it easier for me to remember everyone's names as well and for you to address each other]

Check approval for taping, read out and explain ethics sheet.

Explain modes of discussion e.g. You do not have to know lots to take part, no right or wrongs, I'm just interested in what you have to say. What I really want is for us to have a conversation and to explore the issue and what you think individually and as a group. Try to hear from everyone in the group, talk to each other – not just to me

Go round circle asking people to introduce themselves

Discussion

Has anyone heard of stem cell research? – you don't have to know much about them but I want to check that at least the phrase is familiar to you. What do you think it is?

What's the first thing that comes to mind when I say 'stem cell research' – what do you immediately associate with those words? [Prompt afterwards: any visual images?]

Can you remember how you first learnt about stem cell research ['cloning' if that is only word they can associate with] – one particular event?

What do you think are the benefits of stem cell research

What do you think are the risks?

What do you think *might* happen in the future? What has *already* happened?

Where do you think you have got most of your info on stem cell research from? If you wanted to find out more about stem cell research where would you go for that info?

Picture Exercise [Invite them to use set of photographs to construct a 'typical' television news bulletin about stem cell research. Followed by questions such as: Do you think your bulletins were typical of a news bulletin? Does this bulletin reflect your own views on stem cell research? What would you do differently if you were constructing a news bulletin? What did you think of each other's bulletins?]

Do you have an opinion about how the media has covered stem cell research?

Any other comments on stem cell research?

Repeat questions for GM – why similar/different?

Repeat questions for nanotechnology – why similar/different?

[i] In our research proposal we said these consultation interviews would be conducted simply in order to set the context for our analysis and record the main concerns of key players about the nature of media representation. In practice, we gained such good access, and generated such rich material that we intend to develop this part of the work further in future. For example, interviewees spoke at length about their media strategies and how they attempted to enrol the media and the public. We have now decided to transcribe the interviews in full and will be developing an article on this topic in future. Here, however, they are simply used, as originally planned, to add depth to our discussion of the nature of the media coverage and contests over framing.

[ii] Because stem cell research was the most high profile issue in our media sample of HG this became the focus of the subsequent investigation of audience responses.

[iii] Key players were acutely aware of the need for public understanding and support (or opposition) to the emerging technologies and were consciously engaged in fine tuning communication to maximise positive media attention ('for' or 'against' the technology, or simply to promote debate and public engagement with the range of issues involved). The nanotechologists that we interviewed, for example, resisted a 'for' or 'against' position on the range of approaches covered by this label.

[iv] We also analysed magazine and TV coverage. There was very little coverage of any of the topic in magazines, but the patterns of coverage on TV news showed similar differences between topics as evident in the press coverage. Differences between press and TV coverage of each topic were in the expected direction (e.g. TV news have more 'event' oriented news values and less of a range of 'softer' outputs around each topic).

[v] This includes defining the primary definition of an exciting area of research. Stem cell research is thus predominantly linked with stem cell from embryos or cord blood and babies. The idea that stem cells came from bone marrow

was only volunteered in 4 groups (11, 12, 18 and 19) – and in three of these cases the focus was on the notion of saviour siblings being selected to provide bone marrow.

[vi] For example, journalists tend to array 'pro-stem cell scientists' against 'pro-life' or 'religious' campaigners as if this represented the full range of debate. (Kitzinger and Williams, 2005). The lack of access this provides to a range of critical positions on stem cell research is crucial. (For examples of other voices see: Corner House (www.thecornerhouse.org.uk/subject/genetics/) The lack of nuanced debate represented in the media means that the diverse issues stem cell research raises are not fed into public debate. More importantly, the media offer a limited (and artificially dichotimised) set of positions with which people can identify. In the absence of detailed information, people may chose their position on stem cell research on the basis of *who* opposes it or supports it rather than what they know about it , i.e. their own sense of identity and identification, and who is a 'rational' or 'irrational' actor.

[vii] Our methodology was designed to encourage participants to articulate *other* critiques that were different from the criticism that embryonic research was simply inherently unnatural' or 'ungodly'. Partly this was encouraged by going round the group and inviting each group member to identify the pros and cons of stem cell research (each usually tried to identify a criticism not offered by a previous member of the circle). Research participants were also explicitly invited to ventriloquise a range of other opinions via being offered 'talking-head' shots showing a range of key players including George Bush, Tony Blair, a named representative of the HFEA and of Life. These pictures deliberately included a picture of David King, from Human Genetics Alert – 'a secular, independent public interest watchdog group, … committed to informing people about human genetics issues, and to putting forward clear policies that serve the public interest.' (see http://www.hgalert.org/aboutUs/.) However, no one recognised David King and most either declared themselves either unable to imagine his position on the topic, or assigned him to a 'pro' stem cell position or an anti-abortion oppositional stance. This, in part, reflects the relatively low profile given to critics such as David King in the media coverage of stem cell research (or, indeed radical groups such as the Corner House) (www.thecornerhouse.org.uk/subject/genetics/). But it also reflects the structuring of the debate – see previous footnote.

[viii] Exceptions were the few research participants who had read 'Prey' and 'New Scientist'. They talked about fiction, but also felt relatively well informed. It could be that the type of reader who chooses to read science *fiction* is also interested in science *fact*.