

The Reproductive Revolution – how far have we come?

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Good evening, welcome, and thank you for joining me this evening. Happy Thanksgiving!

My title is meant to be provocative by using the attention-seeking term ‘revolution’ and its marching companion ‘how far have we come’ to establish a question in the form of a familiar cliché. In doing this I hope to suggest that in order to understand what is happening in the context of new reproductive technologies we need to look at both the content and the form, or what Hayden White famously called the content *of* the form. My title question thus poses another question, which is *what language we use to describe the sociology of increasing technological control over reproductive biology*.

While this question is of a general and intrinsic sociological interest, I also want to pose another, more specific, version of this question, in the form of the challenges that arise as assisted conception has come into closer connection with human embryonic stem cell research. It is this increasing proximity which poses the most recent in a series of challenges to the governance of ‘human fertilisation and embryology’, which was not so long ago described as a ‘legal vacuum’, but today is increasingly visible as a primary domain of global biopolitics.

I’m particularly pleased to be able to give this lecture here at the LSE since, as I mentioned earlier this year at the centenary of the department of sociology, it was here 100 years ago that one of the most important sociological arguments about reproduction took place, between Edward Westermarck and his student Bronislaw Malinowski. In opposition to the views of Westermarck and many other formative theorists of kinship and the family, Malinowski argued that there was *nothing inherent in the biological facts of sexual reproduction that determined their social shape*. Three of Malinowski’s most famous contributions to social anthropology were formulated here at the LSE in his doctoral dissertation on the family in non-western society. He claimed first that there was no place for ‘a physiological fact per se’ in social science, second that even our most ‘objective’ scientific claims about conception reveal an underlying *social* order, and third that, to paraphrase a refrain of much of his later work – ‘what a culture believes about conception will tell you what it believes about everything else’.

Malinowski’s argument that human biology is socially formed would be hard to refute in today’s context of the redesign and reprogramming of cellular interiority on what are frequently described as the new frontiers of reproductive and genetic technology. Beyond the hype and the glamour and the razzmatazz of the brave new biology, however, are the social mechanisms that bring about this change, *and it is these which require more precise description*.

When I Googled ‘reproductive revolution’ I got more than one-and-a-half million results in less than a fifth of a second, which is the product of yet another technological ‘revolution’, and a reminder that the language of revolution is increasingly today used to describe technology rather than social movements. I would like to suggest we need to think about the ‘reproductive revolution’ the other way round, from the point of view of the social actors involved.

‘Revolution’ is a useful term because, of course, it means many things. Among the four definitions of ‘revolution’ in the *American Heritage Dictionary*, which you will pardon me for using on this occasion, is ‘a sudden or momentous change in a situation’. This is one way to describe what happened in 1978 when it suddenly became a clinically viable possibility to create what was initially described as a ‘test tube baby’. Public response to the birth of Louise Brown in Oldham, Lancashire, in the summer of 1978 was mixed. While many people could empathise with Mr and Mrs Brown on the occasion of their daughter’s birth, the very term ‘test-tube baby’ conjured up an all too familiar set of less joyful connotations. At once a moment of triumph for British medical science, and another world first to add to a long list of accomplishments in the life sciences, fears were also expressed that such radical interventions into the very beginnings of human life might be a ‘slippery slope’ that would bring Britain into disrepute.

But how radical was *in vitro* fertilisation, or IVF? The UK has been home to a vital curiosity about the facts of life that extends from the eighteenth century experiments in livestock breeding by agricultural entrepreneurs, such as Robert Bakewell, to fascination with the genetic code that characterised the post-war period, so in some senses it could be argued IVF was nothing new. The primary definition of ‘revolution’ is ‘orbital motion’, ‘rotational motion around an axis’, or ‘a single complete cycle of such motion’. Perhaps this is a better way to define ‘in vitro fertilisation’, as it was, in many senses, as much a *return* as ‘a sudden or momentous change’. Much of the scientific knowledge on which IVF depends dates back centuries to the long history of debate about the biological workings of conception and development. Were we to consider the embryo to be the point around which orbital scientific motion, or attention, has been focussed we could go back to Aristotle, and beyond.

Robert Edwards, who was one of the co-developers of IVF along with the obstetrician Patrick Steptoe, first wrote about IVF in his PhD in the 1950s in Edinburgh, where he studied under Waddington. Prior to his work in humans, Edwards experimented with the eggs and embryos of mice, rats, hamsters, sheep, cows, and primates. The human oocyte proved unexpectedly, and like that of pigs, to require more than 24 hours to mature *in vitro*, and it was in 1965 when Edwards described the first tentative steps toward IVF in the British journal *Nature*.

What was radical about IVF was the transfer of these experimental, and essentially agricultural, techniques into clinical practice. In the face of considerable scepticism and even outright professional hostility, Steptoe and Edwards began transferring fertilised oocytes back into women patient volunteers in 1972. As we now know, Louise Brown was born six years later.

It is often forgotten that the first major field of scholarly literature on the social implications of new reproductive and genetic technologies was produced by feminist

scholars during the 1980s – I cited over 100 such studies in my PhD. The first ethnography of a reproductive technology, amniocentesis, was Barbara Katz Rothman's brilliant analysis of what she called *The Tentative Pregnancy*, published in 1986, in which she documented how women's experience of pregnancy was rendered ambivalent by the knowledge that they might have to terminate their pregnancy. Ann Oakley's work on the medicalization of childbirth and on ultrasound here in the UK was complemented by Emily Martin's brilliant analysis of technology, reproduction, and embodiment in *The Woman in the Body*, published by Beacon Press in Boston in 1987. A key feature of these studies, captured by the feminist biologist and theorist Donna Haraway, was the double-edged quality of new technologies, which enabled some choices at the expense of others. As she put it in her famous 'Cyborg Manifesto', 'The structural rearrangements related to the social relations of science and technology evoke a strong ambivalence'. As feminists predicted, this ambivalence has proven to be one of the core sociological themes of both 'the reproductive revolution' and the wider 'biosociety' of which it is a part.

The other major area of work on reproduction in the 1970s and 1980s came from feminist anthropology, by scholars such as Annette Weiner, who argued that for too long 'reproduction has been viewed in its biological context only'. Revisiting Malinowski's theme, and also the site of his fieldwork, in the Trobriand Islands, Weiner wrote in 1978,

'I analyze reproduction not as a biological construct, but as a cultural concept in which the basic process for reproducing human beings, social relations, cosmological phenomena, and material resources are culturally defined, and structurally interconnected' (1978:83).

This view led to a resurgence of interest in reproduction as something that was never 'purely physiological', but rather at the core of social and cultural systems, and intertwined in other forms of reproduction – of identities, institutions, and social structures.

This view was significantly extended by Marilyn Strathern, who argued simultaneously in two path breaking publications in 1992 that it was technological assistance to reproduction that made its hybridity – its dual identity as both social and biological – newly explicit, and that in doing so, created new ambiguities about the meaning of 'biological facts'. 'There is a new ambiguity about what should count as natural' 1992a:19, she noted, claiming also that technological assistance to human reproduction would have effects on cultural knowledge: 'The more facilitation is given to the biological reproduction of human persons, the harder it is to think of a domain of natural facts independent of social intervention....[This] will not be without consequence for the way people think about one another.' 1992a:30.

Nor, it has turned out, without consequence for the way people think about sheep. For what is the main question that has been asked about Dolly – the sheep -- since she became the first viable offspring to be cloned from an adult cell? It is whether humans can be cloned. And why is this? Because we assume that what can be done to the reproductive biology of sheep can also be done to the reproductive biology of humans. Intervention into the reproductive biology of sheep thus, it appears, has consequences for who we think we are.

Perhaps we need some help at this stage from Dolly – we wouldn't want to have to wait too long – so perhaps we should think a bit about her technologically conceived body, with its unusual electrical origins, and ironically unique individual pedigree, as a clone. It is oddly telling that the most revolutionary thing about Dolly's body is that she looks just like a perfectly normal sheep. It is a paradox of our times that what was miraculous about this sheep was that there was nothing unusual about her. Her viability as an offspring provided biological proof of the viability of the technique used to create her. To further prove her 'complete' viability Dolly was 'conventionally bred' (meaning to a ram) and gave birth to two sets of lambs, confirming her fertility through a kind of double-reproductive, or reverse reproductive grammar of biological normality. And this is a very important part of the new biology: *that it has not so much left the older, more conventional, biology behind – but has added to it.*

Thus, when we see a picture of Dolly, what we are very often shown in quick succession, or beside her, is one of the emergent iconic images of the 'reproductive revolution' – which is the looking-down-the-microscope-view of micro-manipulation. As Jackie Stacey notes, the cell is the iconic signifier of life itself at its most bodily level (2000). This new primal scene of life's recreation is typically set as a horizon, the egg cell or embryo a kind of planetary orb, and the pipettes on either side forming a new plane of interaction with the interior of the cell. This is an important birth scene for the new horizon industries of stem cell science, in the context of which the interior of the cell has become a new frontier of exploration. What is different about this new image of scientific exploration, unlike the delicate fetal portraits of Lennart Nilsson's journey inside the womb, or the images of the blue planet taken by astronauts from outer space -- which are two of the most iconic images of 'life itself' from the previous century -- is the prominence of the tools of the trade, or hands of science in this new visual iconography of life itself *being remade*. This is an intimate portrait of the bio-technological interface that challenges us today – in an image of explicit interaction, revealing a new degree of biological mobility and contingency, and literally breaking the frame. This is how *the inextricability of social and biological form* can be delivered on the evening news.

But let us go back a bit to an earlier period in the reproductive revolution. What is interesting about the 'radical' nature of IVF when it was first practiced is how quickly this technique has been normalised. Since 1978 more than two million IVF babies have been born worldwide, and in some countries, such as Denmark, IVF births make up as much as 5% of the birth-rate. IVF has become a platform technology for an ever-widening range of applications, from pre-implantation genetic diagnosis, aneuploidy screening, sex selection, and male infertility. Ironically, it is the widespread availability of IVF that has itself now come to pose a new reproductive risk from the point of view of obstetricians who fear its very existence results in too much reliance on the 'last chance' it offers to the over-35s who face a higher risk of reproductive complications.

We might thus think of IVF in yet another sense of 'revolution' meaning 'the overthrow of one government and its replacement by another'. From the 'hopelessness' which once prevailed in the context of infertility, in which there was little medical prospect of 'repair', we have moved into a new era of reproductive

intervention and management in which, since 1978, it is clear that more and more can now be done to assist conception. Rather than being a hopeless condition, infertility has become subject to a new order, in which conception is something that can be *achieved*.

This new order is manifest in a number of related changes that have flowed directly from IVF. From being a personal, private, intimate, and often secretive topic, reproductive failure has become much more of an explicit public concern. Reproductive assistance has become the subject of lobbying groups and campaigns leading to the birth of 'reproductive citizenship'. IVF is part of a competitive and commercial market in reproductive services and products, leading some couples to travel to other countries to seek out specific services, or cheaper prices, in what is now known as 'reproductive tourism'. From being a comparatively inaccessible process, conception has literally moved out of the womb and into full view, with many implications for how we view the human embryo, which is now even featured in beer commercials and on the most recent advertisement for Nokia phones. In fact recently here in London I was walking down the street on the day the Newcastle team announced their new mitochondria replacement programme and the headline of the Evening Standard said in huge type: SCIENTISTS CREATE AMAZING EMBRYO. I photographed it with my mobile phone thus collapsing two reproductive revolutions into one!

Reproduction has also become subject to an explicit form of governance through legislation such as the UK's famous 'Human Fertilisation and Embryology Act', the world's most comprehensive regulation in this area, which came into force in 1990. The fact that the human embryo has acquired such a complicated social life, and that reproduction can now be considered a technological achievement, are but two of the most radical changes that have occurred since 1978. And yet these changes are rarely represented as revolutionary, and have instead become routine. IVF, which is by far the most prominent form of reproductive intervention to have become established in the past two decades, is now a familiar part of modern life, and is represented in terms of some of the oldest and most traditional social aspirations and hopes, namely the desire to have children, to improve technology, to encourage scientific progress, and to alleviate human suffering.

So I want now to turn to one of the most important senses of 'revolution' which is its use to *signify progress*. This is the sense of revolution used to refer, for example, to the industrial revolution, or the revolutionary consequences of the internet. The adjective 'revolutionary' signifies progress, improvement, and subsequent transformation, and is routinely annexed to science and technology to convey the sense of *moving forward* into a new era, in which the old ways of the past are cast aside. From this perspective, the reproductive revolution is viewed as a breakthrough in the capacity of medical science to overcome previously unassailable obstacles, and the opening up of whole new possibilities that were formerly all but unimaginable.

Significantly, this notion of revolution as progress, although today primarily associated with technology, has its roots, as Maureen McNeil has shown, in ideas about biology, and even more particularly about reproduction. As McNeil notes the idea that the biological function of reproduction is integral to the project of human advancement, and indeed that human biology could 'itself' be a model of progress and

improvement, was first formulated by Erasmus Darwin, in the midst of an earlier period of revolutionary technological change in England during the late eighteenth century. His grandson Charles Darwin's theories of evolution are arguably where the idea of progress first became attached to reproduction by analogy to industrial technology.

So, is today's reproductive revolution revolutionary or not?

The question we have to ask about the curious case of the reproductive revolution, which both is and is not new, both is and is not biological, and may or may not be radically transformative of who we are, is *what kind of revolution is it?* Is it a revolution *in progress*? And, if so, what kind of progress is its result? Zygmunt Bauman, who recently completed three lectures here at the LSE, has argued that 'the novelty of our times is that the periods of condensed and accelerated change called "revolutions" are [no longer] "breaks in the routine" like they might have seemed [in the past]'. He argues instead that 'We live today under a condition of *permanent revolution*. Revolution is the way society nowadays lives. Revolution has become the human society's *normal state*' (2003:2). Interestingly, Bauman's contemporary, Ulrich Beck, argues that the opposite has happened to the idea of progress. Once a defining feature of 'revolutionary' change, scientific and technological progress can no longer be thought of in the singular, but must be imagined as always, already accompanied by its double in the form of increased risk. Hence, while scientific progress may be associated with the revolutionary developments enabling the emergence of modernity, it is in turn this very same form of progress, and its discontents, that brings us the counterface of modernity, in the form of the 'risk society', in which, as Beck puts it, "the sources of danger are no longer ignorance but knowledge".

So how might we think of the 'reproductive revolution' in relation to these arguments by two of Europe's leading social scientists, who, it might be added, appear to be returning to some of the major themes of an earlier, feminist, discussion of these questions? Is IVF an example of the kind of 'revolutionary' change we have come to take for granted? Is human reproduction a good place to look for the kind of 'permanent revolution' that has become a 'normal state'? What about progress? Is the revolutionary impact of new reproductive technologies an example of the impossibility of imagining progress without risk? Are the new reproductive choices being made by would-be IVF parents typical examples of reflexive, risk-calculating, self-actualising decision-making in the postmodern context of increased scepticism about expert knowledge, ambivalence, uncertainty and doubt?

Perhaps. But if we listen to what people say when they are in the midst of undergoing treatments such as IVF or PGD it is not always expressed in exactly these terms. For example, one of the striking findings of the very first study I did of IVF, in the late 1980s and early 1990s was that in every single interview people said they felt they 'had to try' IVF, that they had 'no choice' but to pursue this technique. In other studies I have undertaken since, these and similar expressions of obligation, duty, and of not having any choice are one of the most consistent themes. These motivations, not technology, are the sociological roots of the reproductive revolution, whatever kind of revolution it may be.

So how do we interpret a situation in which people who are choosing IVF describe themselves in terms of 'having to try' and 'having no choice'? Is this a technological imperative that emerges out of the same dynamic that constantly associates new technology with progress and revolutions? If so, what is this dynamic composed of? What is its sociology, and how can this be characterised?

The question posed by the reproductive revolution is not only what kind of revolution it might be, but how we measure the change this supposedly describes in terms of 'how far have we come'?

So let us consider this question in terms of where we are now. In addition to being in the Old Theatre at the LSE we are in the UK, which is currently one of the most 'radical' countries in Europe in terms of its position on stem cell research – which is a science that has come of age almost entirely as a result of the enormous expansion in the use of IVF, creating the supply of human embryos available for scientific research.. We also need to remember that in addition to being the country in which IVF was first developed, the UK is where much of the modern embryology and developmental biology on which it depends was developed. Both IVF and Dolly are the offspring of a scientific community that has been reverse-engineering biological development for centuries. Post-IVF, new understandings of cellular differentiation, and, more recently, de-differentiation, have been driven in no small part by an emergent, and more collectivised, form of 'reproductive hope' directed at finding cures for disease by harnessing the special reproductive powers of embryonic cells. It is this special, or 'totipotent', regenerative capacity of the embryo that has been linked to the prospect of new treatments for everything from Alzheimer's and Parkinson's diseases to diabetes and cancer.

So, where we are today, is, once again, at a new, and some will say 'revolutionary' interface between the now-routine existence of IVF and the not-so-routine existence of something else – human embryonic stem cell research, the science of creating new medical therapies out of embryos that have been created through IVF.

To explain a little further, if you are a woman undergoing IVF, you are 80% likely to fail, and to maximise your chances of success, you undergo a hormonal replacement programme to stimulate egg development, which is known as ovulation induction. This means that you are hormonally stimulated to produce more eggs – ideally 10 or 12. These eggs are fertilised in vitro and the more viable embryos you end up with, the more you have available to attempt successful embryo transfer, when the fertilised eggs are put back into your womb. But only two can be put back in at a time in order to minimise the chances of multiple pregnancy, which often leads to complications. The rest of the embryos, if they appear to be developing normally, are most often frozen for future use.

Many couples consequently have what are described as 'excess', 'surplus', or 'spare' embryos at the end of their treatment and they may choose to donate some or all of these either to other couples or to research. They can also do neither, and simply allow the embryos to perish after five, or exceptionally ten years, which is the legal limit on embryo storage.

In a recent study I conducted with my colleagues Karen Throsby and Celia Roberts of couples' willingness to donate embryos to stem cell research, 70% wanted to pursue this option. And this is not surprising as it is difficult, time consuming, and emotionally fraught to go through IVF, and the desire for leftover embryos that are not going to be used in treatment to be valued in another context, such as scientific research, is often described in terms of wanting 'to give something back'.

However, this situation is not uncomplicated. In addition to other risks, such as the risk to health, which is minimal but present for women who undergo ovulation induction, there is a new risk of a conflict of interest between stem cell science and IVF that women or couples in the context of assisted conception are vulnerable to pressure to donate their leftover embryos to the new reproductive revolution that is stem cell science. Is this an example of the unsettling consequences of revolutions for their citizens, who may be subjected to new forms of exploitation? Or is egg donation potentially a new way to become a biological volunteer for scientific progress? Given the tendency for femininity to be organised in relation to serving the needs of others, is this a particularly worrying trend? And, given the persistent economic inequality which defines the sexual division of labour, globally, is a new division of reproductive labour not likely to follow a similar path?

So this brings us to the important question we might describe not so much in terms of the revolution *as* progress, or a revolution *in* progress, but the progress *of* revolutions – as in their succession. For we should not be surprised that the reproductive revolution has also been reproductive of itself! As IVF and stem cells demonstrate, one revolution can give birth to another. But how do we evaluate the new contingency between IVF and stem cell research? I have already suggested it is useful to ask some of the people directly involved, so here are a few quotes from people, whom we might describe as reproductive citizens, who have been asked to donate their embryos to stem cell research.

Some respondents express the 'classically' reciprocal 'gift model', famous from the work of Richard Titmuss here at the LSE on blood donation, of 'giving something back':

'We would not have had the opportunity to benefit from [IVF] if other people had not been there first, and we feel we would like to give back what we can with our embryos to help [research]'.

Other respondents were more equivocal

'So much depends on what they would be used for and how long they would be stored. I am not always confident that research is being done for the 'right' reasons rather than because it is simply advancing medical science.'

And some said 'No':

'Having lost two babies I feel that I could not use the beginnings of another baby for research.'

As we can see, some respondents express a desire to contribute their embryos to a new, more generalised, context of reproductive hope, meaning the hope for new cures from scientific advances in the ability to harness the special reproductive qualities of embryonic cells. Other couples are less willing to convert their attachments to their embryos into faith in scientific progress, and still others could not separate their embryos from a history of reproductive loss.

Even such brief quotations, I suggest, provide a crucial glimpse into the sociology of biological and technological change that may be obscured by the triumphalist language of the 'reproductive revolution'. For here we have at the IVF-stem cell interface a huge question – the same question Malinowski asked about the place of biology in determining social structure. Only now it is reversed. For what we are now asking how society is going to organise its own biology? And what we see are not only many answers, but even answers that are themselves made up of mixed emotions, and ambivalent tendencies. For example, as yet another respondent replied:

'If people hadn't already done this [IVF], we may not be able to benefit from treatment but [the embryo] is a start of a living thing...and that makes it a difficult decision.'

Such comments require us to listen to the content, as well as the form of language being used at the IVF-Stem cell interface in terms of what, exactly, it is telling us. This 'yes-no' kind of answer expresses an ambivalence that that will not be easy to capture in large scale public opinion surveys, as its mixed-message makes it difficult to quantify.

According to Anne Kerr and Sarah Cunningham-Burley, public ambivalence toward the new biomedical revolution could open up new avenues for dialogue and deliberation, thus 'pav[ing] the way towards more socially responsible and democratic science and technology'. However, they note that doubts and uncertainties about new reproductive, genetic, and biological futures associated with their various 'revolutionary' potentials are offset by normative, and conventional assumptions about scientific progress and its benefits. As evidence of this tendency they cite Ulrich Beck who argues that:

Reproductive medicine and genetic research throw open the door to a new quality of politics... Here everyone rules himself and his progeny and can directly implement the values that govern him.

Kerr and Cunningham-Burley reject Beck's over-valuation of choice exercised by 'himself on behalf of his progeny' and, as in the description of 'no choice' offered earlier by IVF patients, they describe an ambivalent 'public' within the new constituency Carlos Novas and Nikolas Rose describe as 'biological citizens' who, according to Kerr and Cunningham-Burley, 'may hold up scientific knowledge as an accurate reflection of the workings of the human body, yet also critically discuss the methods and institutional relations of science, thus directly challenging the dominant view of scientific practice as morally and politically neutral' (292). Like Beck, Giddens, and Bauman Kerr and Cunningham-Burley argue that a new 'politics of lay ambivalence' may enable what Beck describes as the 'creeping revolution' in democracy that will result in new 'forms and forums of consensus' (292). They

conclude, however, that this democratic creep is currently ‘more sedative than revolutionary’ implying, as others have done, that the language of revolution associated with political change has been fundamentally detached from the meaning of ‘revolutionary’ to describe technological innovation.

This view, in turn, is challenged by a group of US anthropologists including Faye Ginsburg, Rayna Rapp, Karen Sue Taussig and Deborah Heath who use the slightly different term ‘genetic citizenship’ to describe new constellations of actors – such as patient groups, disability activists, and medical-scientific experts – who collectively lobby and campaign for improved treatments for genetic diseases, while also challenging the stigma of inherited conditions such as achondroplasia. These more politicised and ‘revolutionary’ biological citizens, they argue, are evidence of new forms of socio-political activism that are reshaping what Rapp and her colleagues describe as ‘the biogenetic public sphere’.

So are the new biological citizens of the post-IVF moral landscape, to use Lene Koch’s formulation, ambivalent revolutionaries, or revolutionary ambivalents? Using IVF as an example we could say it has brought undoubted benefits to those couples it has enabled to conceive a child, but for every one of these there are at least four unsuccessful couples who may feel they are even worse off after trying IVF than they were beforehand. IVF has led to complications: the sharp rise in multiple births and attendant pathology was an expensive cost to impose from the largely private Assisted Conception market of the 1980s and the 1990s into the already-over-burdened National Health Service. There is debate about whether the more recent recommendation by the National Institute of Clinical Excellence – that all couples should be entitled to three free cycles – will similarly impose an inappropriate strain on over-stretched public health facilities.

However, these risks are accompanied by a rapid proliferation of IVF-based therapies, including preimplantation genetic diagnosis, aneuploidy screening, and more recently the possibility of having a child who is tissue matched to become a donor to an older brother or sister who is suffering from a potentially terminal illness – the so-called saviour sibling technique. This list of IVF platform technologies is quite long, and is now complemented by stem cell research, which is among the world’s most rapidly developing areas of scientific growth, into which considerable sums are being invested not only in the UK and the EU but in India, China, Sweden, Japan, Canada, Australia, Singapore, and Denmark.

Thus, in contrast to the use of ‘revolutionary’ as a promotional adjective to describe scientific progress in terms of advances, benefits, and improvements it might be said this term is increasingly associated with divided opinion, mixed feelings, and professional, as well as lay ambivalence – especially in the context of reproduction, where terms such as ‘cloning’ carry a strongly negative connotation.

As Suzi Leather, who is the head of the Human Fertilisation and Embryology Authority, said last week at a conference on ‘putting stem cells into practice’:

‘There are too many areas of scientific progress that have suffered as a result of negative public perceptions....The benefits of the existing system can only be maintained by strengthening public consensus’

‘The benefits of the existing system’ to which she referred are those that have been established through the highly regulated, and very strict licensing system for assisted conception and embryo research which is unique to the UK, and is seen to protect and promote its highly permissive climate of scientific innovation, while retaining public, parliamentary, and political support, to produce a climate of well-governed scientific progress.

As *Business Week* journalist Kerry Capell put it in the introduction to an article entitled 'In Stem Cell Research, It's Rule Britannia' (4 April 2002):

Britain has long been known for Shakespeare, soccer, fine cheeses, and quirky cars. Now it is emerging as the world leader in one of the most controversial, yet promising, areas of scientific research: human embryonic stem cells.

As he notes, 'Britain is the only country on the globe with a regulatory structure in place that provides a clear road map for both public- and private- sector research on embryonic stem cells.' As a result, Capell describes Britain as having 'the most conducive climate in the world for this important new area of scientific research'.

However, as both Suzi Leather and Mary Warnock, author of the Report on which the legislation is based, have emphasised, scientific progress in the field of human reproduction and embryology primarily relies on what the HFEA refers to as ‘keeping in step’ with public opinion. The first premise of Warnock’s approach was “to take very seriously the...wide diversity in moral feelings” and to determine which feelings were most strongly held in common. “The Warnock position,” as sociologist Michael Mulkay has argued, was the outcome of an effort to acknowledge fundamentally opposing views and find the path of greatest social consensus among them (Mulkay 1997). This not only remains the core strategy of the HFEA, but is widely seen by outside commentators to be the secret of the UK’s success in the highly emotive, contested, and divided context of human stem cell derivation.

In a properly revolutionary way, that is by coming full circle, we thus reach our conclusions. It is from where we are today – here in the UK, at the IVF-Stem cell interface, in 2005, in the midst of a unique global controversy about the future of human biology – that we can see a 100 year old debate about the extent to which biology determines social structure completing an orbital turn, and, returning, but also being overthrown, and suddenly transformed. To the extent that scientific progress in the UK is seen to depend upon ‘keeping in step’ with the wider society, *its future is essentially sociological*. None of the future biologies that beckon as revolutionary scientific advances will become facts of life without a viable social infrastructure as their enabling condition.

This does not have to be entirely new to be revolutionary, and it does not need to be revolutionary to be important, but it does mean that Malinowski’s refrain has yet to leave the building.

It also means that insofar as reproduction has been revolutionised, and however we take this to be the case, its future is sociological. An example of this is the question of how the legacy of IVF will be interpreted in the context of stem cell research – not

only by columnists and political commentators, but by people who are literally in the midst of the IVF-stem cell interface, whose decisions about donation exemplify the concept of 'biological citizenship' being debated within social science. Another measure of this will be our ability to learn from the history of IVF to improve the quality of deliberation over stem cells. The nature of this deliberation depends on our language, on the ability to communicate, and on the quality of the dialogue – which is something that clinicians in particular know very well. The measure of how far we have come in the reproductive revolution is also sociological. It will depend on the answers to questions such as why ambivalence is such a prominent feature of public and professional views of developments in reproductive biomedicine, and what this ambivalence is saying. The answer to this question will involve listening to ambivalence as a social form, as well as a literal content. Answering this question is thus primarily an empirical task, of collecting language, sorting it through, and developing an interpretation. As a description of the social study of biomedicine, I think that's quite appropriate.

Thank you.