

Immoral advances

When research raises deeply felt objections, it's not enough just to dismiss them as "irrational", says **Dan Jones**

WHAT would our forebears have made of test-tube babies, microwave ovens, organ transplants, CCTV and iPhones? Could they have believed that one day people might jet to another continent for a weekend break, meet their future spouse on the internet, have their genome sequenced and live to a private soundtrack from an MP3 player? Science and technology have changed our world dramatically, and, for the most part, we take them in our stride. Nevertheless, there are certain innovations that many people find unpalatable.

A focused campaign on embryo research changed attitudes in the UK

Leaving aside special-interest attitudes such as the fundamentalist Christian denial of evolution, many controversies over scientific

advances are based on ethical concerns. In the past, the main areas of contention have included nuclear weapons, eugenics and experiments on animals, but in recent years the list of "immoral" research areas has grown exponentially. In particular, reproductive biology and medicine have become ripe for moral outrage: think cloning, designer babies, stem-cell research, human-animal hybrids, and so on. Other troublesome areas include nanotechnology, synthetic biology, genomics and genetically modified organisms or so-called "Frankenfoods".

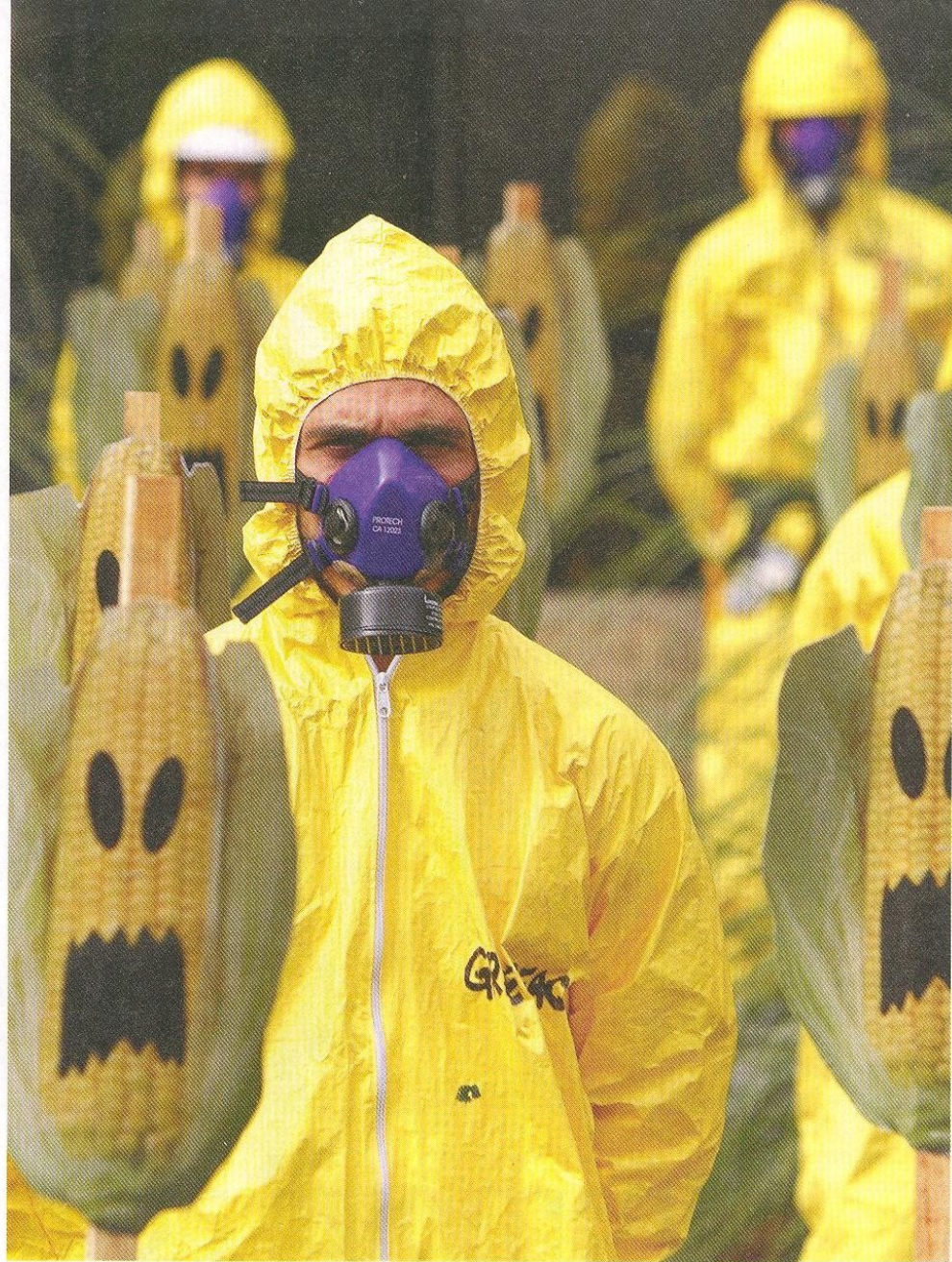
To many scientists, moral objections to their work are not valid: science, by definition, is morally neutral, so any moral judgement ►

on it simply reflects scientific illiteracy. That, however, is an abdication of responsibility. Some moral reactions are irrational, but if scientists are serious about tackling them – and the bad decisions, harm, suffering and barriers to progress that flow from them – they need to understand a little more and condemn a little less.

Do not play God

So what are the snares people step into when trying to work their way through the moral dimension of science? Some of the most common are to do with the simple rules of thumb, or heuristics, that we use to make sense of the world. Heuristics can be thought of as tools in our mental toolbox that have evolved over millennia to help us make fast decisions in complex situations or where information may be limited, such as when choosing between various options or making everyday predictions. A particularly pervasive example in the moral domain is the injunction “Do not play God” or, in more secular terms, “Do not tamper with nature”. These axioms make intuitive good sense but have led to some of the most bitter clashes between science and morality (see “Some things are sacred”).

Take our attitudes to food production. Cass Sunstein, an adviser to Barack Obama and the Felix Frankfurter Professor of Law at Harvard University, points out that manufacturers go to great lengths to portray foods as natural, and that consumers attach considerable importance to these assurances. He argues that much of the public opposition to genetically modified organisms is founded on moral heuristics: GMOs are seen as unnatural and therefore morally unacceptable. This is an example of the naturalistic fallacy, a well-known pitfall in rational thought. More than a century ago, British philosopher John Stuart Mill wrote an essay called *On Nature* in which he argued that the term “natural” is “one of the most copious sources of false taste, false philosophy, false morality, and even bad law”. This is certainly the case with food, says Sunstein, where our tendency to see “natural”



foods as safer leads us to underestimate the cancer-causing potential of some such products and overestimate the dangers of pesticides, cloned livestock and GMOs (*Behavioral and Brain Sciences*, vol 28, p 531).

The problem with using moral heuristics to judge science is even starker in some popular perceptions of reproductive technologies. “Designer” babies are a case in point. IVF combined with genetic testing makes it possible to screen the cells of an embryo for specific gene variants before it is implanted into the womb. This pre-implantation genetic diagnosis is primarily used to filter out embryos with genes for heritable diseases, but in future it could be used to choose babies with desired traits, such as tallness or a particular eye colour, and perhaps even physical prowess, intelligence and aspects of personality. To take it to the extreme, parents of the future

may want to add new genes to the embryo to rig nature’s genetic lottery.

Many people view this as the ultimate hubris of scientists and parents wishing to play God. Lewis Wolpert, a developmental biologist at University College London, disagrees. “Instead of worrying about embryos, we should be worrying about children,” he says. Statistics compiled by the UK’s National Society for the Prevention of Cruelty to Children suggest that up to a quarter of children suffer from some sort of emotional, physical or sexual abuse. “You deny people the right to modify the child, but if they’re going to be the most terrible parents in the world you say, ‘All right, go ahead.’ This is absolute moral confusion,” Wolpert says.

Wolpert believes that knowledge, not a moral heuristic, is the best guide to thinking about the desirability of scientific or technological progress. So while he doesn’t

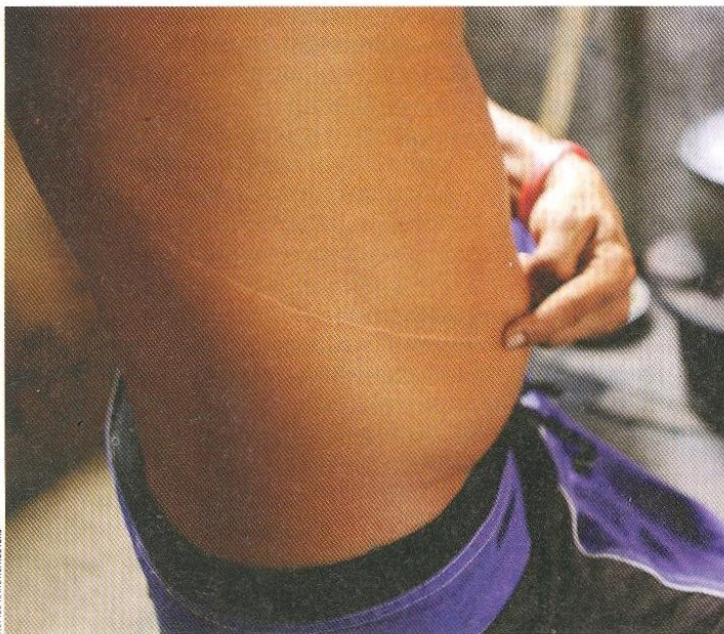
"GMOs are seen as unnatural and therefore morally unacceptable"

oppose "designer" babies on ethical grounds, he doesn't think there should be a genetic free-for-all either, because his own expertise has persuaded him this is an area where scientists should tread carefully. "You might think you know what you're doing when you put in new genes, but it's very tricky, and you're likely to produce abnormalities," he says. "I think it's a safety issue, not an ethical issue."

As societies become more scientifically literate, scientific developments may well be judged more from a position of knowledge and less on the basis of intuitive responses driven by moral heuristics. However, there is another serious obstacle to the rational approach: our emotions, and especially the most morally loaded of emotions, disgust. In the wake of the creation of Dolly the cloned sheep, bioethicist Leon Kass of the University of Chicago argued that the visceral feeling which many people have in response to the most contentious scientific advances embodies a kind of wisdom that is beyond the power of reason to articulate (*The New Republic*, vol 216, p 17). Many people are guided by this supposed "wisdom of repugnance".

Arthur Caplan, a bioethicist at the

► Should we legalise a market in scarce donor organs such as kidneys?



ROMEO GALIMBERTI/GETTY IMAGES

Some things are sacred

Certain issues can seem so clearly right or wrong that they are almost immune to rational consideration: for instance, when others seem to have put a value on something we deem sacred. Last August there was a public outcry in the UK when it emerged that the National Institute for Health and Clinical Excellence – which is charged with undertaking cost-benefit analyses of treatments for the National Health Service – had advised against the use of four drugs that could prolong the lives of people with kidney cancer, on the grounds that they were too expensive. The fact that a monetary value was being placed on human life – in this case, £24,000 a year – was considered a monstrously cold calculus. The advice has now been reversed.

Psychologist Philip Tetlock from the University of California, Berkeley, has been investigating this phenomenon. His research shows that people generally treat trade-offs between "sacred" values (a life, say) and "secular" values (such as money or efficiency) as morally outrageous, even taboo (*Trends in Cognitive Science*, vol 7, p 320). However, his study of attitudes to organ donation also suggests ways that we can reframe such issues to help us think about them more clearly.

Worldwide, there is a shortage of human organs for lifesaving transplants. One solution recently debated in the UK and Australia is to change the law from an opt-in to a "presumed consent" system, under which everyone is treated as a potential organ donor unless they actively opt out (*New Scientist*, 13 September 2008, p 11). Another even more contentious answer is to set up regulated markets

for buying and selling organs. For many, it is a gross violation of human dignity and sanctity to treat body parts as mere commodities, to be traded like pork bellies or oil. In Tetlock's study, most people were initially appalled by the idea, but 40 per cent of objectors toned down their opposition after hearing two arguments rationalising the proposal. The first was simply that such transactions are the best way to solve the organ shortfall and save lives that would otherwise be lost. The second made it clear that measures would be put in place to help the poor, so they would not be driven to sell their organs out of desperation, and would have access to replacement organs.

ACCEPTABLE TRADE-OFFS

Tetlock suggests that these points transformed what was seen as a taboo trade-off (the sacred quality of human body parts for the secular commodity of money) into something more palatable. The first argument makes sacred the secular side of the trade-off, replacing money with the sacred value of saving lives. This allows people to see the organ market as what Tetlock calls a "tragic" trade-off, in which competing sacred values are in the balance.

The second argument pits two secular concerns against one another in a "routine" trade-off: providing access to needed organs on the one hand, and preventing exploitation and inequalities in access to healthcare on the other. People are more willing to think about both routine and tragic trade-offs than taboo ones, says Tetlock, so this kind of reframing could be widely applied to help the public assess these sorts of difficult issues.

"Parents may one day want to add genes to the embryo to rig nature's genetic lottery"

University of Pennsylvania in Philadelphia, is not one of them. He has coined the more disparaging term "yuk response" to describe this reaction, and believes we should challenge the idea that repugnance is a reliable moral guide and the ultimate arbiter. "You begin the process by questioning the validity of the yuk response, calling it into doubt and pointing out that the yuk meter may be untrustworthy," says Caplan. Then it becomes possible to start exploring the reasons and justifications for people's initial intuitions of right or wrong, and see how they stand up to scrutiny.

Beyond the yuk factor

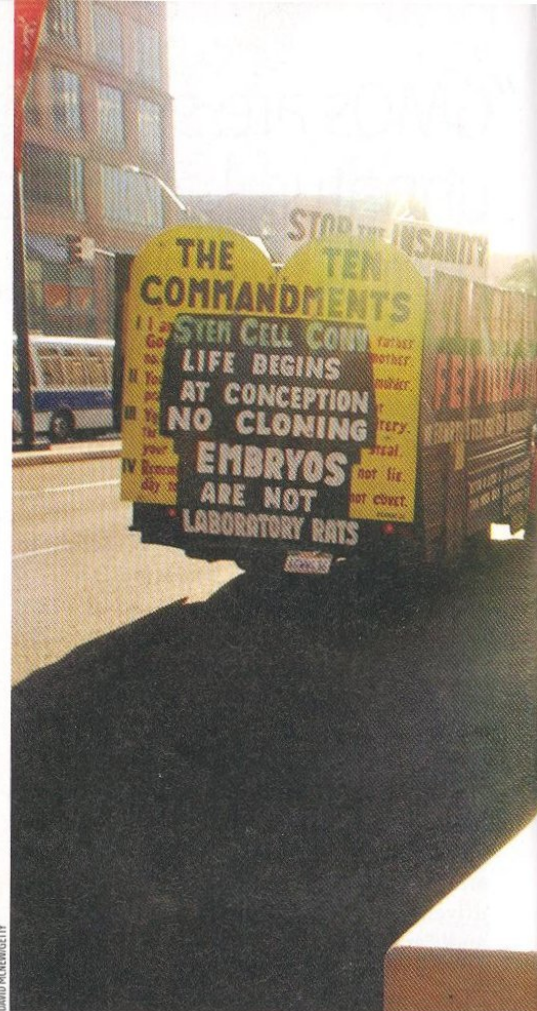
The power of this approach can be seen in the changing attitudes of the British public to the creation of human-animal hybrids, according to Fiona Fox, director of the Science Media Centre at the Royal Institution of Great Britain in London. This research involves removing DNA from an animal egg, substituting human DNA and then allowing the embryo to develop for 14 days before harvesting stem cells for research into diseases such as Parkinson's and diabetes. Two years ago, public consultations revealed widespread moral unease about such work, driven primarily by the yuk response. So in December 2006, the British government issued a draft bill that would make it illegal.

However, the scientists involved believed this was a bad decision that would close

a promising area of research, and decided to challenge the issue head-on. "For two years scientists repeatedly briefed journalists and explained to the public what this research involves and why they want to do it, all without over-hyping the science," says Fox, who helped arrange many of these meetings. Gradually public perceptions of the research changed from repugnance based on ill-informed notions about chimeras to an understanding of the lifesaving aims of the work. Earlier this year the bill was changed to allow the creation of human-animal hybrids and now looks set to pass into law. "Opinion polls say the public now accepts this research and parliament has voted for it. It's a fantastic story," says Fox, and one to which scientists who work in ethically contentious fields should pay heed.

Persuading people to rationalise their feelings about developments in science may be a good way to get a conversation going between researchers and the public, but it also exposes a crucial difference – one that goes beyond morality – in the way the two groups tend to see the world. It is only human to fear the unknown. We want firm assurances that everything will be OK, and are used to getting these from politicians and other public figures. But scientists spend their lives considering possibilities, risks and precise statistics, and so tend never to say "never".

This can lead to very different perceptions of a situation. A fascinating instance of this



happened last September when the Large Hadron Collider was switched on at CERN. There was speculation that the new accelerator might create a black hole that could destroy the world, and this so terrified several groups of people that they attempted to use the law to prevent the experiments going ahead. Many physicists said it was all nonsense, but the few who did accept there might be a minute possibility of catastrophe seemed quite sanguine about it, recognising that we blithely accept everyday situations that are far more risky.

Cynics have argued that the LHC episode was just a good publicity stunt. Nevertheless,

Tomorrow's moral minefields

MIND READING

Progress in neuroscience could usher in an era in which brain imaging reveals our deepest desires and secrets. The ability to peer inside our heads to discover when we are lying and whether we prefer one product, or perhaps even one sex or racial group, to another, raises profound worries about privacy as well as practical issues about how such technologies might be used in law courts or by marketing companies (*Trends in Cognitive Sciences*, vol 9, p 34).

ARTIFICIAL REPRODUCTION

Traditional ideas about procreation will be overturned if biologists succeed in creating artificial sperm and eggs, or even artificial wombs in which fetuses can grow outside of human mothers (*Nature*, vol 454, p 260). Some people will see these innovations in reproductive biology as welcome technological advances to help single or infertile people who want to have children. Others, however, are likely to view them as immoral attempts to play God.

"CURING" CRIMINALITY

The spectre of "fixing broken brains" looms as we gain more power to manipulate cognitive states with drugs and implants (*Trends in Cognitive Sciences*, vol 9, p 34). Using brain "enhancers" to treat psychiatric patients is contentious enough, but what if we could alter the thinking of criminals to "cure" their errant behaviour? Would that be an unconscionable infringement of individual liberty or a pragmatic solution to a social problem?



fear of the unknown does shape public opinion about scientific developments, and in new fields of research where uncertainty is high, it can be enormously powerful. Critics of nanotechnology, for example, have conjured up the image of out-of-control self-replicating nanomachines greedily eating up the world as they produce more copies of themselves – the dystopian “grey goo” scenario. Similarly, some detractors of advances in synthetic biology fear that newly created life forms could produce a comparable “green goo” meltdown.

Such speculations may be fanciful, but if they appeal to the public imagination they can be very difficult to dispel. Nevertheless, bioethicists Erik Parens, Josephine Johnston and Jacob Moses from the Hastings Center in New York suggest that there may not be quite as much unknown to fear as these scenarios suggest. They have recently argued that while new disciplines such as synthetic biology seem to present new concerns, in fact they often raise familiar ethical issues (*Science*, vol 321, p 1449). “We risk reinventing the ethical wheel with each new development, and squandering scarce resources,” says Parens.

Johnston also believes we must accept that often there are no definitive answers to these divisive problems. “We should engage in extended discussion in which we try to understand the very different perspectives

out there rather than adjudicating the one correct position,” she says. While this is already happening in some quarters, as the public debate over human-animal hybrids in the UK testifies, Caplan for one thinks much more could be done. “I remain unpersuaded that the scientific community takes seriously its responsibility to get into this,” he says. “They don’t care much what society thinks, so long as the money keeps rolling in.”

Wolpert believes part of the problem is that it is not clear what scientists should do. “Say you put on a whole series of television programmes about some topic. There’s just no research to see whether this changes people’s minds.”

GOT A PROBLEM WITH THIS?

Contentious research faces a variety of objections

FIELD	MAIN OBJECTION
Stem-cell research	Playing God
Cloning	Yuk factor
Genetically modified organisms	Unnatural
Human-animal hybrids	Yuk factor
Nanotechnology	Fear of the unknown
“Designer” babies	Playing God
Synthetic biology	Fear of the unknown

He suspects that face-to-face meetings between scientists and the public could be crucial. As an example, he cites a recent public vote on a proposal to restrict the use of GMOs in Switzerland. Scientists gave a series of impersonal public lectures opposing the measure, with little effect. “They were a total waste of time,” says Wolpert. “It was direct contact with small groups of people that made all the difference – the public see that the researchers aren’t Frankenstein.” Meeting the human face of science helps assure people that researchers are not an army of moral monsters and should be allowed to continue working with GMOs.

Even if openness, accountability and mutual understanding do not create consensus on the thorniest ethical issues, at least they can expose instances where our judgements are based on irrational thinking such as moral heuristics, feelings of disgust or fear of the unknown. The more we understand why we demonise certain scientific advances, the better we will be able to decide whether some areas of research are so sensitive they should always remain off limits to science (see “Tomorrow’s moral minefields”).

For scientists themselves, this is perhaps the most contentious issue. “It is very dangerous to try picking and choosing which truths we dare acknowledge,” says Nick Bostrom, director of the Future of Humanity Institute at the University of Oxford. “Such a practice destroys intellectual integrity, which is a fragile yet tremendously precious quality – one that we urgently need to grow if we are to handle wisely the existential challenges of the 21st century.”

Many researchers will share Bostrom’s robust view, yet even he acknowledges that some research projects may be harmful. We must all take part in the debate about what these might be. The onward march of science and technology is bound to continue to raise ethical issues. Only by scrutinising them can we make better decisions about how that progress shapes humanity’s future. ●

Dan Jones is a freelance writer based in Brighton, UK