NUFFIELD COUNCIL ON BIOETHICS

Review of research on public perceptions of naturalness
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Overview

1   This review aims to provide a summary of the existing literature on public perceptions of the meaning of naturalness, as part of the approach to answering the first research question of this project: 'what are the different meanings associated with uses of the terms natural and unnatural in public and political debate?'

Type of work reviewed

2   Academic research and public consultation or engagement exercises that have explored public perceptions of naturalness within the field of bioethics according to the criteria for relevant research were included in the review (see **Annex A** for the criteria).

3   In total, 36 papers were reviewed from a range of themes: general biotechnology (5); GM (8); food and farming (5); environment (3); xenotransplantation and organ donation (3); assisted reproduction and childbirth (6); cosmetic procedures (5); complementary and alternative medicine (1). A full list of summaries of the reviewed literature can be found in **Annex B**.

4   A range of methodologies were employed by the included studies: focus groups/public workshops (18); interviews (12); questionnaires/surveys (9); analysis of online forums (1) (some studies included multiple methods).

5   The included research was published from 2001-2015 and conducted in a range of geographical areas: UK (18); Europe (12); USA/Canada (11); and Australia/New Zealand (3).

Overview

6   In general, participants often equated naturalness with rightness, and unnatural with wrongness. Describing a technology or product as natural was commonly employed to express ideas about acceptability, safety, and healthiness. In contrast, the use of unnatural often conveyed ideas of unacceptability, dangerousness, and unease. However, this natural is good/unnatural is bad

dichotomy was not universally held by all participants with some being critical of its employment.

7   Natural and unnatural were also sometimes used to denote the presence or absence of human intervention, respectively. Although this could be construed as a neutral distinction, participants often used language that implied value when referring to human involvement, such as meddling, messing, and tampering with nature (see below).

8   Despite these broad associations, it is clear from the literature that the concept of naturalness is complex; there is no single concrete definition for this term, but rather a fluid array of interwoven, and sometimes contradictory, ideas and constructions. These different meanings of nature and natural are used by people in specific times and places to frame and understand the world. The term unnatural is then applied to technologies or entities that are perceived to conflict with these notions of naturalness.

9   There are a number of ways in which these ideas of naturalness can be organised. The different constructs of naturalness that follow are based on the categories proposed by Coyle and Fairweather, which was found to be a useful way of incorporating the various themes expressed in the papers that were reviewed.[1] However, it is acknowledged that this is just one such way of doing so and that there may be other ways of classifying these ideas.

10   References in brackets within the text refer to papers included in this review, summaries of which can be found in **Annex B**.

Different constructs of naturalness identified

Balanced or complex nature

11   Nature was often perceived as being in a delicate state of ecological harmony, or as a dynamic and complex process. This was also referred to as a natural order. Novel technologies could upset this balance and result in unexpected consequences; balance dissolves into disharmony and potentially results in monstrosities or freakish phenomena (NCSR 2009).

   a.   Genetic technologies can bypass inherent protective mechanisms and endanger the stability of the system (Lassen & Jamison 2006).
   b.   Genetic engineering techniques described as pushing nature beyond its limits and upsetting the equilibrium of nature (Marris et al 2001).

12   A particularly common theme throughout the literature was the concern that scientists are attempting to manipulate this uncontrollable and unpredictable nature, which could lead to unforeseen and potentially dangerous outcomes. This idea was expressed in a range of ways: transgressing nature (Macnaghten 2004); messing/meddling/tampering/fiddling with nature (Royal Society & Royal

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[1] See: Coyle F and Fairweather J (2005) Space, time and nature: exploring the public reception of biotechnology in New Zealand *Public Understanding of Science* 14(2): 143-61.

Academy of Engineering 2004; Davies & Macnaghten 2010; Clarke & Griffin 2007; Corner et al 2013; Marcu et al 2014; Shaw 2002; NCSR 2009; Michael & Brown 2004); violating the integrity of nature (Lassen et al 2002; Lundin 2002); trespassing nature's borders (Sanner 2001). Technologies that were perceived to act in this way were sometimes described as unnatural.

13 A separate line of argument that emerged from the idea of a complex and dynamic nature, was the notion of a warrior-like nature that could overcome whatever was inflicted on it by humanity or exact revenge (Coyle & Fairweather 2005; Macnaghten 2004; Shaw 2002).

14 Unnatural was also equated with displacement – something naturally occurring being put into something else naturally occurring, but which did not evolve together, such as in the case of xenotransplantation (Coyle & Fairweather 2005). This idea sometimes provoked disgust among participants, or the fear that the body would feel awkward or not itself (Sanner 2001).

Wise nature

15 This idea involves nature being perceived as inherently good, whole and perfect. Participants placed great trust in the wisdom of nature, using it as a moral frame for deciding on the acceptability of novel technologies.

16 Nature was sometimes expressed as an agent (e.g. Mother Earth or Mother Nature) that knows best and looks after its own (Coyle & Fairweather 2005). As such, humans should let nature take its course (Corner et al 2013; Macnaghten 2004). For example, social sex selection was perceived as wrong by some respondents because people should let nature surprise them, and that nature will give them what they need (Scully et al 2006; Monson & Donaghue 2015).

17 According to this construct, humans were sometimes perceived to corrupt this inherent goodness, replacing the wisdom of nature with inferior knowledge (Coyle & Fairweather 2005). Some participants used the phrase playing God to refer to the perceived hubris of scientists that attempt to subvert this natural wisdom, and the term unnatural to describe the resulting technology or products (for example: Macnaghten 2004). This was often a general view shared by various participants and was not necessarily linked to a religious belief.

   a. The use of reproductive genetic technologies is playing God or unnatural (Kalfoglou et al 2005).
   b. Playing God invoked in arguments against the permissibility of human cloning (Shepherd et al 2007).
   c. Scientists should afford dignity, responsibility and respect when intervening in the natural world (BBSRC & EPSRC 2010).
   d. Concerns that nanotechnology enabled actors to be God or to create, make, fabricate, or engineer life (Davies & Macnaghten 2010).
   e. The sense that scientists do not know or fully understand the extent of their work and cannot anticipate the long-term consequences of their actions on ecosystems, human health and social relations (Marris et al 2001).

Traditional nature

18 This concept of naturalness involved perceptions of a nature that existed prior to the birth of participants or what they were aware of during childhood. A central theme underpinning this construct was the notion of a slower pace of life.

19 Technologies that speed up this slow-time were perceived as unnatural and dangerous. Some participants were of the opinion that scientific progress had developed too fast or that it was out of control (NCSR 2009).

20 Decisions regarding the acceptability of a technology or product were sometimes based on whether a person was familiar with it or not.

   a. Older methods of food production were perceived as well-known and acceptable, whilst GM was seen as unknown, new, and frightening (Shaw 2002).
   b. Contrasts with futuristic high-tech interventions were used by some participants to render IVF familiar by comparison and reinforce the idea that it was natural (Throsby & Gill 2004).
   c. Analogies to GMOs were used to maintain synthetic meat as unfamiliar and associated with risk, strangeness and unnaturalness (Marcu et al 2014).

21 Some participants wished to return to this traditional nature by moving away from the use of certain technologies, whilst others desired progress and economic development (Coyle & Fairweather 2005).

Pure nature

22 In this construct (which is closely related to traditional nature), nature is sanctified, revered and ideally untainted or devoid of human interference. Often naturalness was perceived to represent pureness, wholesomeness, healthiness, and safety (NCSR 2009).

   a. In the context of food, natural was equated with the absence of chemicals or certain additives, or less processing (Rozin et al 2012).
   b. Herbal medicines and caring for oneself naturally were perceived to be healthier and better for the environment (Nissen 2015).
   c. It also featured in discussions of natural ageing and cosmetic procedures, whereby natural ageing was defined as untouched by culture and the unmodified body was perceived as pure, authentic, and laudable (Clarke & Griffin 2007).
   d. Natural environments viewed as places free from human intervention; as pure, clean, and peaceful surroundings (Vining et al 2008).

23 According to this concept of naturalness, the term unnatural was used to denote anything that taints this original purity. For example, food could be rendered unnatural by the addition of unnatural entities, such as certain chemicals or additives (Rozin 2005).

Special case: Cosmetic procedures

24 Some of the discussions within this theme were slightly removed from the constructs presented above. Notions of what constitutes a natural body or natural ageing were expressed within the construct of pure nature, in terms of the natural body being an unaltered one (as noted above). However, the term natural was also used to convey the idea that a natural look is the desired result from a cosmetic procedure. A natural look was defined as an appearance that has been altered subtly and skilfully so as to make it hard to tell that it has been enhanced. Results from cosmetic procedures were classified as good or bad depending on how easy it was to detect that work had been done (Clarke & Griffin 2007). In this context, an unnatural or artificial look was used to describe people that were perceived to have undergone excessive cosmetic enhancement (Clarke et al 2007; Askegaard et al 2002).

Annex A: Criteria for relevant research for inclusion in this review

- Time scale: 2000-present (earlier work will be included if highly relevant).
- Geographical scope: Primarily looking at research that has been conducted in English-speaking and western, developed countries (e.g. UK, Europe, USA, Australia, New Zealand).

Types of research:

- Research that explores what the public means when using the terms 'natural', 'unnatural' and 'nature' in the discussion of a bioethics-related topic.

- Research that explores the concepts that the public utilises when evaluating a technology or entity within a bioethics-related topic, which may be related to ideas about naturalness even if the terms natural/unnatural are not explicitly used.

Relevant research will include academic research and public consultation or engagement exercises which may involve:

- Focus groups discussions
- Questionnaires
- Interviews
- Deliberative workshops or meetings
- Analysis of online forum discussions

Bioethics-related topics for the purposes of this review:

- General biotechnology
- GM other genome/genetic editing technologies
- Food and farming
- Environment
- Xenotransplantation and organ donation
- Assisted reproduction technologies (e.g. IVF, sperm donation, sex selection) and childbirth
- Cloning
- Cosmetic procedures
- Complementary and alternative medicine

Annex B: Summaries of research included in literature review on public perceptions of naturalness

This is a complete list of the research that was included in the literature review on public perceptions of naturalness. Each paper has a summary including the author's abstract, method, and a brief overview of the results that were relevant to this review. Direct quotes of participants from these studies are shown in italics.

Contents

General biotechnology

Coyle F and Fairweather J (2005) Space, time and nature: exploring the public reception of biotechnology in New Zealand *Public Understanding of Science* **14(2): 143-61**

Abstract: Nature is widely acknowledged to be a fluid, contested, material-semiotic construction, historically and spatially grounded. This is certainly the case for New Zealand, where a number of constructions of nature have been mobilized as a means to make judgments over the viability of particular biotechnologies that have entered into public debate. In this paper, we utilize Mikhail Bakhtin's space-time matrix, the chronotope, to explore a series of complementary nature-narratives that have been mobilized as a moral basis for making judgments over the acceptability of a series of exemplars of novel biotechnologies that were presented to participants in eleven national focus groups. We argue that it is the specific space-time manipulations that characterize these sometimes overlapping narrative constructions that are used to justify reactions to novel biotechnologies.

Method: 11 nationwide focus groups involving 117 participants in New Zealand. Participants were asked to: express their vision of New Zealand in 20 years; outline their understanding of biotechnology; rank and discuss a number of examples of recent developments in environmental, agricultural and medical technologies; discuss themes of nature and safety that were introduced with reference to biotechnologies, such as xenotransplantation, cloning and genetic testing.

Results:

- The authors argued that different nature narratives, or natures, are mobilised by participants to make judgements over novel biotechnologies. The authors view these natures as space-time configurations, or chronotopes, which are in conflict with the chronotopes offered by biotechnology, which emphasises rapid change and unpredictable outcomes.[1]
- Participants' expressions of nature were multi-faceted, somewhat ambivalent constructions, which were simultaneously adaptive, complex, dynamic, simplistic, flexible, an agent, a fighter, interactive, a balancing act, compensating, and an entity that may or may not include humans.
- Five natures proposed: Wise nature; Traditional nature; Pure nature; Complex nature; Balanced nature.

Wise nature

- Personification of nature as Mother Earth, Gaia, or a healer, and an assumption of moral goodness. Mother Nature was perceived to look after its own, whilst humans were accused of corrupting its inherent goodness.

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[1] The authors used Mikhail Bakhtin's space-time matrix, the 'chronotope', to interpret the data and explore a number of nature narratives that were constructed during the focus group discussions. The chronotope is a device for analysing how time and space are represented in language and discourse.

- Nature was seen as equivocally whole – there is perfection in nature's imperfection (or randomness) and ultimate creativity. Participants placed great trust in the wisdom of nature and used it as a moral frame for deciding on the acceptability of novel biotechnologies. Concerns were raised that science is trying to fix something (nature) that is already healthy.
- Genetic engineering was perceived to subvert this historical wisdom, replacing it with inferior knowledge produced by humans trying to play God; a perfect nature was usurped by an artefactual (human design) nature. Whilst nature was regarded as wise and benevolent, anything that threatened this wisdom for the sake of profit was regarded as unnatural/unacceptable.

  > *"If Mother Nature wanted to do it Mother Nature would have done it years ago and what I see happening is all for short-term gain."*

- Also associated with wildness and rurality, but also health stores and healing centres (popular spiritual and New Age discourse).
- Not without criticisms: "nature isn't perfect in a lot of ways anyway", "even natural drugs have side effects". Some respondents were also critical of the nature is good/not nature is bad dichotomy.

Traditional nature

- A nature that existed prior to the birth of participants, or what they were aware of in childhood. A nature perceived as a reminiscence of what once was – a slower pace of life that was stress free.
- Biotechnologies speed up this slow-time, altering things at a pace that participants found dangerous. Unnatural became equated with human interference with traditional nature. However, traditional nature could be re-established by moving away from the use of biotechnologies, such as genetic engineering.
- Some participants did not want to go back to working with nature, instead desiring progress and economic development: if it were not for human curiosity to advance, "we'd still be living in caves". This tension between tradition and progress was not explored further but manifested as a preference for some technologies over others, as well as indecision. Participants acknowledged that the issues were complex, and that discussions had raised more questions for them than answers, with some moving from a position of certainty to a position of uncertainty.

Pure nature

- Variant of traditional nature where nature is sanctified, revered, and ideally untainted. Corresponds closely to concept of nature as wilderness, devoid of human interference. Anything that taints this original purity of nature becomes unnatural.
- Some participants emphasised the importance of consuming pure products. In this desire to absorb the purity of the original is an overlap with traditional

nature and wise nature. They represent pure, wholesome, organic products, direct from nature's pantry.

- When nature was perceived as pure and unsullied, biotechnologies were defined as unnatural, for they perverted this purity.

> *"But I don't see that as natural because I think that people have interfered with it. So when I think natural I think I would go down to the organic place and I'll ask for the organically grown herbs. Save my time."*

Complex nature

- Nature was viewed by some participants as a process, characterised by dynamism, complexity, transience and evolution. Nature was alive, an actor, a protagonist in its own development. Furthermore, this actor could not be directed by human intervention.
- Humans were perceived as being in competition with nature. This emphasis on competition was often expressed through references to ecosystems and humans as part of the food chain.
- Some participants perceived nature as an organic evolving system, and felt that harnessing nature and its inherent aliveness was potentially dangerous. Fear was expressed at scientists' attempts to manipulate what was perceived as an uncontrollable and unpredictable nature. Meddling with nature could lead to unpredictable outcomes.
- Some participants also thought that biotechnologies were reflective of an inherent laziness in production methods – an emphasis on getting an end product quickly by any means available rather than focusing on making the processes involved sustainable.

Balanced nature

- Similar to complex nature, but rather than complex and dynamic, the emphasis in balanced nature was ecological harmony; everything is in its place and unexpected consequences could occur when this relative stability was disrupted. Two lines of argument emerged from this: either that nature was thrown out of balance by biotechnologies, or that a more warrior-like nature out-competed them.
- Firstly, nature in the balance was perceived as inherently stable, and that new biotechnologies were viewed as upsetting or destabilising to it. Biotechnologies disrupted the order of nature, and balance dissolved into disharmony, characterised by monsters that could mutate and change. These monstrosities were diverse, but all expressed the fear of scientific endeavour that was out of control (e.g. humans that "go oink oink"; potatoes that talk; "a piece of lamb having a human finger"; sheep that will "be standing up and walking round on two legs"; "somebody standing on the blocks at the Olympics with frog feet going 'I'm actually human'").
- Unnatural was equated with displacement – something natural (evolved in nature, such as pig pancreatic cells) being put into something else natural

(e.g. human bodies). The two entities did not evolve together and so were considered unnatural.

> *"The pancreatic cells are a natural product that is being put in an unnatural place."*

- Secondly, balanced nature drew on competitive language of popular Darwinism. Participants emphasised survival of the fittest, random mutations through experimentation, etc. Some participants expressed the idea that nature could adapt to any adversities that humanity threw at it. Organisms derived through biotechnology were not seen to have a competitive edge when they left the lab.

BBSRC and EPSRC (2010) *Synthetic Biology Dialogue*, **available at:** http://www.bbsrc.ac.uk/documents/1006-synthetic-biology-dialogue-pdf/

Method: Public workshops involving 160 people from the UK on the science and issues surrounding synthetic biology that took place in 2009-10.

Results:

- Participants expressed concerns about the implications of synthetic biology on our relationship with nature, although participants found these concerns hard to articulate. Science was often viewed as transgressing nature – both in terms of manipulating nature itself (e.g. altering distinctions between human and non-human or modifying an organism), and the idea of natural balances and the revenge of nature. The idea of being able to manage nature was also seen as problematic, with unintended consequences emerging from uncertainties in knowledge and limits to scientific understanding.
- Certain groups were concerned about the ability to create living entities. This included references to playing God, but also discussions that scientists should afford dignity, responsibility, respect and attention when intervening in the natural world.
- Participants became increasingly concerned along a continuum of using synthetic biology from biological pathways, to micro-organisms, to more complex and ultimately sentient creatures – a Pandora's box where creating whole new organisms was viewed as qualitatively different from creating parts alone.
- *Synthetic* invoked images of living things being artificial or not natural, which made people feel slightly uneasy.
- Nature was viewed as something that should be treated with respect, and not just something to be broken down, engineered, predicted and controlled. Concerns expressed about treating nature as merely parts to be assembled. Nature was perceived as too complex to predict in a precise way.
- Overall, the idea of creating life was acceptable when balanced with the benefits that synthetic biology can bring. However, it is important that this is done with humility.

The Royal Society and Royal Academy of Engineering Nanotechnology Working Group (2004) *Nanotechnology: views of the general public*, available at: http://www.nanotec.org.uk/Market%20Research.pdf

Method: Two elements: a qualitative strand, consisting of two evening workshops with 50 members of the public; and a quantitative strand involving 1005 participants, for which questions were placed on a face-to-face omnibus survey from 8th to 14th January 2004.

Results:

- Respondents referred to some technologies as not being natural to express the idea that they subverted their ethical beliefs or notions of good taste, and describing these technologies as not being right. In the context of GM for example, the possibility of introducing animal DNA into a plant crop felt wrong as it was a process that could not occur in nature.

  > *"One of the classic examples is GM food, we all understand that for centuries people have been developing, basic grass has created grain, even by cross-fertilisation, we all understand the genetic side of it. When we get slightly worried is when they start putting animal proteins into it, because we know that somehow intrinsically that ain't right."*

- Other technologies that were perceived by participants as not being right included those that interfered with the natural reproductive process, such as cloning and embryo gender selection. These were often referred to as playing God.

  > *"I'm for a lot of them, [new technologies] but I've got a lot of reservations about answers in the medical field in particular, in relation to cloning and stuff like that. Messing about with nature, reproduction, playing God."*

- Playing God was a phrase that was used in a negative sense and to disparage certain technological developments.

  > *"Are we trying to control nature, are we trying to manipulate nature… I don't think we should, we don't have the right to play God... I don't know, I can't articulate it, I just think it makes me feel things are getting out of control, there might be a nasty end product."*

- However, participants often found it difficult to be more specific about their use of the phrase. For example, they acknowledged that IVF could be described as playing God, but did not use the phrase to describe this technology in the same sense. This was because IVF was felt to be an

essentially beneficial technology in allowing childless couples to have children, whereas embryo gender selection was seen to subvert nature by allowing an imbalance between the genders to be created.

- Even if a technology was considered unnatural, respondents would have no hesitation in using it if it was considered beneficial to themselves or their families.

> *"Ten years ago people said that (IVF) was wrong, you're playing God and you shouldn't be doing that, now we take it totally for granted and we think it's marvellous."*

- Both nanotechnology and GM were characterised as messing with nature in a specific way by manipulating the building blocks of nature.

Davies SR and Macnaghten P (2010) Narratives of mastery and resistance: lay ethics of nanotechnology *NanoEthics* 4(2): 141-51

Abstract: This paper contributes towards a lay ethics of nanotechnology through an analysis of talk from focus groups designed to examine how laypeople grapple with the meaning of a technology 'in-the-making'. We describe the content of lay ethical concerns before suggesting that this content can be understood as being structured by five archetypal narratives which underpin talk. These we term: 'the rich get richer and the poor get poorer'; 'kept in the dark'; 'opening Pandora's box'; 'messing with nature'; and 'be careful what you wish for'. We further suggest that these narratives can be understood as sharing an emphasis on the 'giftedness' of life, and that together they are used to resist dominant technoscientific and Enlightenment narratives of control and mastery which are encapsulated by nanotechnology.

Method: Attitudes to nanotechnology obtained from six focus groups of 6-8 individuals in the UK.

Results:

- Messing with nature was a narrative that expresses concerns about the disruption of nature, the natural and the human. It implies that there are natural orders or boundaries that should be left alone.

> *"My thing was the sort of the… a lot of the things that were said seem wonderful and we should be working on them as fast as possible, but a few of the things were a bit… messing with natural things, pushing… too much human interference in natural things is a very scary prospect, and you need to be very careful whenever you do anything like that, like designing babies or putting stuff in ecosystems or anything like that. So, messing with the natural order of things, I guess."*

- Particular concerns were troubling notions of nanotechnology as enabling actors to be God or to create, make, fabricate, or engineer life and the future. This talk seemed to summarise many of the threats the technology presented.

Dragojlovic N and Einsiedel E (2013) Framing synthetic biology: evolutionary distance, conceptions of nature, and the unnaturalness objection *Science Communication* (ahead-of-print): 1-25

Abstract: Under what conditions does the perceived "unnaturalness" of a specific application of synthetic biology influence its public acceptability? Using data from a framing experiment embedded in a national survey of Canadian adults, we argue that this consideration leads to negative perceptions of the technology only when opponents of the application use rhetoric that refers to its unnaturalness and when characteristics of the application itself, such as the use of genetic material from "dissimilar" organisms, increase the perceived relevance of such arguments. Additionally, we find that individuals who view nature as sacred or spiritual are most responsive to unnaturalness framing.

Method: Hybrid online and mail-based survey that measured the Canadian public's perceptions of synthetic biology in 2012, involving 1201 respondents in total.

Results:

- The authors found that the perception of unnaturalness leads to negative perceptions of the technology only when opponents of the application use rhetoric that refers to its unnaturalness and when characteristics of the application itself, such as the use of genetic material from dissimilar organisms, increase the perceived relevance of such arguments.
- Furthermore, individuals who view nature as sacred or spiritual are most responsive to unnaturalness framing.

GM

Marris C, Wynne B, Simmons P and Weldon S (2001) *Public perceptions of agricultural biotechnologies in Europe. Final report of the PABE research project,* **available at:**
http://csec.lancs.ac.uk/archive/pabe/docs/pabe_finalreport.pdf

Method: Attitudes towards agricultural biotechnologies and related food products obtained from focus groups held in 1998-1999 in five European Member states, involving a total of 432 participants – 86 (UK); 82 (France); 85 (Germany); 88 (Italy); 91 (Spain).

Results:

- GMOs were frequently described as unnatural, although this varied between countries (absent in Italian focus groups). Even if the term unnatural was not used, focus groups from all countries expressed the view that genetic modification was qualitatively different from previous techniques.
- A common viewpoint was that until now traditional breeding methods have only crossed already-existing organisms, within natural species boundaries, using natural fertilisation techniques. The label unnatural was used because GMOs were novel life forms that would not have existed otherwise. According to many participants, we had only helped nature along before, whereas now we were modifying nature.
- Genetic engineering techniques were also described as pushing Nature beyond its limits, and were thought to upset the equilibrium of Nature.
- Playing God (UK and Germany) and sorcerers' apprentices (France) – a sense that scientists do not know or fully understand the extent of their work and cannot anticipate the long-term consequences of their actions on ecosystems, human health and social relations.
- Non-GM agricultural technologies are not necessarily perceived as natural. Many of the concerns expressed about GMOs, including ideas about unnaturalness, were also expressed in relation to other farming practices, including pesticides, animal-derived animal feed, and antibiotics in animal feed.
- Participants felt that most agricultural innovations were focused towards increasing productivity, economies of scale, and profit, which resulted in uniform and tasteless food. Another way in which the idea of unnaturalness was invoked was in regard to tomatoes that are available all year round, looked good, and had a long shelf life, but which were considered tasteless.
- Although GM technologies were perceived to represent a qualitative change, many participants viewed them as the next step in a long established trend of manipulating nature.
- Some focus groups (UK and France) perceived organic agricultural practices as reversing or opposing the industrialising trend described above, and in all five countries, some participants felt that there are alternatives to the hyper-industrialisation of food production systems. This would involve:
  o Focusing on prevention rather than cure;

- Changes in lifestyle;
  - Closer connection with the natural environment;
  - More equitable distribution of profits;
  - Redefinition of progress.
  - All of the dimensions listed above were incorporated by participants into their concept of what constitutes natural.

Shaw A (2002) "It just goes against the grain." Public understandings of genetically modified (GM) food in the UK *Public Understanding of Science* **11(3): 273-91**

Abstract: This paper reports on one aspect of qualitative research on public understandings of food risks, focusing on lay understandings of genetically modified (GM) food in a UK context. A range of theoretical, conceptual, and empirical literature on food, risk, and the public understanding of science are reviewed. The fieldwork methods are outlined and empirical data from a range of lay groups are presented. Major themes include: varying "technical" knowledge of science, the relationship between knowledge and acceptance of genetic modification, the uncertainty of scientific knowledge, genetic modification as inappropriate scientific intervention in "nature," the acceptability of animal and human applications of genetic modification, the appropriate boundaries of scientific innovation, the necessity for GM foods, the uncertainty of risks in GM food, fatalism about avoiding risks, and trust in "experts" to manage potential risks in GM food. Key discussion points relating to a sociological understanding of public attitudes to GM food are raised and some policy implications are highlighted.

Method: In-depth interviews with 32 participants from the UK.

Results:

- Recurring issue raised by respondents was the unacceptability and unnaturalness of GM.
- In particular, people expressed an intuitive unease about the movement of genes between species; described by one participant as going "against the grain". There was an intuition that the transfer of genes from one species to another represented the crossing of a line that should not be crossed.
- Older methods of food production were perceived as being scientifically well known and acceptable. In contrast, GM was seen as unknown, new, and frightening. In particular, moving genetic material between species, which would not occur naturally, and the speed in which this genetic change occurs, were seen as crucial differences.

  "If they're joining things together that wouldn't occur naturally I think that's dangerous. I'm quite happy with cross-fertilization of the same thing, say different tomatoes or different potatoes, to improve the strain . . . But to actually invent crosses I think is incredibly dangerous."

- Inappropriate human intervention in nature was a recurring theme. Close parallels drawn between BSE and GM in relation to the questions of how far scientists should interfere with nature. Despite seeing the scientific value of GM, the majority rejected these foods as unnatural.
- Scientists were frequently described as playing God and GM as fiddling/tampering/messing around with nature.

  "It is totally unnatural... it's very impressive from a scientific point of view, but… they haven't given a lot of thought as to what the end result is… genetic modification is tinkering with nature for no particularly good reason."

  "Science, technology . . . in some ways it's good . . . But other things, like tampering with food . . . it's all interfering with nature really."

  "Fiddling with nature to the extent that we put genes from totally different species into another species . . . that really is playing God."

- Nature was often portrayed as fundamentally good and human intervention was seen as inherently bad. Furthermore, nature was sometimes personified as a powerful she that can exact revenge.

  "I don't like nature being interfered with, because I think she always hits back… I don't hold with GM food at all… I don't think they should interfere with nature to that degree… nature always gets you back… you won't ever beat her… like the beef problem, whoever the stupid people were who introduced cannibalism into the beef chain, they wanted their heads examined, it hit back."

- Ethical objections also included wider concerns about the appropriate boundaries of scientific innovation, and in particular genetics. For some, unnatural and genetics were intimately connected. Concerns about GM foods appeared to be part of wider concerns about messing with genetics in laboratories and the fear of the unknown.

National Centre for Social Research (NCSR) (2009) *Exploring attitudes to GM food. Final report*, **available at:**
https://www.food.gov.uk/sites/default/files/multimedia/pdfs/gmreportnov09final report.pdf

Method: Three stages: 30 in-depth interviews were held with BSA survey respondents in two geographical areas to explore what shapes attitudes to GM food; two deliberative workshops to further understand what shapes attitudes and the impact of information about GM food; and six follow-up telephone interviews explored participants' experience of the research process.

Results:

- Participants that were less confident about their level of understanding described GM as unnatural and as an activity of play or experimentation. Language used included terms such as "playing", "messing", or "toying" with food by "injecting it with chemicals" or "pumping water into it".
- Some participants described the technology as shocking or scary – a common association made by people who were less confident was between GM food and Frankenstein food, through the use of terms such as monsters or freaks.
- A key theme was that GM food would look artificial or like rubber, or aesthetically appealing in an extreme way – brightly coloured or appearing very large and juicy – which was itself off-putting.

> *"It just means something's been altered in the food to make it more appealing and to probably make it bigger and just more appealing colouring and all that. One of the wonderful chemicals or funny number things – I don't know – they put chemicals of some sort in to the foods. Basically, something that shouldn't be there naturally is going in."*

- Some of those that were opposed to GM described the technology as meddling with the natural order of things, and that humans should avoid messing with nature and altering the genetic makeup of organisms.
- Naturalness was often equated with quality/healthiness/safety – the inclusion of unnatural chemicals in food was seen as having potentially negative impact on health.
- Some participants were of the opinion that scientific progress had developed at too fast a pace – that it was out of control – and that the ethics of scientific activity received insufficient attention. These participants spontaneously mentioned scientific developments which had received extensive press attention when discussing their attitudes to GM food. In particular, animal cloning and the case of Dolly the sheep were given as examples of science being out of control and producing freakish phenomena. Those that were concerned about such issues saw GM food as similar in nature to these scientific developments and were fearful that they could have freakish impacts.
- The central issue for participants holding religious beliefs was that the natural order of things was being tampered with and that this was fundamentally wrong.

> *"You're messing about with something… I don't see the benefits. It's like going against nature, isn't it?… Because you can do it scientifically doesn't make it right somehow - unless there's a really, really good reason…you're altering things with this [GM food], but, but why? I don't see… I just don't, I can't think of any positive benefits for us in our society."*

Macnaghten P (2004) Animals in their nature a case study on public attitudes to animals, genetic modification and 'nature' *Sociology* 38(3): 533-51

Abstract: This article seeks to engage with contemporary debates on the social and ethical dimensions of genetically modified (GM) animals. Dominant policy ethical approaches and frameworks are criticized for failing radically to accommodate some of the most important dimensions of concern. Drawing on primary empirical data emphasizing existing embodied relationships to animals, the article analyses how people express ethical concern over GM animals, including their sense of the continuities and discontinuities between GM animals and those determined by conventional selective breeding practices. The findings suggest that GM animals are likely to become an issue of public controversy, especially in the animal testing domain, due to the ways in which they symbolize and give voice to underlying tensions between 'moral' and 'instrumental' approaches to animals. The article concludes that people reject GM animals as 'going against nature', and that such concerns reflect wider unease about science, about technological modernity, and about hubris.

Method: Eight structured focus group discussions involving a selection of population groups in the UK in 2001.

Results:

- Dominant response in all groups to the proposed GM technology examples was negative, with some responses emphasising that it is not natural, messing/interfering with nature, taking away nature, not letting nature take its course, etc.

- There appeared to be two dimensions to such responses. On the one hand, people adopted a deontological reaction against the proposed technology as intrinsically a violation of nature and transgressive of so-called natural parameters. On the other hand, people reacted more pragmatically, questioning the apparent usefulness of the prospective applications and their known and unknown consequences. With the exception of the malaria application, people found the applications dubious, dangerous and unnecessary. Sometimes, these two considerations were combined.

- Underpinning some discussions was the sense that nature had a tendency to fight back in vengeance:

  > Male 1*: "You'll never beat Mother Nature."* Moderator*: "What do you mean by that?"* Male 1*: "She'll always come back at you one way or another."* Moderator*: "So is this trying to beat Mother Nature, all this stuff, is that what you're saying?"* Male 1*: "In effect, yes."* Female 1*: "Well it's altering nature isn't it."* Male 2*: "No, I don't think it, no. We are assisting nature, I don't think we're trying to…"* Male 3*: "No, we can't be assisting nature if we want to breed a cat that doesn't catch birds or*

mice. The whole essence of a cat being put on the Earth and not by God is to catch birds and mice. That's what they do. So we're not – however many millions of years we breed cats they will always catch birds and mice. What this can do is, it can take an animal and it can alter its characteristics, and that's what I think you should be thinking about, is do we want a dog that doesn't bark, do we want a cat that doesn't catch mice."

- More generally, people saw such applications as attempts to solve problems that were of their own making. Plants and animals had evolved over millennia and to propose that one could improve characteristics on a more or less instantaneous basis appeared to some respondents as arrogant, as hubris and as likely to rebound on humans. The principles of letting be and the need for humility appear to be powerfully endorsed in the discussions.

- Importantly, the research suggests that most people reject GM animals as going against nature. This sentiment does not rely on an outright rejection of the technology per se. Rather, the argument is that such proposed applications do not appear to merit the risks associated with the corresponding technological advance. People seem willing to make trade-offs in judging the boundaries between acceptable and unacceptable use. Concerns about GM animals appear to reflect a number of further elements, such as the requirement to prove a genuine and authentic need for undertaking such procedures, commensurate with the moral act of going into the laboratory and altering the DNA, speeding up the genetic alteration, and the anticipated likelihood of unanticipated mistakes arising from the speed, scale and scope of such highly interventionist practices.

CONSUMERCHOICE (2008) *Do European consumers buy GM foods? Final report,* **available at:**
http://www.kcl.ac.uk/lsm/research/divisions/dns/projects/consumerchoice/downloads.aspx

Method: Focus groups consisting of 4-8 participants were conducted in 2007-8 in seven European countries: UK (4 groups), the Netherlands (4), Poland (10), Spain (4), Greece (6), Slovenia (4), and Sweden (4).

Results:

- Those who perceived gene technology as unnatural made a clear distinction between gene technology and traditional breeding – gene technology was described as an activity in which humans meddle with natural processes. In the British and Dutch focus groups, participants explicitly voiced emotional resistance to GM-products, claiming that they had an uneasy feeling about them. Such emotional resistance may also underlie the argument that gene technology is unnatural.

- Argument that gene technology in food production brings about moral concerns rests upon the premise that nature is inherently good; if gene

technology was regarded as unnatural it was also conceived of as non-acceptable.

- Feeling of unease expressed by some focus group participants could be interpreted as one example of how emotional considerations take precedence of rational calculation of risks and benefits. Regardless of whether GM-foods are proven safe for health or for the environment, people remain sceptical because of emotional unease.

Lassen J and Jamison A (2006) Genetic technologies meet the public the discourses of concern *Science, Technology & Human Values* 31(1): 8-28

Abstract: To clarify concerns that the public has with genetic technologies, the article presents the results of focus group interviews conducted in Denmark in 2000. The concerns of the public are divided into three ideal-typical categories: social (dealing with environmental and health risks), economic (dealing with both the threats and opportunities of the new technologies), and cultural (taking up ethical and moral concerns). Following a general discussion of why it is important to take these discourses of concern seriously, each discursive category is discussed with examples taken from the focus group interviews.

Method: Focus group interviews conducted in Denmark in 2000 involving 36 participants in total.

Results:

- In environmental discussions, nature was often seen as a fragile set of systems that need protection. This system includes some inherent protective mechanisms, which ensure stability and safety, but genetic technologies were perceived as bypassing these safety mechanisms and endangering the stability of the system.

  > *"[What concerns me is] traditional breeding compared to genetic manipulation. When you use genetic manipulation, you move from the starting point to the final product in one move, fiddling with the genes you want to change. When you breed, you have to do it at the speed of nature and allow nature to produce what it needs. Nature will make sure that you are stopped in time—genetic manipulation wouldn't be stopped by nature because it isn't natural."*

- Basic concern with genetic technology is that it is in conflict with fundamental values or orders. This can be expressed in religious dialogues as interfering with God's work or divine order, or with vocabulary inspired by ecology or a kind of natural rights philosophy, where the offended subject is nature (rather than God).

  > *"I have considered manipulations of the natural basis, our hereditary material. I think the evolution is governed by chance.*

> *As I see it, there is no underlying meaning in our government of the direction of mutations. Now it's us making the mutations, consciously and controlled; beforehand, catastrophes happened or animals were extinct because they developed in disharmony with the natural evolution. Now we are the agents of evolution – or whatever we call the 'it' that makes the mutations… that leaves us with a huge responsibility. We need to consider what we do when we play the game of 'chance.'"*

Lassen J, Madsen K and Sandøe P (2002) Ethics and genetic engineering– lessons to be learned from GM foods *Bioprocess and Biosystems Engineering* **24(5): 263-71**

Abstract: Attempts to introduce GM foods in Europe have prompted a major conflict that may now well be beyond resolution. This raises the question whether GM foods have a future in Europe. This outcome can mainly be seen as a result of the failure of industry, researchers and public authorities to address concerns prevailing among the general public. In order to avoid similar controversies arising over other applications of gene technology a dialogue respecting other positions and values needs to be promoted. The aim of the paper is to use GM foods as case story. On the basis of quantitative and qualitative studies, an in-depth understanding of the concerns of the general public regarding GM food is provided. Furthermore, it is shown how those wanting to promote GM food failed to consider these concerns. At the end of the paper an attempt is made to spell out the general lessons to be learnt from this case.

Method: Focus group interviews in Denmark in 2000.

Results:

- Typical to perceive GM as unnatural and therefore wrong, although exactly what lies behind this concept is not always clear. Some argue that it is contrary to some fundamental values relating to God or nature, whilst others seem to use the concept of naturalness to express an understanding of usefulness and risk.
- Unnaturalness may either be a threat to the natural order of things, a violation of the integrity of nature, or a matter of gene technology putting man before nature or God.
- The idea that GM violates the integrity of nature is based on the view that technology corrupts the wholeness of individual plants and animals, of species or ecosystems. Impacts are perceived as against the stable background of an unchanging environment.

Peters HP, Lang JT, Sawicka M and Hallman WK (2007) Culture and technological innovation: impact of institutional trust and appreciation of

nature on attitudes towards food biotechnology in the USA and Germany
International Journal of Public Opinion Research **19(2): 191-220**

Abstract: Using 'general trust in institutions' and 'concepts of nature' as examples, the article analyzes the influence of cultural factors on sense-making of food biotechnology and the resulting public attitudes in the USA and Germany. According to the hypotheses investigated, different levels of trust and appreciation of nature explain part of the well-known differences in attitudes between both countries. The analysis of a cross-cultural survey of the general population shows that appreciation of nature is a predictor of attitudes in both countries. The higher appreciation of nature in Germany partly explains why attitudes towards food biotechnology are more negative in Germany than in the USA. The relationship between trust and attitudes is more complex than expected, however. Institutional trust is a moderate predictor of attitudes towards food biotechnology in the USA but not in Germany. To explain the varying effectiveness of trust in resolving innovation-related uncertainty we refer to differences in issue framing in both countries and to the higher degree of universalism and individualism in the USA. We conclude that the higher relevance of trust and the lower appreciation of nature make the U.S. culture more apt to assimilate technical innovations than the German culture.

Method: Telephone interviews conducted in 2004 in USA and Germany involving 601 American and 942 German respondents.

Results:

- In USA and Germany, concepts of nature play an important role in attitudes towards food biotechnology. One relevant way in which concepts of nature differ is the degree of appreciation of nature implicit in them. The higher appreciation of nature in Germany partly explains why attitudes towards food biotechnology are more negative in Germany than in the USA.
- Appreciation of nature scale used in study:
  - Eight items representing four aspects in which concepts of nature might differ: priority; sensitiveness; perfection; threat.
  - Two for each – positive and negative wording:
    - Negative wording: 'Okay for humans to change nature'; 'Nature finds ways to adapt'; 'Humans are smarter than nature'; 'Humans must control nature to protect themselves'.
    - Positive wording: 'Nature should be left alone'; 'Humans can easily destroy balance of nature'; 'Things in nature more perfect than those made by humans'; 'Nature must be protected against humans'.

Food and farming

Rozin P, Fischler C and Shields-Argelès C (2012) European and American perspectives on the meaning of natural *Appetite* **59(2): 448-55**

Abstract: Attitudes to natural foods and genetically modified organisms, assessed by multiple choice items, definitions of natural, and free associations to the word "natural" were determined for a representative sample of adults from France, Germany, Italy, Switzerland, the U.K., and the U.S.A. Individuals in all countries had a very positive attitude to natural. There is a surprising degree of similarity in conceptions of natural across the six countries, with a focus of food (and beverages) as central to the idea of natural, and links to the ideas of biological, healthy, plants, and the environment. Demographic differences (e.g., sex, education) were also small. Analysis of definitions and free associations suggests, and other data confirm, that across all countries, natural is defined principally by the absence of certain "negative" features (e.g., additives, pollution, human intervention), rather than the presence of certain positive features. Across all countries, plants, and in particular, plant foods, are more frequent exemplars of "natural" than are animals, with green the dominant color associated with natural. There is opposition to genetic engineering, which can be thought to be the opposite of natural, in all countries, but it is highest in continental Europe and lowest in the U.S.A.

Method: Attitudes to natural foods and GMOs were assessed by telephone questionnaires carried out between 2001-2 in UK, France, Germany, Switzerland, Italy, and USA. First phase of telephone interviews involved approximately 180 participants in each country; a second phase of telephone multiple choice questionnaires involved about 900 people from each European country and 1500 from USA.

Results:

- Participants were generally very positive towards natural.
- Definitions of natural given by participants:
    - No chemicals; no alterations; no additives; no contact with/intervention from humans.
    - Natural is principally defined by the absence of certain negatives.
    - Largest categories: No processing; no additives; original/from nature; grown in a human context (homemade, from a garden, etc.); simply grown; healthy; pure.
- Free associations of natural:
    - At least three of the top 10 for each country were food/beverages: food, water, vegetables, fruits, yoghurt.
    - Other common associations included near synonyms (nature, biological, organic), aspects of the environment (air, country), and positive affect (good, healthy).
    - Five most common categories seem to constitute an intuitive sense of natural: biological; positive affect; environment; food (particularly plant products); health.

- Attitudes to GMOs and genetic engineering were generally negative, with greater opposition in continental Europe compared with the UK and USA.
- Plants come to mind much more than animals when people think about natural.

Verhoog H, Matze M, Van Bueren EL and Baars T (2003) The role of the concept of the natural (naturalness) in organic farming *Journal of Agricultural and Environmental Ethics* **16(1): 29-49**

Abstract: Producers, traders, and consumers of organic food regularly use the concept of the natural (naturalness) to characterize organic agriculture and or organic food, in contrast to the unnaturalness of conventional agriculture. Critics sometimes argue that such use lacks any rational (scientific) basis and only refers to sentiment. In our project, we made an attempt to clarify the content and the use of the concepts of nature and naturalness in organic agriculture, to relate this conception to discussions within bioethical literature, and to draw the implications for agricultural practice and policy. Qualitative interviews were executed with a range of people in the field of organic agriculture and with consumers of organic products, on the basis of a list of statements about the meaning of the concept of naturalness formulated by the authors. Based on the results of the interviews, we distinguished 3 aspects of the concept of naturalness: natural as the organic (life processes), natural as the ecological, and natural as referring to the characteristic nature of an entity. We related these conceptual aspects to three main approaches within the field of organic agriculture: the no chemicals approach, the agro-ecological approach, and the integrity approach. It became clear that these approaches can also be recognized in the change of attitude of farmers as they convert from conventional to organic agriculture, and in the attitudes of consumers of organic food products. We conclude that the idea of naturalness can be used to characterize organic agriculture and to distinguish it from conventional agriculture, but only if naturalness not only refers to not using chemicals but also to ecological principles and respect for the integrity of life. Thus perceived, the principle of naturalness can also serve as a guide to future developments in the field of organic agriculture. As part of the holocentricethics of organic farming the value of naturalness has three dimensions: a cognitive one, an emotive one, and a normative one.

Method: Interviews with consumers of organic products.

Results:

- In spontaneous descriptions of organic agriculture, consumers often use the terms nature or natural – natural balance, naturalness as norm, closer to nature, producing as natural as possible, leaving nature in its value, using the forces of nature.
- Most consumers do not define nature as wildness, but as everything that lives (growing by itself). The concept of nature has an emotional meaning: peacefulness, silence, freedom, becoming yourself, holidays.

- Method of food processing influences naturalness. Less processed, processed in a traditional way, without additives are associated with more natural food. The more artificial the process is perceived to be, the less natural it is. Genetic engineering is perceived to be very unnatural.
- Naturalness is associated with simple, pure, non-artificial, unspoilt, fair.

Evans G, de Challemaison B and Cox DN (2010) Consumers' ratings of the natural and unnatural qualities of foods *Appetite* 54(3): 557-63

Abstract: An investigation sought to understand what consumers perceive by the term natural. The aim was to test eight hypotheses on food ingredients and processes used for manufactured food. A representative sample (n = 190, aged 18–65 years), rated 50 food exemplars for naturalness (0–100 scale). Data were analysed by repeated measures ANOVA. Results support three hypotheses: chemical changes were more potent than physical changes; there was a minimal effect of mixing like entities and the more processing the greater the effect on consumer's deviation away from natural. Two hypotheses were validated conditionally: contagion accounts for naturalness reduction but is independent of dose above a certain level; E-numbers were always perceived to be less natural than the same preservatives described by chemical and common names; however, there were gender and some education interaction effects. The hypothesis that addition has a greater effect than removal was only partially validated. There was no evidence found to support the hypotheses that process has more effect than content, or that novel ingredients have a greater effect than 'known' ingredients, however, this result may have been confounded. The implications for new manufactured food products, suggested by the results, are that products with physical changes, less processing, with like ingredients and described using common named descriptors for ingredients would be perceived to be more natural.

Results:

- Contagion accounts for a reduction in naturalness.
- Chemical changes are more potent than physical changes.
- The hypothesis that process is more important than content was not supported.
- Mixing like entities produces a minimal effect.
- The more processing the greater the effect.
- E numbers were always perceived to be less natural than chemical and common names.
- Addition was sometimes seen to have a greater effect than removal.
- The hypothesis that novel ingredients have a greater effect than known (current) ingredients was not supported.

Marcu A, Gaspar R, Rutsaert P et al. (2014) Analogies, metaphors, and wondering about the future: lay sense-making around synthetic meat *Public Understanding of Science* **(ahead-of-print): 1-16**

Abstract: Drawing on social representations theory, we explore how the public make sense of the unfamiliar, taking as the example a novel technology: synthetic meat. Data from an online deliberation study and eighteen focus groups in Belgium, Portugal and the UK indicated that the various strategies of sense-making afforded different levels of critical thinking about synthetic meat. Anchoring to genetic modification, metaphors like 'Frankenfoods' and commonplaces like 'playing God' closed off debates around potential applications of synthetic meat, whereas asking factual and rhetorical questions about it, weighing up pragmatically its risks and benefits, and envisaging changing current mentalities or behaviours in order to adapt to scientific developments enabled a consideration of synthetic meat's possible implications for agriculture, environment, and society. We suggest that research on public understanding of technology should cultivate a climate of active thinking and should encourage questioning during the process of sense-making to try to reduce unhelpful anchoring.

Method: Assessed views of synthetic meat using online deliberation study and 18 focus groups in Belgium, Portugal and UK, involving 174 participants in total.

Results:

- Reference to other biotechnologies was used by some to express concerns about synthetic meat, whilst others used them as anchors to show that technological progress is inevitable.

  > People also make new life through in-vitro, and this is already generally accepted (I mean by having children)"

  > "It's like GM, it's true what they say, just grow stem cells and you have meat. It sounds simple. In light of the animal industry and the bio-industry… My main fear is that there is something we don't know or should be taking care of… We might get sick or our DNA might become modified in some way. We turn into zombies. It looks good but…" "We don't know enough about it." "I also have the same opinion. But if you think about it, there are already a number of things where we have intervened with nature and where we got used to. For example the fact that a chicken lays an egg every day, it's not like this in nature. Or a cow keeps giving milk. We are doing this already for a long time. And this is again a step ahead."

- Synthetic meat was also understood by comparing it to things it was different from, such as natural meat or the traditional process of meat production.

  > "Doesn't appear to me like a very healthy meat because it's not in contact with the environment, is not outdoors, in the laboratory it seems very chemical."

> *"I think there would be a different taste and a different structure. An animal that ran outside compared to something that didn't see or smell air, I think this would differ in taste and structure."*

- Participants viewed synthetic meat as being against nature, where naturalness was construed as being safe and healthy, whilst synthetic was construed as carrying risks and having ethical implications.

  > *"I find it unnatural and would never eat it. Could be carcinogenic according to me. This goes against nature, which is being destroyed already enough."*

  > *"It's scary to think that we will be eating a genetically manipulated meat, without its going through a process of natural and traditional production."*

- Understanding of synthetic meat appeared to rely on implicit dichotomies – natural/artificial, nature/science, evolved/designed.
- Another strategy used by participants to evaluate synthetic meat was the use of certain figurative constructions (or commonplaces) – general arguments, observations, or formulaic phrases that can be used in any context, particularly when the speaker is uncertain or lacks knowledge about an issue. The most frequent of these in the current study were playing God and interfering with nature. These commonplaces acted as bottom-line arguments to close off further debate.

  > *"Maybe I am too conservative on that aspect but we shouldn't play God, we shouldn't clone animals… no…"*

  > *"I do not like the idea of eating synthetic meat. It seems too strange and we shouldn't be messing about with nature."*

  > *"And the fact that you're playing with nature…" "It's a bit like Jurassic Park…" "You're playing God, aren't you?" "You are God, yeah, you know, and [we'd be] consuming that, so… That has issues."*

- Analogies were made to past contentious biotechnologies, such as GMOs, which it could be argued maintained synthetic meat as unfamiliar and associated with risk, strangeness, tampering with nature, unnaturalness.

De Barcellos MD, Kügler JO, Grunert KG et al. (2010) European consumers' acceptance of beef processing technologies: a focus group study *Innovative Food Science & Emerging Technologies* **11(4): 721-32**

Abstract: The use of new technologies in beef production chains may affect consumers' opinion of meat products. A qualitative study was performed to investigate consumers' acceptance of seven beef processing technologies: marinating by injection aiming for increased 1) healthiness; 2) safety; and 3) eating

quality; 4) marinating by submerging aiming for increased eating quality; 5) nutritional enhancement and restructuring through enzyme binding; 6) shock wave treatment and 7) thermal processing. Participants' attitudes towards beef, their innovativeness and risk aversion were also assessed. In total, 65 adults (19–60 years old) participated in eight focus groups in Spain, France, Germany and the UK. Results suggested a relationship between acceptance of new beef products, technology familiarity and perceived risks related to its application. Excessive manipulation and fear of moving away from 'natural' beef were considered negative outcomes of technological innovations. Beef processing technologies were predominantly perceived as valuable options for convenience shoppers and less demanding consumers. Overall, respondents supported the development of 'non-invasive' technologies that were able to provide more healthiness and better eating quality. Excessive intervention in meat production chains was severely criticized and participants expressed their longing to keep beef processing 'simple and natural'. The aim of the present study is to investigate European consumers' acceptance or rejection of beef processing technologies, exploring their attitudes, risk aversion and innovativeness. An inventory of acceptable beef processes and products is provided as a tool to guide process and product innovation in the beef chain, contributing to increase the competitiveness of beef. Of special interest is the understanding of the acceptance of novel beef processing technologies, since it can satisfy modern consumer demands for convenience, health, eating quality and food safety, adding value to beef products.

Results:

- Relationship between acceptance of new beef products, technology familiarity and perceived risks related to its application. Excessive manipulation and fear of moving away from natural beef were considered negative outcomes of technological innovations. Respondents supported non-invasive technologies that improve healthiness and quality. Participants expressed a desire to keep beef processing simple and natural.
- Participants defined natural beef as beef without processing or additives, and equivalent to fresh beef. Additives were the main concern for some participants and counteracted any traditional (and natural) methods of producing beef, although certain additives (e.g. salt and spices) were acceptable.
- Most participants associated natural, non-processed or fresh meat with higher nutritional value and a better eating experience.

Rozin P (2005) The meaning of "natural" process more important than content *Psychological Science* **16(8): 652-8**

Abstract: The meaning of the desirable attribute "natural" was explored in two samples, American college students and adults in the Philadelphia jury pool. Participants rated the naturalness of a variety of "natural" entities, before and after they were transformed by operations such as freezing, adding or removing components, mixing with other natural or unnatural entities, domestication, and

genetic engineering. Results support four hypotheses. First, the principle of contagion accounts for many aspects of the reduction of naturalness by contact with unnatural entities. Second, chemical transformations reduce naturalness much more than physical transformations do. Third, the history of an entity's processing is more important in determining its naturalness than is the nature of the entity's contents. Fourth, mixing like natural entities (e.g., water from different sources) does not markedly reduce naturalness. The insertion of a gene from another species, the process used in producing genetically modified organisms, produces the biggest drop in naturalness; domestication, a human-accomplished activity that changes genotype and phenotype in major ways, is considered much less damaging to naturalness.

Method: Questionnaires completed in 2001 by American adults from a jury pool and American college students. Participants rated the naturalness of a variety of food and water-based entities, before and after they were transformed by operations such as freezing, adding or removing components, mixing with other natural or unnatural entities, domestication, and genetic engineering.

Results:

- Support 4 hypotheses:
    - The principle of contagion (an additive that has some negative or non-natural characteristics) accounts for many aspects of the reduction of naturalness by contact with unnatural entities.
    - Chemical transformations reduce naturalness much more than physical ones.
    - The processing of an entity is more important in determining naturalness than composition of entity.
    - Mixing like natural entities (e.g. water from different sources) does not markedly reduce naturalness.
    - Inserting a gene from another species produced the biggest drop in naturalness, whereas domestication was considered much less damaging to naturalness.

Environment

Fish R and Saratsi E (2015) *Naturally speaking… A public dialogue on the UK National Ecosystem Assessment. Final report*, **available at:** http://www.valuing-nature.net/sites/default/files/documents/NEA%20Dialogue_Final%20Report.pdf

Method: Deliberative workshops in 2014 involving 118 members of the public in the UK.

Results:

- Participants made an unambiguous and fundamental connection between the natural environment and human well-being. People are dependent on the natural environment for a range of physical, mental and economic benefits.
- In general, the cultural and health dimensions of human interactions with nature were most prominent in the dialogue. Alongside these benefits participants also understood that the natural environment was an external threat that could threaten and overwhelm human livelihoods.
- Strong association between the idea of a healthy natural environment and the capacity of individuals and communities to flourish. Natural environment was viewed as being taken for granted by society. Generally pessimistic about the future outlook for their local natural environment over the long term.
- Many participants expressed the idea of humans being small parts of a much larger natural world and viewed the environment as a life-giving and life-affirming force in their lives; an essential part of what it means to be human.
- Some spoke of the invaluableness and pricelessness of the natural environment to convey the idea of dependency and wonder in the natural world, as well as the importance of being in tune with nature in order to feel satisfied and fulfilled.

Corner A, Parkhill K, Pidgeon N and Vaughan NE (2013) Messing with nature? Exploring public perceptions of geoengineering in the UK *Global Environmental Change* **23(5): 938-47**

Abstract: Anthropogenic influence on the climate – and possible societal responses to it – offers a unique window through which to examine the way people think about and relate to the natural world. This paper reports data from four, one-day deliberative workshops conducted with members of the UK public during early 2012. The workshops focused on geoengineering – the deliberate, large-scale manipulation of the planetary environment – as one of three possible responses to climate change (alongside mitigation and adaptation). Here, we explore one of the most pervasive and wide-ranging themes to emerge from the workshops: whether geoengineering represented an unprecedented human intervention into 'nature', and what the moral consequences of this might be. Using the concept of 'messing with nature' as an analytical lens, we explore public perceptions of geoengineering. We also reflect on why 'messing with nature' was such a focal point for debate and

disagreement, and whether the prospect of geoengineering may reveal new dimensions to the way that people think about the natural world, and their relationship to it.

Results:

- It appeared that participants conceptualised nature as being distinct from society; the appropriate human role in combatting climate change was to work with nature rather than against it, setting humans apart from nature and casting them as stewards for the planet.

    "Nature really has got its own balance hasn't it? It's only the human input that has created much of this problem, so if you can get nature to do the best it can, I mean use nature… the whole idea is to keep nature doing what nature does."

- Divergent views as to whether geoengineering represented a means of preserving nature or a threat to natural processes. Some technologies (like solar radiation management) were construed as relatively compatible with natural processes because they operate within pre-existing natural systems.

    "messing with nature is like cloning or something… whereas going out and putting droplets in the air to increase reflect… that's… it's not the same… even though it's, it's artificial: but nature has a surface in the air. It doesn't have a sheep that's identical to another sheep."

- Some participants expressed the idea that Earth knows there is a problem and that it might respond with a catastrophic event; an almost fatalistic conception of the all-powerfulness of nature was shared widely among participants to a greater or lesser degree. A belief that nature would take its course.

Vining J, Merrick MS and Price EA (2008) The distinction between humans and nature: human perceptions of connectedness to nature and elements of the natural and unnatural *Human Ecology Review* 15(1): 1-11

Abstract: The perceived separation between humans and nature may have implications for subsequent environmental values, attitudes, and behavior. This research examines people's perceptions of their connection to nature as well as their ideas about what constitutes natural and unnatural environments. We asked participants from three separate studies if they thought of themselves as part of or separate from nature. We also asked participants to list words that came to mind when thinking of natural and unnatural environments. The results show that even though the majority of the participants considered themselves part of nature (76.9%), natural environments were largely described as places absent from any human interference. Gaining an understanding of this apparent contradiction may lead to a better awareness of the importance of people's perceptions of themselves in nature

and how that perception relates to general human-environment interactions as well as management and policy.

Method: Questionnaires submitted to American residents in 1997, 2003 and 2005, involving a total of 198 participants.

Results:

- Most participants considered themselves part of nature (77%), whereas only 12% thought they were separate. A variety of reasons for feeling part of nature: connectedness with nature, actions within nature, emotional feeling while in nature, and by definition. Those who believed they were separate expressed a lack of contact or not living near nature.
- Participants viewed natural environments as places free of human intervention; pure or clean; peaceful and beautiful.
- Unnatural environments were considered man-made entities, but were also associated with disharmony/altered and lack of vegetation.

Xenotransplantation/organ donation

Sanner MA (2001) People's feelings and ideas about receiving transplants of different origins–questions of life and death, identity, and nature's border *Clinical Transplantation* 15(1): 19-27

Abstract: The aim of this study was to explore the public's feelings and ideas with regard to receiving transplants of different origins. Sixty-nine individuals with varying sociodemographic background, selected from samples who had responded to a questionnaire on receiving and donating organs, were interviewed in-depth. A wide variety of reactions was displayed. The feelings and ideas about receiving organs were summarized in ten categories: 1) the emergency situation; 2) the functioning of the transplant; 3) the influence of transplants on personality, behaviour, and appearance; 4) the influence of transplants on body image; 5) disgust; 6) cannibalism; 7) trespassing nature's border; 8) tradition; 9) ethical considerations; and 10) the debt of gratitude. Most individuals were willing to accept at least one organ. Animal organs were the least preferred. The hierarchy of organ preferences – with organs from a relative at the top and animal organs at the bottom – was explained in terms of rational, magical, and analogy thinking. Finally, the consequences for the encounter between health care personnel and transplantation candidates were briefly discussed.

Method: In-depth interviews with 69 participants – 31 were registered bone marrow donors; 17 blood donors; and 21 from the general public.

Results:

- Trespassing nature's borders. The risky consequences of mixing species as in xenotransplantation were stressed by several informants. It was regarded as a scientists' game that in the end would go wrong and create chaos. The whole transplantation enterprise was questioned: at some point of time life must end, and nature shall decide on that time.

  "I feel instinctively that it's wrong to mix different species, it would go wrong."

  "My body would let me know that an animal organ didn't fit. It's against nature."

  "The desire to play, that many doctors have, is really dangerous. In the end they will breach the borders that nature has determined."

  "The body is unique, and you shouldn't make body parts in an artificial way."

  "It's unnatural to move body parts between species."

- Disgust. Receiving animal and human organs was considered disgusting by some of the participants. Pig organs were associated with dirt, and the

thought of receiving cadaveric organs provoked disgust by association with death and decay. Some thought the idea of receiving organs from another person was like wearing another person's dirty underwear – the feeling that it was too intimate and unclean. Furthermore, having something that is usually eaten as part of your body was also perceived as disgusting by some.

> *"The whole pig nature just feels like a big 'no'."*

> *"I use to buy pig liver pre-packed at the supermarket. To have it inside me – well, it feels a bit disgusting."*

> *"I wouldn't like to have an organ from a dead animal inside me and it's the same thing with a dead person."*

> *"Disgusting to have an old rotten thing from a deceased."*

- Influence of transplants on body image. Some participants thought that the idea of having a pig's kidney or heart would feel awkward, a fear of having the sensation that the body would not be itself – it would be wrong.

> *"The mere knowledge that I'll go around with a pig's kidney is horrifying."*

> *"I'd prefer being without arms before having somebody else's arms, that I can see and touch. It sounds macabre."*

> *"A plastic thing would feel unnatural."*

> *"How would my body image change if much of me would be exchanged?"*

- Animal organs were least preferred – this was considered as an intolerable breaching of nature's borders by mixing species, or as too dangerous with regard to becoming more animal. Those who rejected any form of transplantation suggested that mixing of humans would also be against nature.

Michael M and Brown N (2004) The meat of the matter: grasping and judging xenotransplantation *Public Understanding of Science* 13(4): 379-97

Abstract: This paper is concerned with the ways in which lay people come to understand and assess xenotransplantation. Drawing on focus group data, we explore how people can both demonstrate a collective process of cost–benefit thinking and tacitly problematize this by deploying three meta-arguments that we call "trust," "telos," and "trump." Respectively, these meta-arguments emphasize: unexamined relations of trust; irrelevance because innovations such as xenotransplantation are inevitable; and redundancy in the face of desperation. We then consider how lay people draw upon certain analogies associated with meat in order to grasp the meaning of xenotransplantation. The data show how "meat" itself displays disparate and contested meanings. Depending on what aspects of meat are

emphasized, xenotransplantation is represented in either a negative or a positive light. Some of the implications of the fluidity of the meaning of both meat and xenotransplantation for cost– benefit thinking in lay and expert discourse are discussed.

Method: Analysis of lay people's understanding and evaluation of xenotransplantation using data from 11 focus groups in the UK: 5 groups were drawn from patient support organisations and 6 from various local community organisations.

Results:

- Lay people draw on certain analogies associated with meat (e.g. eating meat, leather clothing, etc.) in order to understand and evaluate xenotransplantation. Depending on what aspects of meat are emphasised, xenotransplantation is represented in either negative or positive ways.
- Evidence of cost-benefit thinking: From 'xenotransplantation is messing with nature/unnatural' to 'BUT it is necessary if you want to save yourself/someone close' to 'BUT how is xenotransplantation made possible? Do animals suffer?' to 'BUT don't we use animals anyway'. Implication that messing with nature is wrong, but might be justified to save a life.
- Use of comparisons of xenotransplantation with eating meat and wearing leather to discuss boundaries of natural vs unnatural/artificial.

  > A: "Do you eat meat?" B: "Me, yeah. Why do you say that?" A: "Because you were very strongly, 'That's not natural. That's not right,' and I just wondered if you were." B: "Yeah, but eating meat is natural." A: "But do you wear leather?" B: "It's different as well. I'm saying you shouldn't be putting pigs into humans. That's nothing to do with eating meat has it? That's nature isn't it? Nature was man eats that." A: "So you don't mind the fact that it's animals per se, you don't like the fact that animals would be in you?" B: "No, I just don't think… That's not right…" D: [Overlaps] "It's too artificial…" B: "Yeah, because it's just totally different I think. I don't think it's got anything to do with eating meat."

- Xenotransplantation was sometimes placed in the same category as meat-eating, but this category was sometimes associated with naturalness and sometimes with artificiality. Furthermore, artificiality was represented as both positive and negative by participants.
- Five main strands of thought emerged from focus groups:
  - o Meat-eating is natural and so too is xenotransplantation – both reflect our natural relations to animals.
  - o Meat (and leather) are processed – something humans have always done. Xenotransplantation is a continuation of this natural technological relationship to animals.

- Meat (and leather) are processed, which reflects our unnatural technological relation to animals and our (negatively perceived) disposable society attitude. Xenotransplantation is no different, raising similar concerns.
  - Meat is derived from artificial animals (bred for that purpose) because it is needed. Similarly, xenotransplantation entails the production of particular animals because they're needed.
  - Conversely, meat is no longer needed as there are alternative sources of nutrition – it is now a matter of choice, as it is for xenotransplantation.

Lundin S (2002) Creating identity with biotechnology: the xenotransplanted body as the norm *Public Understanding of Science* 11(4): 333-45

Abstract: One of today's great issues is how an advanced medical technology like xenotransplantation should be applied. It is well known that medicine brings not only potential but also risk. On the cultural level, xenotransplantations are equally complicated; they arouse thoughts about whether our outlook on humanity will be influenced now that modern techniques can "correct" our defective bodies. The article asks whether xenotransplantation creates new cultural meanings. That is, how do newly emerging ideas of a technologically created normality raise a set of moral questions about nature and culture, mind and body? The discussion is based on interview studies with patients suffering from diabetes and Parkinson's disease. The former have been given porcine islets, while the others have had human fetal cells transplanted into the brain; the latter are also potential recipients of xenotransplants. This empirical material becomes the basis for discussing how diseases can lead to a crisis in which it is essential—on a concrete, everyday level—to find strategies for dealing with the consequences. In this process of identity and normalization, advanced biomedicine is an important factor.

Method: Discussion based on two qualitative interview studies and a quantitative investigation of attitudes. One interview group consisted of people with Parkinson's disease who had received human embryonic cells and were potential recipients of xenotranplants (n=19); the other consisted of diabetic patients who had received pig cells (n=10); the third study was a statistical investigation of the Swedish public's attitude towards transplantations (n=1000).

Results:

- People can have a negative view of xenotransplantation in general, but accept it in specific circumstances – the unnatural encroachment into people's lives versus the importance of supporting biomedical research that saves lives. In this, illness and death become unnecessary or unnatural phenomena which require artificial efforts to allow individuals to recover the naturalness of living. This rationalisation can de-technologise biomedical interventions, and instead assume the role of nature's helper.

- The idea that someone can be negative to biotechnology generally ("*it is immoral to transplant fetal cells and wrong to cross species barriers*") but accept a similar treatment for their own or close relative's sake. Fundamental ideas about sacredness and integrity of nature are interwoven with other values, such as the belief in the power of technology. Even if there is uneasiness about such technology, it can also offer a healthier life ("*With cell transplantation, I can maybe become normal again*").
- Many felt that their natural and real self could be restored using technology – there was no conflict between the fear of unnatural techniques and the desire to be healthy, natural, and normal.

Assisted reproduction/childbirth and cloning

Scully JL, Shakespeare T and Banks S (2006) Gift not commodity? Lay people deliberating social sex selection *Sociology of Health & Illness* **28(6): 749-67**

Abstract: In this paper we explore lay people's discussions of the controversial topic of social sex selection (SSS). In the UK and many other countries, SSS is prohibited by law. In 2003 the UK Human Fertilisation and Embryology Authority, after an extensive public consultation, decided against changing the existing legislation. However, this initiative and similar consultation exercises have been criticised on the grounds that public opinion is poorly informed and reasoned. In our study, one of the most consistently expressed ideas was that children should be regarded as 'a gift' rather than 'a commodity'. In contrast, the 'gift not a commodity' argument is rarely cited positively in Anglo-American, secular-liberal bioethics. These metaphorical statements are condensed articulations of complex but coherent moral intuitions. Where much of the bioethics literature stresses parental autonomy, our lay discussants balanced this principle with ideas about the need to respect the personhood of the potential child, and the characteristics of a good parent. We conclude our analysis by considering the implications for expanding bioethics' knowledge base and improving the input of lay people in bioethical decision making.

Method: Discussion of some of the findings from the research project 'Ordinary Ethics: the moral evaluation of the new genetics by non-professionals', which studied lay people's ethical evaluations about biomedical technologies.[2] 10 group discussions based on a scenario about prenatal sex selection by PGD held during 2002-4 in north-east England.

Results:

- One of the most common and extensively discussed themes was the idea that children should be viewed as a gift, as opposed to a commodity or a right.

  > "*I think that having a child is not some kind of human right to which you can attach conditions, whatever those conditions are… I feel that quite strongly. I think that's actually wrong, to me that is a wrong way of looking at having children. I would prefer to look at it as a gift, something like that.*"

- Apart from one, participants were not framing their concerns in overtly religious terms. Instead, the idea that a child is a gift is a metaphor, which is used to convey how parents should relate to their children – to accept them as they are, and not want to change their characteristics.
- Participants also expressed the idea that the lack of control in gift-receiving entails surprise on the part of the receiver. In the reproductive context, unpredictability is important.

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[2] Banks S, Scully JL & Shakespeare T (2006) Ordinary ethics: lay people's deliberations on social sex selection.

"In a way [social sex selection] could be setting limits to what that child is going to be instead of letting the random element come into it. I don't know enough about the science. Perhaps a random element comes into it anyway. In which case, good!"

Kalfoglou AL, Doksum T, Bernhardt B et al. (2005) Opinions about new reproductive genetic technologies: hopes and fears for our genetic future *Fertility and Sterility* 83(6): 1612-21

Abstract: Objective: To identify underlying beliefs and values shaping Americans' opinions about the appropriate use of new reproductive genetic technologies (RGTs), including preimplantation genetic diagnosis, hypothetical genetic modification, and sperm sorting for sex selection. Design: Scenarios with ethical dilemmas presented to 21 focus groups organized by sex, race/ethnicity, religion, age, education, and parental status. Setting: A city in each state: California, Colorado, Massachusetts, Michigan, and Tennessee. Participant(s): One hundred and eighty-one paid volunteers, ages 18 to 68. Intervention(s): None. Main Outcome Measure(s): Beliefs and values that shape participants' opinions about the appropriate use of new RGTs. Result(s): Regardless of demographic characteristics, focus group participants considered six key factors when determining the appropriateness of using RGTs: [1] whether embryos would be destroyed; [2] the nature of the disease or trait being avoided or sought; [3] technological control over "natural" reproduction; [4] the value of suffering, disability, and difference; [5] the importance of having genetically related children; and [6] the kind of future people desire or fear. Conclusion(s): Public opinions about the appropriate use of RGTs are shaped by numerous complementary and conflicting values beyond classic abortion arguments. Clinicians and policy-makers have the opportunity to consider these opinions when creating messages and crafting policy.

Results:

- Some participants thought that technological intervention in reproduction, especially the manipulation of embryos, was unnatural or playing God, although both religious and secular rationales were given for why it was problematic.

  "I don't think that you can just discard an embryo that has been fertilised, or change that in any way because I just don't believe that that is the way God intended it to be… I think that's an ethical thing, and I think that's God's choice and not mine, or the doctor's or anybody else's."

- The idea that using reproductive genetic technologies is playing God or unnatural was common to many of the focus groups, not just religiously orientated participants.
- Some religious participants (Evangelicals and Catholics) expressed the idea that everything in life happens for a reason as part of God's divine plan, and that the use of these technologies reflects a lack of faith in this plan.

- When challenged by other participants, some of those who thought that reproductive genetic technologies were unnatural or playing God were persuaded that using reproductive technologies to avoid disease is not all that different from other medical interventions.

Monson O and Donaghue N (2015) "You get the baby you need": negotiating the use of assisted reproductive technology for social sex selection in online discussion forums *Qualitative Research in Psychology* **(ahead-of-print): 1-16**

Abstract: As a result of developments in assisted reproductive technology (ART), it is now possible to choose the sex of a baby. However, the procedures are currently not allowed for this purpose in Australia. This article explores how the positions for and against the use of ART for social sex selection are constructed by parents and parents-to-be in online discussion forums. Critical Discourse Analysis is employed to identify the arguments, evidence and experience drawn upon in the negotiation of the topic. We identify an important distinction between the legitimacy of using ART procedures for social sex selection, and the appropriateness of individuals actually wanting to use the procedures. We further show that expectations about the parent/child relationship, the nature of parental love and implications for society are mobilized in the debate, much of which is underscored by traditional gender constructions.

Method: Data was gathered from six threads from online forum discussions on three Australian parenting websites: 'The bub hub', 'Birth' and 'Natural Parenting'. The discussions took place between December 2007 and September 2009. There were a total of 179 posts from 97 posters. The three parenting websites all offer information and articles relating to conception, pregnancy, birth and parenting.

Results:

- People who wish to select sex were sometimes framed negatively as controlling.

  > *"TTC [trying to conceive] naturally doesn't give you a choice, so why do they want to be so controlling on what should be one of the few exciting surprises in life".*

- The invocations of nature and natural processes in these discussions was used to frame the *desire* to select sex, as well as PGD itself, as unnatural. The authors argued that nature was being interpreted as representing balance, order and the way things are meant to be. Those who wish to select the sex of their child are constructed as trying to control things they shouldn't. Instead, they should let nature surprise them and give them what they need.

  > *"… I believe that you don't get the baby you want, you get the baby you need… my babies are here to teach me something, and each of them are people in their own right. It is not up to me to design the people I want in my life. It is up to me to nurture the people that into my life…"*

- This construct of nature as connected to fate was a powerful idea within the discourses and is linked to the notion of unconditional acceptance of the children that nature gives parents. If parents attempt to design the people they want in their lives, they are crossing a boundary and disturbing the natural order.
- The idea of nature positions parenthood as a matter of destiny, suggesting that, rather than try to control nature, parents should give themselves over to it.

Throsby K and Gill R (2004) "It's different for men" masculinity and IVF *Men and Masculinities* 6(4): 330-48

Abstract: Drawing on interview data with men and women who have engaged with in vitro fertilization (IVF) unsuccessfully, this article explores the ways in which men experience and make sense of the failure of treatment. Focusing on men's experiences of infertility, their perceptions of IVF as a technology, and their involvement in the IVF process, the analysis highlights the ambivalent relationship between men and IVF as a technology; the predominance of hegemonic masculine culture in mediating the meaning of IVF for both men and women, particularly in relation to the association of fertility and virility in the normative construction of masculinity; and the very traditionally gendered emotional scripts that structure the experience of IVF and its failure.

Method: 15 women and 13 heterosexual couples who had undergone unsuccessful IVF were interviewed to assess their experiences, with a particular focus on the views of the men.

Results:

- Men repeatedly disavowed that IVF is a technological procedure. This was less about denying the technological features of IVF, but rather claiming that this intervention was natural. This view was sometimes elaborated overtly, and contrasted with their perceptions of other medical interventions, such as gene therapy and cloning.

  "It was natural… It was just the mechanisms of it that were assisted. It wasn't like cloning sheep or growing ears on the back of mice or things like that".

- The contrast with futuristic high-tech interventions was commonly used to render IVF as familiar by comparison and to enhance the claim that it is just another way of doing what nature does – a mechanical aid to a natural process.

Stoll K, Fairbrother N, Carty E et al. (2009) "It's all the rage these days": university students' attitudes toward vaginal and cesarean birth *Birth* **36(2): 133-40**

Abstract: Background: At 30 percent, British Columbia has the highest cesarean section rate in Canada. Little is known about the childbirth views and birthing preferences of college-aged women and men. The objectives of this study were to document (a) the prevalence of cesarean versus vaginal delivery as the preferred mode of delivery among non-pregnant university students without a history of childbirth, (b) the reasons for reported childbirth preferences, and (c) confidence in vaginal birth as a predictor of childbirth preference. Methods: A cohort of 3,680 male and female university students without a history of childbirth participated in an online survey of childbirth preferences. The study used a mixed methods approach (quantitative thematic analysis and logistic regression modeling). Prevalence of, and reasons for, preferred mode of delivery were analyzed separately for male and female respondents. Results: Most men and women responded that they preferred vaginal delivery, with 9 percent stating a preference for cesarean delivery. Reasons for preferred mode of delivery were similar for men and women. For women, confidence in vaginal birth emerged as a significant predictor of childbirth preference. Conclusions: Results indicate that a preference for cesarean section is linked to fear of childbirth and driven by low confidence in vaginal birth. Educational strategies targeting university-aged men and women may be helpful in alleviating fears of vaginal birth and providing evidence-based information about different birth options.

Results:

- Most respondents indicated a preference for vaginal delivery (91.2% of women and 91.6% of men); only 8.8% of women and 8.4% of men preferred C-section.
- The foremost reason for the preference for vaginal delivery was ideas surrounding normalness and naturalness.

  "It is natural and I would like me and my baby to experience it".

  "I believe pregnancy is a natural process and that deviating from nature when it is not necessary complicates it further".

- Vaginal deliveries were also associated with being safer and healthier, with fewer risks and complications.

  "My body was built for birthing, and I believe I should celebrate its capabilities, not subject it to unnecessary harm".

Shepherd R, Barnett J, Cooper H et al. (2007) Towards an understanding of British public attitudes concerning human cloning *Social Science & Medicine* **65(2): 377-92**

Abstract: The ability of scientists to apply cloning technology to humans has provoked public discussion and media coverage. The present paper reports on a

series of studies examining public attitudes to human cloning in the UK, bringing together a range of quantitative and qualitative methods to address this question. These included a nationally representative survey, an experimental vignette study, focus groups and analyses of media coverage. Overall the research presents a complex picture of attitude to and constructions of human cloning. In all of the analyses, therapeutic cloning was viewed more favourably than reproductive cloning. However, while participants in the focus groups were generally negative about both forms of cloning, and this was also reflected in the media analyses, quantitative results showed more positive responses. In the quantitative research, therapeutic cloning was generally accepted when the benefits of such procedures were clear, and although reproductive cloning was less accepted there was still substantial support. Participants in the focus groups only differentiated between therapeutic and reproductive cloning after the issue of therapeutic cloning was explicitly raised; initially they saw cloning as being reproductive cloning and saw no real benefits. Attitudes were shown to be associated with underlying values associated with scientific progress rather than with age, gender or education, and although there were a few differences in the quantitative data based on religious affiliation, these tended to be small effects. Likewise in the focus groups there was little direct appeal to religion, but the main themes were 'interfering with nature' and the 'status of the embryo', with the latter being used more effectively to try to close down further discussion. In general there was a close correspondence between the media analysis and focus group responses, possibly demonstrating the importance of media as a resource, or that the media reflect public discourse accurately. However, focus group responses did not simply reflect media coverage.

Method: Four elements: British survey of about 2500 adults in 2003; an experimental vignette study involving 368 British adults in 2004; 10 focus groups carried out between 2004 and 2005 in the UK; and a media analysis.

Results:

- In the focus groups, interfering with nature and the status of the embryo were the main themes invoked in arguments against the permissibility of cloning technologies. Typically, they were drawn upon early in such discussions and may be interpreted as means by which further discussions of the permissibility of cloning technologies may be closed down.

  > *"Just leave things alone. You don't know what you're doing.*
  > *You know, the Frankenstein thing. What? You're interfering*
  > *with nature. You're playing God."*

- While an individual might indicate they were opposed to cloning on the basis that it was interfering with nature or that the embryo was actually a human life, the former was more frequently challenged by other participants. Typically, these contestations of cautions against interfering with nature were based on the questioning of the historical and cultural stability of the concept of nature.
- Participants who regarded themselves as belonging to a particular religion were more likely to agree that cloning threatens the natural order of things.

Cosmetic surgery

Clarke LH and Griffin M (2007) The body natural and the body unnatural: beauty work and aging *Journal of Aging Studies* **21(3): 187-201**

Abstract: This paper examines older women's perceptions of natural and unnatural aging in relation to the use of beauty work interventions, including anti-wrinkle creams, cosmetics, hair dyes, cosmetic surgeries, and non-surgical cosmetic procedures. The data are drawn from in-depth interviews with 44 women aged 50 to 70. The women tended to define natural aging as a lack of beauty work intervention and argued that this was a commendable goal. However, the majority engaged in beauty work and many articulated the importance of producing a 'natural look' through their beauty practices. While some women argued for an acceptance of the physical realities of growing older, others asserted that an aged appearance should be fought against using whatever beauty work interventions were required and available. We discuss the meanings that the women attribute to natural and unnatural aging in relation to the literature concerning ageism, the body, cosmetic surgery, nature, and technology.

Method: Data drawn from in-depth interviews with 44 women aged 50 to 70 in Canada examining perceptions of natural and unnatural aging in relation to the use of beauty work interventions, including anti-wrinkle creams, cosmetics, hair dyes, cosmetic surgeries, and non-surgical cosmetic procedures.

Results:

- Concept of natural ageing is complex and taken for granted in women's perceptions of beauty, beauty work and ageing. Some women defined natural ageing in terms of lack of cosmetic procedures, whilst others suggested that it entailed the use of beauty products and cosmetic interventions (both surgical and non-surgical) to maintain a natural look.
- Definitions of natural ageing characterised by contradictions between attitudes and actual beauty work behaviours – 31 of 44 women suggested that a natural body was an unaltered one.

    "Natural aging would be just…aging without trying to alter what's happening…letting aging become aging without using any chemicals or other substances to change your appearance."

- Whilst many of the women endorsed this definition, the majority did not actively embrace this perspective and nearly all of the women engaged in some form of beauty work: make-up (37); hair dye (27); anti-wrinkle cream (16); non-surgical cosmetic procedures (21); surgery (4). The respondents suggested that the use of cosmetic procedures (surgical and non-surgical) distinguished natural ageing from not ageing naturally.

    "I think you can take care of your skin and use the creams and the cleansers. That's still natural for me because you're caring

for yourself. If you do any cuts, or do any Botox — anything like that, to me, is not natural. Like, caring for yourself, your body, your exercise, your diet, your — what do you call that? Your ritual, your cleansing, that is natural."

- Respondents who rejected the use of cosmetic procedures perceived natural ageing to be a positive. Some also spoke of the perceived dangers of interfering with this natural process using surgical and non-surgical interventions.

  "People get needles stuck in their face… but I don't think there is anything wrong with looking your age. Some people look far older than what they are but I imagine that things happen in their life and that's why that is. But I can't see doing these things to yourself. It can't be good. You're messing with nature is what you're doing. You can't screw around with nature as far as I am concerned because there is a payback in the end."

- Descriptions of celebrities who had undergone excessive cosmetic enhancement were used to convey the message that technological intervention could result in an unnatural look when taken too far, and that one must strive for a natural result even while resisting natural ageing through the use of these procedures. These examples were used to express the concern that cosmetic procedures put the individual at risk of looking unnatural. Unnatural ageing was defined as faces that lacked expression or appeared fake and obviously altered.

  "I saw a couple ladies about two or three months ago. I know they had had something done. I mean they were easily, 65… And I thought that no way does that look natural. They were all shiny. There were no wrinkles. They were beaming. They thought they looked gorgeous. And I guess they might of looked gorgeous in comparison to what they looked like before but to me they didn't look natural at all… There were no wrinkles around the lips… and I was studying the neck trying to see wrinkles on the neck, which I did see. I thought, 'I don't get the point of that. So your face looks good, but you take your clothes off or you lower your collar and you're an old lady. Why would you do that?'"

  "I look in the mirror and I see all my wrinkles and I think, 'Oh well, that's normal.' I have seen people with Botox, for example, and it looks phony to me. Might not to them. There are people who had Botox to get rid of these wrinkles and then they have a big puffy lip and it just looks so unnatural."

- Consumers of cosmetic procedures argued that the aim of these interventions was to look natural. The respondents distinguished between good and bad

interventions based on how natural the results looked, as well as how easy it was for others to detect that the individual had undergone a procedure.

> *"I think I would get a facelift just to help me age gracefully because your body doesn't help you, let me tell you… It's not like I'm trying to make my face look younger but let my body go. I am working on keeping fit… but it doesn't matter how much I exercise, my face isn't going to look any younger. In fact, you can look older if you're really out there in the weather a lot... I'm doing my part by at least by exercising three times a week and trying to be concerned about what I eat, you know, and drinking water, and taking some vitamins, and taking calcium. Why shouldn't I get [cosmetic procedures]? I'm doing everything else… And, yeah, it is supposed to look natural. So why would you tell? That would take away the fantasy... they would look differently at you, and you would look differently at yourself."*

> *"A good job is fine and a bad job is not…That's the thing, isn't it. So a good job is fine, no matter what they do. And that's because people don't know. People don't know, and they're more pleasing to look at. As opposed to having some surgery done, and now they look very strange."*

> *"It used to be like dyeing your hair. Now you probably don't remember that but I can remember when people would say, 'Oh! She dyes her hair.' That was considered something you didn't share with everybody. So maybe it's like that. These procedures — things where you're altering your appearance but presenting as natural as opposed to just getting your hair cut or something — you're admitting that you're not quite up to snuff with what nature gave you. So you're trying to improve it a little bit. Whereas a new outfit is, you know, that's an accessory…But maybe things that we're trying to pass off as being natural or part of us, we're a little ashamed when we have to admit, 'This isn't really me. I had to make some sort of a change.'… Yeah, and natural-looking hair, natural-looking skin. Yeah. It's all supposed to look as though you haven't had to doctor it or enhance it, or change it."*

- Some respondents who had not had any cosmetic procedures tended to argue that an altered or unnatural appearance resulted in an inauthentic mask that hid the true self.
- Most of the participants defined natural ageing as a body untouched by culture – the absence of beauty products and cosmetic procedures. The unmodified body was perceived as pure, authentic, and laudable. However, the majority also engaged in some form of beauty modification.
- Non-surgical and surgical interventions were perceived to be unnatural, while cosmetics, anti-wrinkle creams, and hair treatments were seen as required

aspects of female beauty work. Many respondents thought this distinction would diminish in the future as cosmetic procedures become increasingly acceptable.

Clarke LH, Repta R and Griffin M (2007) Non-surgical cosmetic procedures: older women's perceptions and experiences *Journal of Women & Aging* **19(3-4): 69-87**

Abstract: This paper analyzes findings from in-depth interviews with 44 women aged 50–70 regarding their perceptions of and experiences with non-surgical cosmetic procedures such as Botox injections, laser hair removal, chemical peels, microdermabrasion, and injectable fillers. While 21 of the women had used a range of non-surgical cosmetic procedures, 23 women had not. The data are discussed in light of feminist theorizing on cosmetic surgery which has tended to ignore the experiences of older women and has been divided in terms of the portrayal of cosmetic surgery as either oppressive or liberating. We found that some of the women used the procedures to increase their physical attractiveness and self-esteem, others viewed the procedures as excessively risky, and still others argued that the procedures stemmed from the social devaluation of later life. Treatments that involved the alteration of the surface of the body tended to be viewed as less risky than the injection of foreign substances into the body.

Method: In-depth interviews with 44 women aged 50-70 regarding their perceptions and experiences of non-surgical cosmetic procedures – 21 had used a range of non-surgical cosmetic procedures, 23 had not.

Results:

- Referred to celebrities as examples of how Botox can result in an unnatural and unappealing appearance.

    "I've actually had patients who had Botox and they just don't look right. I had a patient the other day who was 69 and when I entered the waiting room to call her in, I couldn't see anybody who looked that age. There was this lady who looked like she was in her 50s and I called her and it was her. And I said, 'Oh you look great!' But close up, she didn't!.. She had no lines at all and her face was so stretched. It looked like a mask actually. It looked really odd… I think you need some natural lines. And we've had a few patients like that who've obviously had some, and it just looks so taut that it doesn't look natural. You see the Joan Rivers type and they just don't look natural, with no lines?"

Askegaard S, Gertsen MC and Langer R (2002) The body consumed: reflexivity and cosmetic surgery *Psychology & Marketing* **19(10): 793-812**

Abstract: We live in a time with increasing focus on the body and its perfection. The marketing environment is replete with products and services catering to the health, well-being, and beauty of bodies and, it is implied, of our souls. One of the more drastic and consequently also much debated and, at times, tabooed type of service and consumption within this field is cosmetic surgery. This article is based on interviews with 15 women who have had cosmetic operations. It examines what motivated their decision to have surgery; some of their thoughts and feelings before, during and after the process; and the ways in which the operation has influenced their life and self-identity subsequently. The material is analysed within a theoretical framework resting mainly on Anthony Giddens' work on self-identity in late modernity. This implies that cosmetic surgery is understood to be part of the individual's reflexive construction of self-identity, and leads to a focus on issues such as self-determination, self-esteem, and the relationship between body and identity. Finally, some relations between self-identity and the marketing institution are discussed.

Method: Discussion based on interviews with 15 women who had undergone cosmetic procedures.

Results:

- Ageing was perceived as something that was intrinsically problematic by the respondents. Some felt that ageing ought to be seen as natural and that they must accept it, but that they found this hard. One woman claimed that one should not have surgery to appear younger, but that "wanting to look good for one's age – that's natural."
- Although none of the respondents regretted their surgery, most expressed some concern with the general growth in cosmetic procedures, and thought that there were limits to what is acceptable. Concepts of natural (positively valued) versus unnatural (negatively valued) were central to their assessments of acceptability.
- Some described the features that they had received surgery for as unnatural, and that they could not live with the way they had been.
- Some participants used the term artificial to describe surgery that had gone too far, with references to celebrities that were perceived to have had too much surgery (e.g. Joan Collins, Michael Jackson, Cher). Nearly all the respondents distanced themselves quite strongly from these users.

Muise A and Desmarais S (2010) Women's perceptions and use of "anti-aging" products *Sex Roles* 63(1-2): 126-37

Abstract: Recent advances in the cosmetics industry have accelerated the availability of products marketed as "anti-aging." Our research goals were to identify the factors that predict women's purchase of these products, and to gain insight into women's perceptions of the anti-aging market. Three hundred and four Canadian women were surveyed about their use of anti-aging products, body satisfaction, aging anxiety, appearance importance, sociocultural pressures and self-esteem, as

well as open-ended responses about their perceptions of anti-aging products. Greater aging anxiety and higher importance of appearance were related to greater likelihood of purchasing anti-aging products. Women also described an interesting paradox whereby they report using these products while remaining critical of media messages and embracing the idea of natural aging.

Method: 304 Canadian women were surveyed about their use of anti-aging products, body satisfaction, aging anxiety, appearance importance, sociocultural pressures and self-esteem, as well as open-ended responses about their perceptions of anti-aging products.

Results:

- Some respondents stressed the importance of embracing ageing, although ideas about natural and graceful ageing often included appearance maintenance strategies – physical appearance should not become an obsession, but maintaining an appearance that makes one feel good is an important part of taking care of oneself.
- Often, cosmetic surgery was not perceived as part of natural ageing, but cosmetics could be – natural ageing meant "no surgeries, but maintaining your system properly; taking care of yourself without drastic procedures" or "being healthy, happy and fit without cosmetic surgery. I think one can age naturally and still use cosmetics and hair dye and wear fashionable clothing".

Rubin LR, Chavez J, Alderman A and Pusic AL (2013) 'Use what God has given me': difference and disparity in breast reconstruction *Psychology & Health* 28(10): 1099-120

Abstract: African-American women are significantly less likely to undergo post-mastectomy breast reconstruction compared to white women in the USA. These observed differences have been interpreted as evidence of a healthcare disparity. The current study examines breast reconstruction decision-making among African-American women, locating reconstruction decisions in a context of culture, racial inequality and biomedicalisation. Semi-structured interviews were conducted with 27 African-American women who underwent mastectomy for breast cancer to add patient-centred perspectives to existing conceptualisations of racial/ethnic differences in reconstruction. Participants were socio-demographically diverse, and resided in the New York metropolitan area. Data analysis was informed by grounded theory. Spiritually and culturally informed body ethics often guided surgery decisions. Participants expressed reservations about breast implants, preferring autologous procedures that use 'what God has given'. For some, breast reconstruction restored a sense of normalcy after cancer; others challenged an imperative to reconstruct. Several participants redirected our focus on access to reconstruction toward access to alternatives, noting the low reimbursement for prostheses, or their unavailability in patients' skin tones. We suggest that a framework of 'stratified biomedicalization' better addresses the complexities of race, class and gender that inform preference,

access and recommendations for breast reconstruction, and focuses attention on access to high and low-tech interventions.

Results:

- Concerns about implants were captured by the oft-repeated refrain of wanting nothing foreign in the body.

  "I don't believe in implants…I don't want anything foreign in my body that I don't need foreign."

  "I was going into surgery…to remove a foreign antibody… to consider putting something else foreign in my body was just something I could not accept."

  "I wouldn't want to put any foreign thing in my body unless it's ultimately [necessary] for life."

- Echoing other qualitative studies of body image and health meanings among African-American women, an ethic of body acceptance, informed by the notion that the body is a gift from God, informed participants' reconstruction decisions.

  "They spoke about implants, but being African-American, and Pentecostal Holiness…I believe in pureness of the body…everything natural. I had dreads, which is natural, no chemicals, no nothing. … I just got a way of more into the naturalness of the beauty… Whatever God says, that's what it is, that's where my heart is at."

- For some participants, this translated into a rejection of all reconstruction, including tissue transfer surgeries. For others, it was not reconstruction per se, but specifically breast implants, which were problematic.

  "Use me. Use my flesh … Give me the natural thing. Use what God has given me, use whatever tissues, take it from the thighs…take it from the back, but use my stuff… I don't want nothing, no more foreign stuff put in me."

Complementary and alternative medicine

Nissen N (2015) Naturalness as an ethical stance: idea(l)s and practices of care in western herbal medicine in the UK *Anthropology & Medicine* **(ahead-of-print): 1-15**

Abstract: An association of non-biomedical healthcare with appeals to nature and naturalness, and an invocation of a rhetoric of gentleness, goodness, purity and moral power has been noted previously, and some scholars argue that nature has taken on a meaning broadly opposed to the rational scientific order of modernity. Drawing on an ethnographic study of women's practice and use of western herbal medicine (WHM) in the UK, the intertwining of the perceived naturalness of WHM with distinct care practices points to a further avenue for exploration. To examine patients' and herbalists' discourses of the naturalness of WHM and associated idea(l)s and practices of care, understandings of nature and a feminist ethics of care are utilized as analytical frameworks. The analysis presented suggests that, through WHM, patients and herbalists become embedded in a complex spatio-temporal wholeness and web of care that intertwines past, present and future, self and others, and local and global concerns. In the emerging 'ordinary ethics of care', naturalness constitutes a sign of goodness and of a shared humanity within the organic world, while care, underpinned by idea(l)s of natural and holistic care practices, links human and non-human others. Thus, the naturalness of WHM, as perceived by some patients and herbalists, engages and blends with a continually unfolding field of relationships in the lifeworld(s), where care practices, caring relations and collective wellbeing may constitute an ethical stance that raises deeper questions about the significance of relationality, the values of care/caring and the mutual involvement of nature and human being(s).

Method: Interviews conducted with six herbalists and nine female patients in the UK in 2004-5.

Results:

- Notions of nature and naturalness were often interwoven with ideas about traditions and historical practices of healing.

    "Traditional treatments have been around a lot longer [than biomedical treatments]; one would be going back to the natural beginning of things, to natural ways of healing".

- Nature and tradition held connotations of gentleness, goodness, wholeness and safety – herbal medicines and caring for oneself naturally were perceived to be healthier and better for the environment.
- Both patients and herbalists used multiple meanings of nature and naturalness – herbs as nurturing and gentle, but also as potentially unsafe; herbal medicine as natural and traditional; and the nature of herbal medicine as being beyond human understanding.