Sociology of Health & Illness Vol. 28 No. 6 2006 ISSN 0141–9889, pp. 732–748
doi: 10.1111/j.1467-9566.2006.00465.x

Ethical boundary-work in the embryonic stem cell laboratory

Steven P. Wainwright[1], Clare Williams[1], Mike Michael[2], Bobbie Farsides[3] and Alan Cribb[4]

[1]*Division of Health and Social Care Research, King's College London*
[2]*Department of Sociology, Goldsmith's College London*
[3]*Brighton and Sussex Medical School, University of Sussex*
[4]*School of Social Science and Public Policy, King's College London*

Abstract Most accounts of the ethics of stem cell research are de-contextualised reviews of the ethical and legal literature. In this chapter we present a socially embedded account of some of the ethical implications of stem cell research, from the perspectives of scientists directly involved in this area. Based on an ethnography of two leading embryonic stem cell laboratories in the UK, our data form part of the findings from a larger project mapping the scientific, medical, social and ethical dimensions of innovative stem cell treatment, focusing on the areas of liver cell and pancreatic islet cell transplantation. We explore three key issues: what individual scientists themselves view as ethical sources of human embryos and stem cells; their perceptions of human embryos and stem cells; and how scientists perceive regulatory frameworks in stem cell research. We argue that these dimensions of laboratory practice are all examples of 'ethical boundary-work', which is becoming an integral part of the routine practice and performance of biomedical science. Our work adds to the relatively few sociological studies that explore ethics in clinical settings and to an even smaller body of work that explores scientists' views on the ethical issues relating to their research.

Keywords: stem cells, ethics, boundary-work, science, ethnography

Introduction

Innovative technologies have the potential to diagnose, treat and possibly even prevent illness and disease but they also raise new risks. In this chapter we highlight a set of important questions linking social studies of medical and scientific technologies with debates around the ethical, legal and policy dimensions of innovative but controversial biomedical practices (Cribb 2002, Williams *et al.* 2002a, 2002b, Callahan 2003). These technologies are redefining the scale, scope and the boundaries of science and medicine, and the relationship between biomedical technologies, science and the social (Brown and Webster 2004). As Thompson (2005) argues:

> The biotech mode of (re)production will have, and is already beginning to have, its own characteristic systems of exchange and value, its own notions of the dimensions we currently think of as time and space, its own epistemic norms, its hegemonic political forms, and its own hierarchies and definitions of commodities and personhood (2003: 5, cited in Franklin and Lock 2003: 7).

More specifically in relation to the escalating procurement of human body materials, Lock (2001) states that:

> the commodification of human cells, tissues and organs incites particular concern because boundaries usually assumed to be natural and inviolable are inevitably transgressed, raising concerns about 'self' and 'other', 'identity', 'genealogies', group continuity and so on (2001: 65).

Our work highlights the ways in which bioethics is grounded in the practices and units of analysis (particularly human embryonic stem (hES) cells and embryos) of laboratory scientists. In so doing, we support David's (2005: 18) assertion that different scientific fields have different social relations and histories which need to be studied, rather than attempting to apply one overarching model (not least of ethics) to 'science'.

Stem cell biology is one of the most rapidly developing areas within the life sciences (Kiessling and Anderson 2003). Stem cells are believed to hold the capacity to produce every type of cell and tissue in the body, suggesting huge potential in the fields of regenerative medicine and bioengineering. Proponents contend that stem cells promise a medical revolution in the treatment and cure of diverse and intractable degenerative illnesses such as Parkinson's disease and diabetes (Williams *et al.* 2003, Wainwright 2005). This optimism creates 'promissory capital', or capital raised for speculative ventures on the strength of promised future returns (Thompson 2005). According to Rabinow (1996a), this results in an important shift for the biosciences:

> More than ever before, the legitimacy of the life sciences now rests on claims to produce health . . . The bioscience community now runs the risk that merely producing truth will be insufficient to move the venture capitalists, patent offices, and science writers on whom the biosciences are increasingly dependent for their newfound wealth (1996a: 137).

Within this emerging context, scientists must nevertheless demonstrate their commitment to 'ethics': after all, over and above venture capitalists, patent offices and science writers, the audiences of science include various public and regulatory constituencies who, in one way or another, lend the whole bioscientific enterprise legitimacy. Importantly for us, the ethical and public policy debates on hES cells represent the concatenation of debates on cloning, genetic engineering, pre-implantation genetic diagnosis (PGD) and the human genome that have taken place in Europe (Nerlich *et al.* 2002) and the USA (Shostak 2002, Snow 2003). As such, stem cell research comprises a fruitful case study within which to explore the broader processes of the evolving bioscientific engagement with ethics.

Much of the literature on the scientific, political and ethical dimensions of stem cells originates in North America, but there are significant differences between the UK and USA that affect research, policy and practice, including regulations regarding hES and fetal stem cell research (Holland *et al.* 2001, Weissman 2002, Maienschein 2003). For example, in the UK the *Human Fertilisation and Embryology (HFE) Act 1990* requires the Human Fertilisation and Embryology Authority (HFEA) to regulate the creation, storage and use of embryos for research. Initially, research was permitted for five reasons, mostly relating to reproductive medicine. In 2001 the HFE Act was amended to allow the use of embryos for therapeutic research, including the use of hES cells (House of Commons Science and Technology Committee 2005).

Since 1998, when hES cell lines were first isolated (Thompson *et al.* 1998), a series of social science papers have begun to map the key discourses, debates and shifts in the area of stem cell research (*e.g.* Franklin 2001, Waldby 2002, Kerr 2003, Parry 2003, Cooper 2004, Franklin 2005). All these papers, however, draw upon analysis of documentary sources. In contrast, our data come from interviews with laboratory scientists who describe their views on the ethics of biomedical science research using embryonic and foetal stem cells. We use the idea of 'ethics' to draw together a range of considerations, particularly the distinction between forms of conventional ethics on the one hand, and normative ethics on the other. That is, we pay special attention to what *is* deemed socially acceptable, good or right, and to what principles and other normative frameworks suggest *ought* to be so considered.

We use Gieryn's concept of boundary-work (Gieryn 1983, 1999) to introduce the notion of 'ethical boundary-work'. According to Gieryn, boundary-work – 'The discursive attribution of selected qualities to scientists, scientific methods and scientific claims for the purpose of drawing a rhetorical boundary between

science and some less authoritative residual "non-science"' – highlights the negotiated character of science (Gieryn 1999: 4–5).

Gieryn (1999) argues that important areas for exploration include the ways in which scientists defend their intellectual territory and how the demarcation of science from non-science works to maintain an image of expertise, authority and credibility. In our research we use Gieryn's idea to explore how scientists draw the boundaries of ethical scientific activity. While Gieryn's formulation suggests that non-science must be excised from science, our data show that non-science, in the form of 'ethics', is becoming an integral part of maintaining the image of science. Ethical boundary-work, however, comes in a form not predicted by Gieryn. For example, we find that ethical boundary-work differentiates between scientists, enhances the authority of 'non-science' (*e.g.* regulatory bodies) and de-privileges science.

Methods

Based on an ethnography of two leading embryonic stem cell laboratories in the UK, our data form part of the findings from a larger project mapping the scientific, medical, social and ethical dimensions of innovative stem cell treatment, focusing on the areas of liver cell and pancreatic islet cell transplantation (Wainwright *et al.* in press a, in press b, in press c). In this chapter we draw on interviews with 15 biomedical scientists who work in these laboratories, both of which are situated on one geographical site. Eight of the scientists in one laboratory derive and characterise hES cells, whilst the seven scientists in the second laboratory use hES cells and fetal stem cells to make insulin producing beta and islet cells, with the long-term aim of curing diabetes. We should point out here that, rather unusually, these two laboratories currently obtain the majority of their hES cells from embryos donated by couples attending for pre-implantation diagnosis (PGD), as opposed to in vitro fertilisation (IVF). The technology of pre-implantation genetic diagnosis can be offered to women/couples at risk of having a child with a serious genetic condition, or in some cases, to women who have experienced repeated miscarriage due to chromosomal rearrangements. Women undergo IVF followed by genetic testing of embryos, and only genetically unaffected embryos are transferred. As will be seen, this is important in terms of interpreting our respondents' views on ethical sources of embryos for the derivation of hES cells.

To preserve anonymity we do not include the specific titles of scientists, describing them in our text as either junior scientists or senior scientists. The eight senior scientists have PhDs, are usually in a tenured post and have an average of 20 years in science (five male; three female). Seven are junior scientists, who are PhD students with an average of six years in science (all female). Following ethics committee approval, interviews lasting between 1–2 hours, took place within the laboratory offices, and with permission, were taped and transcribed. Open-ended questions and an informal interview

schedule were used, in order to encourage scientists to speak in their own words about their experiences.

Transcripts were analysed by content for emergent themes (Weber 1990) which were then coded (Strauss 1987). All the research team read the 15 interview transcripts and contributed to the generation of the identified themes. Sections of the transcripts relating to these initial categories were grouped together into broader categories and then into the three major themes of this chapter. The chapter then underwent numerous rewritings as the team discussed and enacted analysis of our data. There was a broad consensus amongst the team as categories were expanded, collapsed and refined through an iterative process. This enabled the different perspectives of the team to be incorporated, and adds to the richness and validity of our analysis. The quotes drawn on below are representative, and illustrate saturated themes. The themes and sub-themes were identified as areas which scientists themselves saw as central in relation to stem cell science and ethics.

Themes

Three major themes emerged from our interviews; each theme contains a number of sub-themes, many of which present a line of cleavage around which our scientists agree to differ.

1. Sources of embryos

Scientists discussed the ethical issues surrounding four sources of embryos for laboratory work with hES cells.

Spare embryos

Much was made of the fact that if 'spare embryos' were not used for scientific research they would be discarded:

> With rare exceptions, the embryos that are used in stem cell research are embryos that have no future, either because they are not implantable . . . or they've been screened by PGD and been shown to have, or be at high risk of having, a genetic disorder . . . If all we're doing is using something left over and destined to be discarded, then if some good can come out of it, it's worth doing (Senior Scientist 8).

In their analysis of media coverage of the stem cell debate in the UK in 2000, this was one of the rhetorical strategies Williams *et al.* (2003) identified as used by proponents of stem cell research to assert an ethical position, that embryos would otherwise be 'discarded' or 'left to perish'. This meant that not only could stem cell research be presented as 'less wasteful' of spare

embryos, but also that stem cell research could be presented as a form of rescue. Similarly, Waldby (2002) states:

> Advocates of stem cell research generally portray the spare embryo as a precious substance. If it is not freely donated it will be simply wasted, a recklessly squandered resource . . . Stem cell technologies are, in these terms, particularly productive sources of biovalue precisely because they can rehabilitate what would otherwise be needless waste and transform it into a spectacularly active, flexible and manageable tissue resource (Waldby 2002, 314).

Only PGD embryos

A few scientists stated that they would only work on embryos donated from PGD and were not prepared to work with embryos from IVF programmes:

> I've got large ethical problems with using spare embryos from routine IVF cycles for stem cell research. I believe if an embryo is rejected as too poor quality to freeze on day three for potential future implantation, and then it turns into a blastocyst suitable for stem cell derivation, it may have some clinical potential and should probably be frozen. PGD doesn't have the same ethical baggage – those embryos can't be replaced (Senior Scientist 10).

Here Scientist 10 is arguing that some 'spare' IVF embryos may turn out to have the clinical potential to be used in treatment by the couple, and should therefore be frozen. This situation cannot arise if only genetically affected PGD embryos are used as a source of stem cells as, by definition, such embryos would be deemed unsuitable for replacement. Scientist 10 supports the work of Throsby (2004), who draws attention to the way in which PGD embryos are constructed as 'pre-discursively *spare*, and therefore unproblematically available, obscuring the [social] process of their production and acquisition' (2004: 22).

Unsure about IVF embryos

A few scientists agreed that PGD embryos were a good source for stem cell research, but were uncertain whether they would work on IVF embryos:

> We use embryos created by PGD – yes, they are created, but they're created because people want to have kids that are not going to suffer. That's the main thing, these conditions are so severe that you can justify doing it. I'm not so convinced that IVF is a necessity – would I work on IVF embryos? I'm not sure (Junior Scientist 9).

This line of reasoning ascribes various meanings to the notion of 'waste'. For Scientist 10, the ethical issue is that IVF embryos may have treatment

potential, leading her to doubt that IVF embryos are really available as waste, whereas Scientist 9 questions whether they should exist at all. However, both are drawing a distinction between unavoidable waste that can be redeemed, and avoidable waste that perhaps should be avoided rather than redeemed. In addition, whilst IVF embryos can be viewed as 'surplus to requirement', PGD embryos are viewed as 'biologically dysfunctional'. These different meanings of waste are thus implicitly deployed as a means of drawing an ethical boundary between IVF and PGD embryos as sources of stem cells.

Further, all the scientists were keen to articulate how, once human embryos were obtained, there was a strong commitment to ensuring that this resource was not itself 'wasted' by inefficient scientific practices:

> You're not going to start your research straight onto human stem cells. You tend to get as much information as you can out of the mouse stem cells and then apply it . . . You can have this technique that you want to make sure works perfectly and you might need to do it five or six times, then the material . . . from stem cells or whatever, it's very limited, it's your precious material, you are not going to waste it looking for ways to perfect your technique for those cells. It's as simple as that I think (Junior Scientist 1).

This comment also illustrates how work on animals could be represented as waste, in comparison to the more valuable hES cell work.

Using embryos created solely for research

All the scientists interviewed were prepared to use 'spare' embryos for research, although their definitions of 'spare' varied. In contrast, many of the scientists we interviewed were opposed to creating embryos solely for research:

> At the moment the way you grow human stem cells is you get embryos that will be thrown away if you don't use them, and the parents have given informed consent for them to be used by researchers. I don't think that's unethical. I think it would be unethical to let those embryos be thrown away when there's a choice. But I wouldn't agree with working with embryos that have been created solely for the purpose of harvesting stem cells – I would definitely refuse to work on those cells (Junior Scientist 1).

> We get embryos from IVF and PGD and those embryos would be thrown away so it's not as if we're making them specifically for cell work. I wouldn't do that, I wouldn't be happy to produce just a continuous supply of fertilised embryos for lab work (Senior Scientist 2).

This stance is interesting in view of the fact that the UK House of Commons Science and Technology Committee (2005) has recently recommended that, 'where necessary, embryos can be created specifically for research purposes'

(Volume 1: 24). Scientists are often portrayed as pushing the ethical limits of biomedical work, but here we see examples of scientists resisting a more permissive public policy on stem cell research. This is an example of our respondents distinguishing between two forms of waste: material that has been created unnecessarily; and existing material that risks not being used. The agency and responsibility of these scientists is deeply embedded in this distinction and, in particular, in not straying into the former zone. Their accounts suggest that they view the source of embryos along an ethical continuum. At one end scientists are simply redeeming the situation, whilst at the other end, embryos are being created for their 'own' purposes alone. The ideal for many of our respondents is the redemption and transformation of material created for other purposes – in other words, the agency of the scientists enters after the 'waste' appears, and not before. However, it is important to note that although the scientists agree that there is an obligation, hovering between the ethical and the social, not to waste sources for the supply of stem cells, there is disagreement about what a legitimate supply constitutes, and what non-usages would be considered wasteful. Thus, agreement about broad principles can obscure differences in the application of those same principles.

The scientists' views also echo the global politics of hES cell science, in that whilst the formal government policy of 18 countries allows the procurement of hES cells from supernumerary embryos, only six, including the UK, also allow the creation of human embryos for research purposes, which includes cloning (Salter 2005). Salter argues that in these countries which allow procurement of hES cells from supernumerary embryos, 'the IVF "supernumerary embryo" is the morally superior option (ironically, because it is "spare" to the needs of reproduction it is then seen as having less intrinsic value) over . . . cloned embryos' (2005: 20). So rather than supporting the UK's more liberal regulations, many of our respondents seem to be aligned with the majority global view. Indeed, we believe that in the context of the ethical contrast between PGD and IVF, our scientists present themselves as *predisposed* to taking a more ethically stringent position. By performing such ethical boundary-work around the sources of human embryos used in their work, our respondents are able to articulate and enact an ethical position that aligns them with the more ethically cautious countries amongst those who permit hES cell research. This example of boundary-work is therefore not about differentiating science from non-science, but rather, about drawing boundaries between what is ethically preferable – in this case, between scientists of higher and those of lesser ethical standards.

2. Perceptions of embryos

The status of the embryo is highly contested. At one end of a continuum some claim that the embryo is a human being, sacrosanct and sacred, whilst

at the opposite end the embryo is viewed as a collection of cells, scientifically useful and secular (Bortolotti and Harris 2005).

As 'just cells'

Debates about the status of the embryo are usually presented, particularly in the media, as polarised views, and as incompatible choices (Williams *et al.* 2003, Kitzinger and Williams 2005). However, by viewing early embryos as 'just cells', the scientists we interviewed with religious beliefs had been able to reconcile their scientific and religious beliefs:

> That really depends on your personal stance and whether after fertilisation you've got something that is a being. I don't happen to think that, I think that there's a stage where we are just talking about cells . . . I'm a Christian and I go to church and have quite strong beliefs – for example, only in exceptional circumstances do I agree with abortion. However, my intellectual situation, knowing about a human embryo in the early stages . . . I haven't got a problem with it (Senior Scientist 2).

The view that hES cells are 'just cells' was universal amongst the scientists we interviewed, who further argued that although hES cells were derived from embryos, they were no longer embryos:

> Stem cells growing in a dish are not embryos . . . stem cells are derived from embryos but are not embryos. A placenta is derived from an embryo but it's not a person, and I think that's where some of the difficulty in understanding comes about. My personal view is, we have eight cells in a dish, that is not a real person (Senior Scientist 16).

Gradualist approach

The majority of scientists adopted a gradualist approach, similar to that adopted by the Warnock Committee (House of Commons Science and Technology Committee 2005: 16–17), to the developing human embryo:

> I don't perceive very small microscopic collections of cells, that are going to be put in the bin, to be equatable with a person . . . We attach huge moral significance to early embryos and cells derived from them, but not [*to cells*] from a six-week-old fetus – we do abortions all the time . . . A six-day-old embryo has a different status to a six-week-old fetus, but I'd argue that six weeks is closer to being something than a six-day-old (Senior Scientist 8).

Implantation

For some scientists, implantation of the embryo into a woman's uterine wall (a process which begins around day nine in humans) was the key factor in delimiting their perceptions of embryos:

> An embryo to me is on its way to being a fetus when it's implanted, but while it's still in the dish, personally I don't feel it's got the capabilities of becoming a human – once it's implanted, yes, I really believe that's what it's going to be, and that it's untouchable. At the stage we see them, at five days old, 20 cells, you can't see any features, you don't know if it's going to survive, whether it would take implantation . . . It's hard, sometimes I do think about it, 'Should I really be doing this?', taking the natural course away, but then I think, 'Well, what about the benefits that are going to possibly be realised?' (Junior Scientist 9).

A senior scientist contrasted the distinction between the developmental potential of the embryo within the environment of the woman's body (*in vivo*) with the development of the embryo outside this environment (*in vitro*):

> If you plot the likelihood of a fertilised egg becoming a baby, you can put it in on day one, it's quite low, day two, and day three, it's quite good, day five is particularly good. But then it ceases, because it starts to hatch, so by day seven, day eight, although this is more developed, it has no potential of developing. So the curve starts to go to zero again, because it is not an organism that is capable of implantation . . . It loses its potential although it is developmentally more senior (Senior Scientist 16).

As Waldby (2002) argues, stem cell research highlights conflicting ideas about life and death. Opponents of the research perceive the life of the embryo as biographical, in contrast to advocates, such as our respondents, who view the life of the embryo as 'a form of raw biological vitality. From this point of view, the embryo is not killed. Rather, its vitality is technically diverted and reorganised' (Waldby 2002: 314). In this way, the humanist biography of embryos/hES cells is erased, to be replaced by a material biography of embryos and hES cells as a biological entity (*cf.* Appadurai 1986).

Respect for all tissue

Another common view of the scientists we interviewed and observed was that all tissue, including embryos, should be treated with respect:

> I can't look upon an embryo as a baby or a potential person when I'm moving it around the lab all day, and there's a chance I could drop it on the floor. I'm poking it, taking bits out of it, I can't possibly think that and carry on working in this area . . . But I do think you have to treat all tissue with respect, and that runs through everything I do (Senior Scientist 10).

Here, we find 'respect' to be another strategic route which enables scientists to rise above the issue of whether the material is biographical or abstractly vital. That is to say, it shifts the ethical boundary from human-biographical/nonhuman-vitality, to respect/'irrespect'.

These accounts of embryos and hES cells as 'just cells', as tissue to be respected, and of the importance of implantation, all seek to ensure that the embryo does not have a biography in the humanist sense. This key distinction allows scientists to draw an ethical boundary which enables them to work on embryos and hES cells.

3. Deferral to regulatory frameworks

The regulatory framework produced by the UK Parliament, the Human Fertilisation and Embryology Authority (HFEA) and various other bodies provides a legal and ethical landscape for the practice of UK stem cell science. A series of reviews have outlined the development of a UK/European legal, regulatory and policy framework on stem cell research and therapy (Romeo-Casabona 2002, Kerr 2003, Parry 2003, Hauskeller 2004). None of this research, however, includes primary interviews with practising stem cell scientists.

All our scientists argued that the UK provided a well regulated environment in which to undertake fetal and hES cell work. This regulatory environment acted as a legitimating framework against which, and through which, scientists were able to present their own personal accounts. For example, clear guidelines and strict rules were seen as enabling scientists to pursue their lab work:

> I work with fetal material which we get through the MRC [Medical Research Council] and I am much happier that it's quite strict so that if the shit did hit the fan I can say, 'Well, I was following very clear guidelines', because I am a bit uncomfortable about using those materials. I'm much happier that there are strict rules . . . I'm squeamish about it, partly because I'm a father (Senior Scientist 3).

The regulatory framework that governs such research in the UK was seen as pre-empting the potential ethical issues that surround such work. Personal unease at using the more 'biographical' human fetal cells in the laboratory were inevitably put aside so that scientists could get on with practising their craft of laboratory experimentation. Thus regulation enables biomedical scientists to engage in personal/public boundary-work, separating the former, such as their role as father, from their professional/public role in the laboratory.

Traditionally, the doctrine of scientific neutrality separates science and society, thereby allowing scientists to engage in purely 'objective' work, leaving society responsible for ethical decision-making (David 2005). For our scientists, this ethical work is in key respects sequestered from the space of the laboratory and placed with public regulatory bodies, such as the MRC Tissue Bank and the HFEA:

> I don't feel altogether comfortable doing it but the view that I take is that this is [fetal] material that would otherwise be destroyed, and a person has made that decision to terminate their pregnancy and that hopefully some benefit will come out of the material which we can obtain for research purposes . . . All of our material comes from the MRC tissue bank so I would hope that the ethical issues had been addressed (Senior Scientist 5).

The regulatory framework that governs the production of stem cells from human embryos was seen as central, in that it allowed scientists to pursue research that was authoritatively and demonstrably legal and ethical:

> [In the UK] you know that somebody is keeping track of how many embryos people are using and that it's all adhering to whatever local and national ethical guidelines there are, you know, what the commercial concerns are, so it's just done at a completely different level . . . The HFEA . . . have done a really good job, particularly in stem cell biology . . . I think they have been very, very thoughtful, conservative, deliberate and I think they have done exactly the right thing . . . So yes, I think most stem cell biologists in this country are pretty happy with the regulations, happy with the climate, happy with the government support (Senior Scientist 8).

The public (mis) understanding of science was a theme touched upon in all our interviews. In the example below, regulation is seen as a vital means to reassure both scientists and the public that research is being conducted appropriately:

> There are very strict regulations regarding, say, animal experiments, human tissue, and I think a lot of people aren't aware really of just how strict they are . . . A lot of people have fears about what mad scientists are doing. They don't realise that they are very constrained by these regulations . . . I wouldn't be happy working in a field where there weren't any regulations, or where people were just free to do as they wished (Junior Scientist 6).

These quotes indicate a complex boundary being drawn between responsibility and 'non-responsibility', where the bulk of responsibility is effectively allocated elsewhere, through the process of regulation. Here, ethical boundary-work is primarily between private and public ethics, drawing on the rhetorical claim that any suspicion about personal ethical standards can be deflected because constant surveillance by regulatory authorities ensures high ethical standards. Scientists thereby become responsible for pursuing the ethically valuable ends of helping people through research, whilst concurrently being 'non-responsible', through allowing regulating authorities to ensure their ethical accountability (Salter and Jones 2002).

Of course, regulatory frameworks are created with the input of scientists: it is senior scientists who shape and help implement the regulations (Mulkay 1997, Jasanoff 2005). But notice: the differentiation between science and regulation is itself an accomplishment, partly enacted through boundary-work. The ethical boundary-work that gets done requires *deferral* to non-science – a reversal of Gieryn's formulation where boundary-work serves to *privilege* science.

Discussion and conclusion

In this chapter we have explored the views of 15 scientists in two UK laboratories, and as such, we make no claims for our participants being 'representative' of the wider scientific community. Our study is however ongoing and, to date, we have found no systematic variation in scientists' views on ethical issues in relation to age, gender, religious convictions or their main scientific interest. We also recognise that from these interviews it is not possible to determine to what extent these scientists' views might relate to their actions if they were asked to undertake procedures they were uncomfortable with, such as creating embryos solely for research: currently, neither laboratory has an HFEA licence for this. Despite these limitations, our account of scientists' deliberations about working with human embryos and stem cells contributes to the development of a more 'socially reflexive healthcare ethics' (Cribb 2005). Furthermore, our work shows how 'ethical problems' are framed and managed by individuals and institutions, and by a dialectical relationship between the two (Alderson *et al.* 2002, Cribb 2002, Farsides *et al.* 2005). Such research is important. As Waldby (2002) argues:

> Contemporary biotechnology demands a bioethics that can understand the complex reciprocities and technical mediations between human and non-human entities, and frame ways of living that acknowledge this. The kinds of social relationships that may develop around stem cell technologies must be understood as part of a broader social negotiation over this network of production, and the kinds of humans and non-humans, entities and hybrids, health and illness it should produce (Waldby 2002: 319).

When we document aspects of the ethical boundary-work done by scientists, what precisely are we witnessing? Most obviously, we are observing the delineation of a positive 'ethical space' which scientists occupy – a space which signals both ethical reflection and rectitude. The rectitude is largely underpinned by reference to the formal legal and ethical framework that defines and allows 'ethical science', but it is also signalled by the reflection itself, by preparedness – at least in many cases – to venture into ethical argumentation. Our respondents thus present themselves as ethical, as well as expert, actors. Indeed, in the contemporary context where the 'traditional'

borders of science are being eroded in numerous ways (*e.g.* Nowotny *et al.* 2001, Irwin and Michael 2003), ethics have become another line of demarcation, not so much from 'non-science' as from 'less ethical' positions. Practical ethics here takes the form of a number of choices over how to conduct oneself in a complicated political, moral and epistemic context. As we have seen, such choices include the use of different sources of embryos, and deferral to regulatory frameworks.

The ethical boundary-work of scientists involves working across a dichotomous and even contradictory terrain. It means maintaining the distinction between 'real science' and 'associated ethics', whilst at the same time incorporating ethical acceptability into the heart of the scientific work. It means both owning the ethical issues as a sign of responsible and thoughtful engagement in a highly contested domain, whilst concurrently devolving ethics to authorities outside science, especially those charged with regulation. Our research indicates that the boundary-work of science has become an altogether more complex process than that initially described by Gieryn (1983). One instance of this increased complexity is the way that ethical boundary-work involves a process of social demarcation – where ethical talk is not only about representing a contradictory set of ethical terrains but is also about ordering such terrains, by making social divisions which speakers identify with, or differentiate from.

These scientists' accounts are very different from 'narrow' philosophical accounts of bioethics because they do not situate themselves in a position of detached abstract rationality, but rather, are centrally implicated in the substantive ethics of practice. They are being deliberative and 'right seeking' (*i.e.* ethically serious) in a way that is akin to bioethics as a discipline, but they are also doing this as part of institutional and social practices of self-justification. Talking to scientists allows us to provide a more grounded and detailed analysis of perspectives, processes and practices that are often erased or 'skated over' by purely philosophical analyses. Appraising their coherence, credibility and defensibility means, amongst other things, attending to how institutions and agents (such as those considered here) embody and enact ethical work. Normative positions in philosophical bioethics – if they are to have any purchase at all – have to be socially embodied, institutionally enacted and 'peopled' (Cribb 2005).

In conclusion, our analysis of the ways in which ethics is embodied in, and mediated by, ethical boundary-work extends Gieryn's original concept (see Ehrich *et al.* 2006). Our paper illustrates how the ethics-talk of stem cell scientists functions at a normative level and simultaneously serves to define and defend the work of scientists involved in ethically sensitive research.

Address for correspondence: Dr Steven Wainwright, Division of Health and Social Care Research, King's College London, 57 Waterloo Road, London, SE1 8WA.
e-mail: steven.wainwright@kcl.ac.uk

Acknowledgements

We would like to thank all those who participated in this research, and acknowledge the support of the ESRC Stem Cell Programme (grant no: RES-340-25-0003). The authors also thank the referees and the Monograph Editors for their comments, which have helped refine the original manuscript.

References

Alderson, P., Williams, C. and Farsides, B. (2002) Examining ethics in practice: health professionals' evaluations of in-hospital ethics seminars, *Journal of Nursing Ethics*, 9, 518–31.

Appadurai, A. (1986) Introduction: Commodities and the politics of value. In Appadurai, A. (ed.) *The Social Life of Things: Commodities in Cultural Perspective*. Cambridge: Cambridge University Press.

Bortolotti, L. and Harris, J. (2005) Stem cell research, personhood and sentience, *Reproductive Biomedicine Online*, 10 (Supplement), 76–9.

Brown, N. and Webster, A. (2004) *New Medical Technologies and Society: Reordering life*. Cambridge: Polity.

Callahan, D. (2003) *What Price Better Health?* Berkeley: University of California Press.

Cooper, M. (2004) Regenerative medicine: stems cells and the science of monstrosity, *Journal of Medical Ethics: Medical Humanities*, 30, 12–22.

Cribb, A. (2002) Ethics: from health care to public policy. In Jones, L. and Siddel, M. (eds) *The Challenge of Promoting Health: Exploration and Action* (2nd ed.). London: Macmillan.

Cribb, A. (2005) *Health and the Public Good: Setting Healthcare Ethics in Social Context*. Oxford: Oxford University Press.

David, M. (2005) *Science in Society*. London: Palgrave Macmillan.

Ehrich, K. Williams, C. Scott, R. Sandall, J. and Farsides, B. (2006) Social welfare, genetic welfare? Boundary-work in the IVF/PGD clinic, *Social Science and Medicine*, 63, 213–14.

Farsides, B., Williams, C. and Alderson, P. (2005) Aiming towards 'moral equilibrium': health care professionals' views on working within the morally contested field of antenatal screening, *Journal of Medical Ethics*, 30, 505–9.

Franklin, S. (2001) Culturing biology: cell lines for the second millennium, *Health*, 5, 335–54.

Franklin, S. (2005) Stem Cells R Us: emergent life forms and the global biological. In Ong, A. and Collier, S.J. (eds) *Global Assemblages: Technology, Politics and Ethics as Anthropological Problems*. New York: Blackwell.

Franklin, S. and Lock, M. (eds) (2003) *Remaking Life and Death: Toward an Anthropology of the Biosciences*. Oxford: John Murray.

Gieryn, T.F. (1983) Boundary-work and the demarcation of science from non-science: strains and interests in professional ideologies of scientists, *American Sociological Review*, 48, 781–95.

Gieryn, T.F. (1999) *Cultural Boundaries of Science: Credibility on the Line*. Chicago: Chicago University Press.

Hauskeller, C. (2004) How traditions of ethical reasoning and institutional processes shape stem cell research in Britain, *Journal of Medical Philosophy*, 29, 509–32.

Holland, S., Lebacqz, K. and Zoloth, L. (eds) (2001) *The Human Embryonic Stem Cell Debate: Science, Ethics and Public Policy*. Cambridge: MIT Press.

House of Commons Science and Technology Committee (2005) *Human Reproductive Technologies and the Law, Fifth Report, Volume 1*. London: House of Commons.

Irwin, A. and Michael, M. (2003) *Science, Social Theory and Public Knowledge*. Maidenhead, Berks.: Open University Press/McGraw-Hill.

Jasanoff, S. (2005) *Designs on Nature: Science and Democracy in Europe and the United States*. Princeton, Princeton University Press.

Kerr, A. (2003) Governing genetics: reifying choice and progress, *New Genetics and Society*, 22, 111–26.

Kitzinger, J. and Williams, C. (2005) Forecasting science futures: legitimising hope and calming fears in the embryo stem cell debate, *Social Science and Medicine*, 61, 731–40.

Kiessling, A.A. and Anderson, S. (2003) *Human Embryonic Stem Cells: An Introduction to the Science and the Therapeutic Potential*. Boston: Jones and Bartlet.

Lock, M. (2001) The alienation of body tissue and the biopolitics of immortalized cell lines, *Body and Society*, 7, 63–91.

Maienschein, J. (2003) *Whose View of Life? Embryos, Cloning and Stem Cells*. Cambridge: Harvard University Press.

Mulkay, M. (1997) *The Embryo Research Debate: Science and the Politics of Reproduction*. Cambridge: Cambridge University Press.

Nerlich, B., Dingwall, R. and Clarke, D.D. (2002) The book of life: how the human genome project was revealed to the public, *Health*, 6, 445–69.

Nowotny, H., Scott, P. and Gibbons, M. (2001) *Re-thinking Science: Knowledge and the Public in an Age of Uncertainty*. Cambridge: Polity.

Parry, S. (2003) The politics of cloning: mapping the rhetorical convergence of embryos and stem cells in parliamentary debates, *New Genetics and Society*, 22, 145–68.

Rabinow, P. (1996) *Essays on the Anthropology of Reason*. Princeton: Princeton University Press.

Romeo-Casabona, C.M. (2002) Embryonic stem cell research and therapy: the need for a common European legal framework, *Bioethics*, 16, 557–67.

Salter, B. (2005) *Working paper 2, Project: The global politics of human embryonic stem cell science, ESRC stem cell programme*. University of East Anglia.

Salter, B. and Jones, M. (2002) Human genetic technologies, European governance and the politics of bioethics, *Nature Reviews Genetics*, 3, 808–14.

Shostak, S. (2002) *Becoming Immortal: Combining Cloning and Stem-cell Therapy*. Albany: State University of New York.

Snow, N.E. (2003) *Stem Cell Research: New Frontiers in Science and Ethics*. Notre Dame: University of Notre Dame Press.

Strauss, A.L. (1987) *Qualitative Analysis for Social Scientists*. Cambridge: Cambridge University Press.

Thompson, C. (2005) *Making Parents: The Ontological Choreography of Reproductive Technologies*. Cambridge: MIT Press.

Thompson, J., Liskovitz-Eldor, J., Shapiro, S. *et al.* (1998) Embryonic stem cell lines derived from human blastocysts, *Science*, 282, 1145–47.

Throsby, K. (2004) *When IVF fails: Feminism, Infertility and the Negotiation of Normality*. London: Palgrave.

Wainwright, S.P., (2005) Can stem cells cure Parkinson's disease? Embryonic steps toward a regenerative brain medicine, *British Journal of Neuroscience Nursing,* 1, 3, 61–66.

Wainwright, S.P., Williams, C., Michael, M., Farsides, B. and Cribb, A. (in press) From bench to bedside? Biomedical scientists' expectations of stem cell science as a future therapy for diabetes, *Social Science and Medicine.*

Wainwright, S.P., Williams, C., Michael, M., Farsides, B. and Gibb, A. (in press b) Remaking the body? Scientists genetic discourses and practices as examples of changing expectations on embryonic stem cell therapy for diabetes, *New Genetics and Society.*

Wainwright, S.P., Williams, C., Persaud, S. and Jones, P. (in press c) Real science, biological bodies and stem cells: constructing images of beta cells in the biomedical science lab, *Social Theory and Health.*

Waldby, C. (2002) Stem cells, tissue cultures and the production of biovalue, *Health*, 6, 305–23.

Weber, R. (1990) *Basic Content Analysis*. London: Sage.

Weissman, I.L. (2002) Stem cells–scientific, medical, and political issues, *New England Journal of Medicine*, 346, 1576–79.

Williams, C., Alderson, P. and Farsides, B. (2002a) 'Drawing the line' in prenatal screening and testing: health practitioners' discussions, *Health, Risk & Society*, 4, 61–75.

Williams, C., Alderson, P. and Farsides, B. (2002b) Is nondirectiveness possible within the context of antenatal screening and testing? *Social Science and Medicine*, 54, 17–25.

Williams, C., Kitzinger, J. and Henderson, L. (2003) Envisaging the embryo in stem cell research: discursive strategies and media reporting of the ethical debates, *Sociology of Health and Illness*, 25, 793–814.