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Reproduction Inside/Outside. Medical Imaging and the Domestication of Assisted

Reproductive Technologies

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Abstract

Contemporary medical imaging technologies produce images on the level of human cells. As a result of such images, egg and sperm cells have become well-known artefacts of popular culture. Medical imaging technology has transformed these gametes from invisible matter integrated in biological processes within the body to identifiable objects. The visualisation of egg and sperm cells has literally lifted the process of human reproduction out of the female body and made the gametes appear as protagonists in the story of human reproduction. The paper argues that visualisation of the gametes and the central role they play in contemporary imaginations of reproduction may offer vital contributions to the rather rapid acceptance and normalisation of assisted reproduction.

The world we inhabit is filled with visual images. They are central to how we represent, make meaning, and communicate in the world around us. In many ways, our culture is increasingly a visual one. Over the course of the last two centuries, Western culture has come to be dominated by visual rather than oral or textual media. (Sturken and Cartwright 2001: 1)

Visual media are gaining in importance as means of communicating and informing, particularly in relation to the mediation of science to the public. New digital visualisation technologies can recreate scientific data, which was typically recorded in numbers and graphs, into a form similar to a photograph (Joyce 2005). With advances in medical imaging, ever more of the previously invisible inside of the body is gaining a public presence. Medical images have transgressed the scientific realm and found their way to the news media, popular science, exhibitions and advertising.

Today, human reproduction is disseminated to the public through digital images of egg and sperm cells and the meeting between them. Previously, the public have been struck by images of fetuses – seemingly within the womb – such as those produced by the Swedish photographer Lennart Nilsson from the 1960s onwards (Nilsson et al. 1977). Feminist researchers have pointed out that visualisations of fetuses – increasing with the use of ultrasound – have transformed the cultural imagination of the fetus to that of a separate individual dissociated from the female body (Duden 1993). Visualisation of fetuses in images and, particularly, video, have also had vital effects on the abortion debate, because videos have

literally brought fetuses ‘to life’. This has effected, according to Petchesky (1987: 264), a change from a religious/mystical to a medical/technological mode in the anti-abortion rhetoric.

The present paper is based on research projects on ART and medical imaging in the Norwegian context and will analyse egg and sperm images at the interface of scientific imaging and popular culture.¹ The paper will explore the role that egg and sperm cells have in contemporary imaginations of reproduction and also discuss the influence that visualisations of the gametes may have on normalisation and acceptance of assisted reproduction.

Medical imaging technologies are a prerequisite for ART techniques, as is vividly illustrated, for instance, by ICSI², whereby a single sperm cell is injected into an egg cell. This procedure is only feasible partly because microscopy and imaging techniques have made it possible to actually see the manipulation of cells by the use of hand-held micropipettes and microinjectors. Research within the field of assisted reproductive technology has, however, not only resulted in new fertility techniques, but simultaneously provided more detailed knowledge of how babies are made – not only for the science community, but also for the public (Franklin 1997, Thompson 2005). Images of egg and sperm cells are popular as illustrations and are widely used in information and education material about human reproduction, including brochures and textbooks. One can find these images in illustrations of ART procedures, in logos and advertisements, in popular science and in the media, more generally.

This paper will analyse visualisations of egg and sperm cells that are made publically available by the media and address how such images contribute to the domestication of ARTs. The paper will highlight the point that such pictures literally lift the process of human reproduction out of the female body and make the gametes materialise before our eyes. The paper goes a step further and will raise some questions about possible effects of the general

visibility of egg, sperm and the process of reproduction. In what ways may visualisations of gametes affect the general understanding of assisted reproduction, and how are egg and sperm cells implicated in the political and ethical debates over the procedures? Finally, I will raise the question if such visualizations may contribute to a normalisation and acceptance of ARTs.

The domestication and materialisation of cells

The processes whereby new ARTs are domesticated are certainly complex and manifold, but included in these is the new visualisation of gametes and their ‘meeting’ at the moment of conception. Domestication is here understood in the sense of cultural meaning-making processes that alter bio-scientific practices from ‘wild science’ into common and familiar matters (Silverstone and Hirsch 1994, Lie and Sørensen 1996, Berker et al. 2006). Still, Silverstone (2006: 247) argues that easy acceptance is not necessarily a goal but that new technologies may produce a kind of ‘moral itch or irritation’ that is culturally productive; in the case of ARTs, a moral itch is a rather precise description of the cultural processes they trigger. These include, for instance, media debates related to the legal regulation of procedures and the variety of procedures offered between countries worldwide – in some cases leading to a stalemate of no regulation – and the wide spectrum of matters that are drawn into these debates (e.g. Bleikli et al. 2004, Engeli 2009, Melhuus 2012, Spilker and Lie 2007).

Domestication refers to a transformation of the new and unknown into the familiar and even mundane. This may take place practically (e.g. through use of a technical gadget time and again); by learning (e.g. through dissemination by public discourse of the message that a new technology is useful and harmless); and symbolically (e.g. through the use of eye-catching and fascinating images). The domestication of ART may be thought of as on-going, since ever new

techniques are introduced, and the political and public debates reveal these on-going processes. Here, I direct attention to the symbolic aspects of domestication by highlighting the way our everyday experience is increasingly filled with visual images that contribute to new cultural imaginaries, in which ART is included (Franklin 2013, Lie 2012).

In the decades following the birth of the first ART babies, the techniques developed rapidly; more methods became available, more babies were born by these methods and more people began to see them as a possibility (Franklin 1997, Melhuus 2012, Thompson 2005). These processes have been publically displayed and discussed as procedures for making an egg and sperm cell merge and start growing outside of human bodies. Whereas, previously, only medical personnel followed the process of cell retrieval, conception and cell division, today, prospective parents may watch their own cells on a computer screen during consultations at the fertility clinic, and the process – the way it takes place outside of the body – is available for everyone to view on the Internet.

The images of egg and sperm cells that proliferate on the Web suggest that something previously invisible and abstract has materialised before our eyes. This is grounded in a perspective on the products of science as only apparently fixed entities, whereas materialisation is a result of an entanglement of social and technical processes, producing materialising narratives (Haraway 1991, 1997). In this instance, the lengthy process of preparing samples before they can be depicted is just one step in a materialisation process (e.g. Lynch 1985, Lynch and Woolgar 1990). One may argue, however, that the cells are, in fact, material matter of the biological body that are transformed to an immaterial form on a computer screen. Still, for lay people, human cells are generally perceived as abstract matter (Ravn 2009). Here, materialisation involves visualisation processes that accord the gametes a body with particular characteristics.

The processes whereby the audience watch, interpret and imagine the gametes and their roles in the process of reproduction transform cells from aspects of an abstract theory of the composition of biological tissue into something imaginable inside the body. Even more concrete, in fertility clinics, the cells are visible through a microscope or on a computer screen as live matter to merge and grow.

Cell images contribute to materialisation processes by according gametes ‘thinghood’ – even identity – through a process of *entification* (Larsen 2010; also in Lie 2012). The concept of *entification* (from Latin *ens*, literally ‘something being’) captures a social trend whereby previously unacknowledged or abstract matters are named and emerge as a unit or category. In the process, social phenomena are transformed to external, disposable matters to be apprehended by choice, rather than as parts of an authentic self. There is, in other words, a trend whereby unacknowledged matters are externalised, materialised and commoditised. This aligns with Giddens’s (1991) notion of disembedding as a core concept in the emergence of modernity. The disembedding of matters from time and place make them imaginable as matters that may be replaced, used and transformed. In the present case, I will discuss whether cells may, so to say, be in a process through which they are released from the human organism and appear in the shape of individual bodies, and what effects this may have on the perception of ARTs and human reproduction.

The Norwegian context

The images chosen for analysis here have been used in different contexts and for an international audience. The interpretations of these images, and their role in the perception of reproduction and the acceptance of ART, are based on studies of ART in Norway over the past ten years. In

Norway, ART is offered through the public health care system. In the past five years, babies conceived by ART techniques in Norway have represented around 3% of total babies born, but there are no official numbers for children conceived by ART outside the country.³ Since 2009, same sex couples of women have been granted access to ART in the public health care system, but same sex male couples have not been afforded this access, since neither egg donation nor surrogacy are legal practices in Norway.

Norway has a relatively high fertility level compared to other European countries, with a total fertility rate around 1.9.⁴ Most Norwegians want children and have children, and the cultural understanding is that having children is normal and expected both for women and for men (Ellingsæter et al. 2013, Ravn 2005). This provides a background for the acceptance of ARTs, in the sense that the wish for children is taken for granted, and the urge to have children is so strong that people will travel abroad to fulfil this wish. Thus, in Norway, one may criticise the practice and profits involved in commercial ART practices, but not a person's will to do whatever can be done to have a child.

In Norway, ARTs are treated as public matters in need of regulation, not as matters of individual choice. Norway was rather early with the legal regulation of ARTs, through the Act on Artificial Conception in 1987. Later, regulation of ARTs was included in the new Act on the Medical Use of Biotechnologies (in short, the Biotechnology Act), which has gone through several amendments, each triggering a heated political debate. Norway has a very restrictive policy compared to other European countries (Bleikli et al. 2004, Melhuus 2012), and with the amendment of the Biotechnology Act in 2003, the trend was towards more restrictions: the anonymity of sperm donation was abolished and the suggestion for allowing egg donation was voted out (Melhuus 2012, Spilker and Lie 2007). In 2013, these restrictions were upheld, though

it was stated that persons who were to go abroad for treatments that are illegal in Norway (egg donation, surrogacy and anonymous sperm donation) would not be prosecuted, revealing an awkward compromise or a double standard. Surveys of the population's attitudes to biotechnology have revealed them to be rather positive – increasingly so after the turn of the century – and more positive to ARTs than to some other biotechnologies.⁵

Gametes on display

In the following, I will display a sample of egg and sperm cell images that are easily accessible on the Internet. The sample I have chosen are by Yorgos Nikas⁶, a gynaecologist who specialises in imaging and has his own image laboratory. They were selected according to the criteria that they are science images, produced in a medical imaging laboratory but also used very much in popular science. Nikas's images frequently appear in popular science and science imaging competitions, such as those organised by the Wellcome Trust (Johansen 2013), and in the Norwegian context they are used i.a. by the Norwegian Biotechnology Advisory Board in their journal and information webpages.⁷ That his images are available in commercial imaging galleries exemplifies the current trend of blurring the genres of science and popular culture imaging.

The process of producing cell images is meticulous and lengthy, and involves many people and several steps of preparation (e.g. Dumit 2004, Landecker 2007). 'In electron microscopy, preparation and handling of the sample are very important. Preparation starts with fixation, then the sample is dehydrated and completely dried, mounted on a holder, sputter coated with metal and finally observed under the scanning electron microscope. In any of these steps the morphology of the sample can be affected and artefacts may occur.'⁸ This briefly

describes Yorgos Nikas's process in his own words. The new practices, tools and techniques of visual technologies in medical science overlap with those of arts and popular image production (Anker and Nelkin 2004). The very same visualisation tools, such as Photoshop, are adopted by scientists, graphic designers and the general public. Moreover, there is a symbiosis between scientific and popular imaging technologies, in the sense that: 'Science and medicine furnish the raw material and the technological apparatus for narratives and spectacles in virtually all venues of popular culture. At the same time, science and medicine, in turn, regularly employ the representational conventions of popular entertainment' (Treichler et al. 1998: 3).

A particular of contemporary visual culture, as referred to initially, is the overall presence of images on screens – public and personal ones – such as posters and magazines. Media researchers emphasise that images are not self-explicatory; translations take place in both the production and the interpretation (e.g. Burri and Dumit 2008, Pauwels 2006). Still, a lot of public images are not scrutinised for meaning, but just seen in the passing. Both aspects of viewing, not only the active viewing but also that seen in the passing, are important to the habituation of seeing gametes and the transformation of the previously invisible to familiar matter. We may question the extent to which the general public acknowledges that these images result from the translation of digital data, and are not a snapshot of human tissue. Scientists, technicians and technologies are involved in a complex process of meaning-making, decisive for what is revealed and obscured, included and excluded (Pauwels 2006: 5). As mentioned, researchers warn that we should not understand visibility to be the same as transparency, and propose that we should be equally aware of what is not displayed and what is out of focus (van Dijck 2005, Rijcke and Beaulieu 2007, Treichler et al. 1998).

Within science, gender has implicitly served as a frame of reference for metaphors and comparisons, which have been exemplified by metaphoric expressions such as unveiling, undressing and penetration in search of truth – calling for the hidden or unexplored to be made visible (Haraway 1991, 1997, Keller 2002). Historians of medical science emphasise the importance of looking for stories that are mediated, for instance by image design and accompanying text directing the spectator’s vision, in addition to the explicit ones and how such implicit mediation contributes to processes of naturalisation – that is, ‘veiling their customary, conventional and social character’ (Jordanova 1989:5). This serves as a guideline for the following analysis. In particular, the analysis will highlight details in the images that cause them to materialise. By this I mean, firstly, how the images and captions attribute the subject with qualities and characteristics, identify shapes and make them recognisable for the audience, and, secondly, the ways in which they are attributed agency and anthropomorphised.

Figure 1 displays a single human egg cell at the time of ovulation. It is depicted on a background of blue and violet. The egg cell is coloured in a way that makes it stand out in contrast to the background, but also reflect the background’s colours. The cell appears with a perfectly round shape that is distinguished by a shadow on the lower edge. It is surrounded by a wide circle, the *corona radiata*, with a more blurred shape, here depicted as glowing pearls. The image emphasises the beauty of the egg cell through the choice of colours and the particular glow.

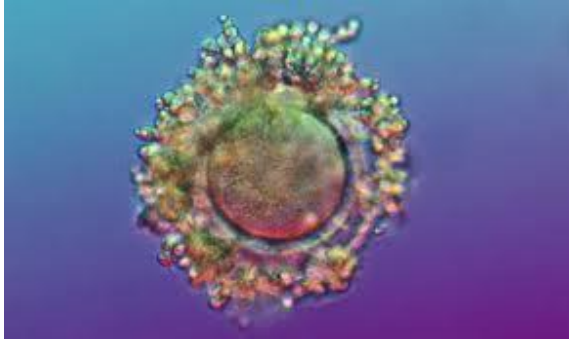


Fig. 1. Caption: A human egg at ovulation. Flaws accumulate in eggs leading to a rapid decrease in fertility from 35 onwards. Photograph: Yorgos Nikas

In contrast to the beauty of the image, the text reveals how such a perfect egg cell will necessarily go through a process of decay. Including the caption, the image not only displays what an egg cell looks like, but also carries a story of ovulation and the possibility of the conception of a child. Thus, the picture and caption, firstly, give the egg cell an identifiable body and particular characteristics (including beauty), and, secondly, indicate its existence as a ‘live being’ by depicting the life cycle of the egg cell.

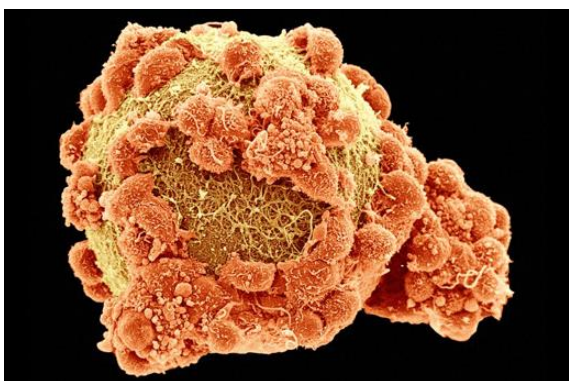


Fig. 2. Caption: A false-colour scanning electron micrograph of a human egg cell (gold) surrounded by cumulus cells (orange). Cumulus cells are specialised cells that nourish the large egg cell while it grows in the ovarian follicle. Credit: Yorgos Nikas, Wellcome Images

Figure 2 is a close-up of an egg cell in which the structure of the surface is visible between the surrounding cumulus cells. The image has strong contrast colours: gold and orange on a black background. The colour yellow is often used in depictions of egg cells, leading the viewer to associate them with a familiar notion of an egg – that is, the yolk of poultry eggs. Still, the threadlike structure tells the viewer that this egg cell is special. The cumulus cells appear large in size, even compared to the egg cell.

In this case, the text reveals that the image has false colours. This is, in fact, true of all the cell images. Even in black and white, one cannot render the exact colours, because the samples must be treated with colouring techniques for the details to light up under the microscope.

The text explains what cumulus cells are by referring to them as nourishment for the egg cell. This reference to a ‘hungry’ egg cell contributes to the anthropomorphisation of the cells and attribution of agency to them.

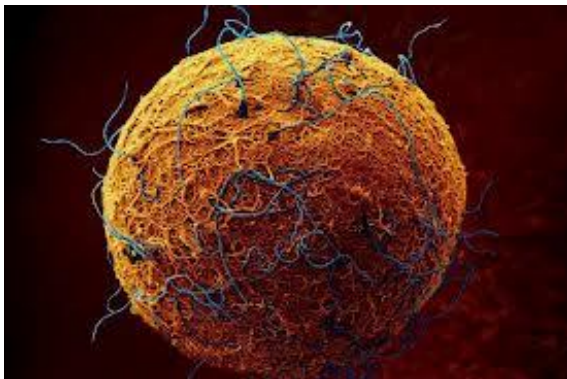


Fig. 3. Caption: ‘Fight club’

Credit Yorgos Nikas

This image, with the telling caption ‘Fight club’, displays an egg cell surrounded by sperm cells. The image is designed with contrast colours (featuring a yellow egg cell and blue sperm) on a black background. The egg cell appears as a circular round ball with even proportions. The sperm cells are mainly visible in the form of threads, but some also have visible heads. In popular notions, this depicts ‘the race’ of sperm cells ‘trying’ to penetrate the egg cell. The phrasing that accords agency and motivation to the sperm cells is well established; so much so that these may well be the terms in which the audience interprets such an image. The style and caption of this image contribute to an interpretation of what the image displays as a dramatic event, in accordance with the common and well-known story of conception as found, for instance, in handbooks for future parents.⁹

Here, the egg cell is clearly identified with a perfect round shape, and materialises with the same fabric-like structure of the surface as in Figure 2. The sperm cells look like threads with their long, narrow shape visible against the black background. The sperm cells are depicted as actors, in the way that the tails are seen to be nearly wagging, and the cell in the front that is most visible seems to be on its way down towards penetrating the egg cell. The caption supports this depiction of the cells as actors by referring to the race to be the one and only sperm to penetrate the egg cell.

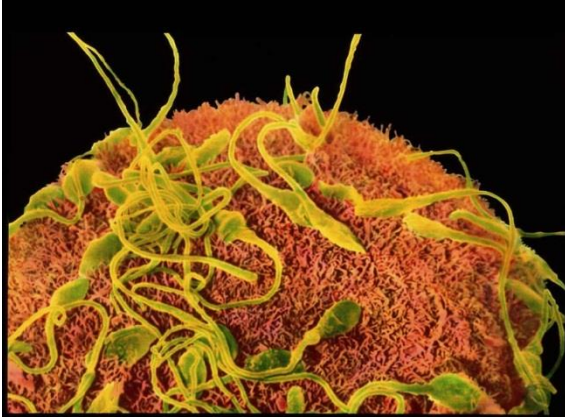


Fig. 4. Caption: **Stuck on you.** One of these sperm will penetrate the egg after binding to carbohydrates on the zona pellucida. Photo: Yorgos Nikas/Photo Researchers, Inc. ScienceNOW August 2011

Figure 4 is a close-up of sperm cells and the surface of an egg cell at the moment of conception. Again, the scene is displayed in strong contrast colours: the surface of the egg cell is in orange, the sperm cells are in phosphorescent green to yellow, and the image is set against a black background. The sperm cells are in focus, and their shapes are visible. In general, each sperm cell has a characteristic head and tail. On the one in front, one can discern the midpiece between head and sperm – in this case with a circular shape. The shape of the heads of the sperm cells is not identical, and such distinctions contribute to a sense of the individuality of each cell.



Fig 5. Caption: **A four-tailed phenomenon:** Specific genetic mutations explain these unusual sperm. Photo: Yorgos Nikas, *Nature Medicine* 14, 1174 (2008)

Figure 5 displays sperm cells in a black and white version, and, this time, depicts the cells as failures. Their shapes come through very clearly as glowing white and greyish on a dark grey background. It is not explained, however, whether these colours are close to the real or natural ones. The two sperm cells in the centre and on the right side of the picture have irregularly-shaped heads and very long tails that are entangled with each other. The caption 'A four-tailed phenomenon' brings the viewer's awareness to the fact that the tails are split. This image brings a perspective of comparison to the former sperm images, causing viewers to consider what is right and wrong, and what healthy sperm should look like.

Figure 6 is a commercial displaying an egg cell and four sperm cells in the 'race' to penetrate an egg cell. It is similar to science images of the gametes, both in shape and colour, and

is probably based on an image from a medical imaging laboratory.

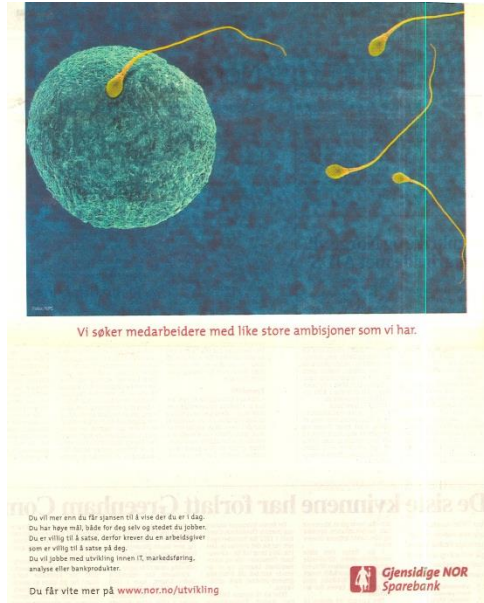


Fig. 7. Advertisement for an insurance company. Caption: We are searching for employees with as high ambitions as our own.

The image refers to a well-known cultural storyline, actually so much so that it can be taken for granted that the audience will receive the intended marketing message about winning. Other commercials with similar depictions of egg and sperm are accompanied by text referring to a race, competition, winning or being outstanding. By finding their way to advertising, images of gametes have definitely reached everyday life and a broad audience.

The texts that accompany these images often bestow the objects that are depicted with human-like capacities, such as competitive or affectionate feeling. This is demonstrated in Emily Martin's humorous article on how egg and sperm cells are attributed gender stereotypical traits in medical textbooks (Martin 1992). The attribution of agency, emotion and motivation to gametes contributes to a domestication process by associating them with a familiar story of 'he meets her' (Lie et al. 2011). Still, the way the gametes are displayed also creates a distance, in the sense that

it is hard to imagine how one can actually depict the magic of conception, thus blurring science, emotions and fantasy.

In summary, we may say that the cells materialise when they can be identified by such particulars as a body with a shape and a certain size. With a combination of microscopy and photo techniques, careful preparation of samples and use of colours, details of a cell's exterior become visible. In some of these cases, the captions indicate that the cells are on the move, even 'acting'. The widespread use of such images contribute to making egg and sperm cells part of everyday knowledge and included in cultural imaginations of what takes place inside the body. The cells are individualised and attributed particular, gendered qualities by the way they are visually presented and supported by the accompanying texts. This is reflected in the way people speak about egg and sperm cells in common language, as well as in the political debate over ARTs (Lie et al. 2011, Spilker and Lie 2007).

Gametes inside and outside bodies

There are several processes of change that have been going on in parallel to enforce the public visualisation of the gametes. Within the biosciences, the advancements in ART have been parallel to the development of visualisation technologies. Then comes the development in photo techniques, and these techniques are used by scientists as well as professional photographers and amateurs, resulting in a thin line between science and popular science images. Finally comes the rapid development of the Internet during the 1990s, which is by now a most important source of information on ARTs for the public.

Imaging techniques have developed rapidly, being a precondition for ART techniques. According to the leader of the fertility clinic at St. Olav's Hospital in Trondheim, where the first

IVF baby in Norway was born in 1984, the techniques that are normal procedure today could never have been developed nor been in use without the developments in visualisation.¹⁰

Researchers and practitioners must be able to see cells and embryos through the microscope throughout the whole process. Imaging technologies are also a precondition for the research leading to new techniques and increase scientific knowledge of reproductive processes more generally. This knowledge is provided by literally taking the gametes out of the body.

Illustrations of traditional sexual reproduction *in vivo* are based on gamete extractions for research and conception *in vitro*. It is only when cells are taken out of the body that they can be depicted by microscopes with built-in cameras. Illustrations of conception *in vivo* are accordingly based on medical imaging from ART laboratories. Visually, conception *in vivo* and *in vitro* are presented similarly, as the spectacular meeting of egg and sperm, and consequently blurring the boundaries between natural and assisted conception in the cultural imagination.

The gametes have become visible in the ethical, political and legal discourses. In the political debates surrounding ARTs in Norway (like in many other countries), the status of motherhood and fatherhood and the children's right to know their biological and genetic origins have been recurring issues (Melhuus 2012, Spilker 2008). Of relevance here is that, in the debates, gametes have taken a lead role. A point of importance in the political debate has been that ARTs involve conception outside of the body, and, whereas sperm has always left the body, it is more controversial to retrieve egg cells and use them outside of a woman's body. This point was particularly important in the early debates after the first IVF baby was born in Norway in 1984.

In contrast to egg donation, sperm donation does not create a situation different from natural reproduction. Donor insemination does not break fundamentally with that which occurs in natural reproduction. Whether conception occurs artificially or naturally, *the sperm is something that comes from the outside*. This implies that there will always be some uncertainty as to who the father of the child is. With natural conception it is not unusual that there is a discrepancy between legal or social paternity and biological paternity ... With natural reproduction the uterus and the egg constitute a natural unity. Conception, pregnancy and birth are a unified process *that occurs within the woman*. With egg donation this unity is broken ... with egg donation physical motherhood is split ... there is reason to believe that this lack of clarity will cause insecurity with regard to the identity of the child. (White Paper, Proposition to the *Odelsting* 25(1986–1987): 19)¹¹

The distinction between outside and inside has been central in the political debate over time. Politicians have pointed out the different roles of egg and sperm cells in the process of conception and used the difference of egg and sperm cells to argue against egg donation. They have done so by highlighting the difference between the inside and outside of the body and associating the differences between the gametes to distinctions of motherhood and fatherhood. In the legislation, motherhood and fatherhood are dealt with in conspicuously different ways. In Norway, like in many other countries, fatherhood is defined in social terms: according to the ancient Roman law *pater est*, the legal father is the man married to the woman who gives birth to the child. Motherhood, however, is defined in terms of the biological body: the legal mother is the woman who gives birth to the child. In the political debate, it has often been argued that a

basic difference between motherhood and fatherhood is that egg cells are kept within a woman's body, whereas sperm cells leave the man's body. This has the consequence that motherhood has always been certain, whereas fatherhood has not.¹²

In the debate, politicians (as well as other participants) have argued in terms of anthropomorphised egg and sperm cells, which have been referred to as if they were women and men. As referred to above, some have argued that egg and sperm cells have never been equal, but, in Norway, where gender equality is the cultural norm and enforced by legal regulations, it is a valid argument in the political debate to hold that egg cells should be treated equally to sperm cells (Spilker and Lie 2007). Thus, whether one argues in terms of gender equality or gender difference, we find that egg and sperms cells have replaced women and men in the political debate, or have come to be referred to interchangeably with women and men. Recently, the government-appointed Biotechnology Advisory Board formulated the following suggested amendment to the Biotechnology Act:

The majority of the Board [...] ¹³ is of the opinion that egg donation is an extension of other types of assisted reproduction that today are legal, accepted and supported by the Authorities. The majority requests that *men and women, and egg- and sperm cells*, be treated as equally as possible in the legislation.

(Biotechnology Advisory Board's statement on egg donation, sent to the Ministry of Health and Care Services 22 November 2011) ¹⁴

Gametes have, accordingly, entered centre stage in the official story of human reproduction. Moreover, they even appear in legal documents as individual bodies and subjects of legal regulation.

Assisted reproductive technologies, and the new life sciences more generally, involve radical interventions into the processes of biological bodies. Many of these interventions are highly disputed as cultural anomalies in the sense that they interfere with the idea that human reproduction is a key feature of the natural. As mentioned, surveys reveal increasingly positive attitudes to biotechnology, including ART.¹⁵ The last survey from 2010 reveals that more than 80% are positive to IVF for heterosexual couples, whereas some other types of ART (such as surrogacy and treatments for same sex couples) are still controversial.¹⁶ Thus at least IVF has been integrated into an accepted – and even normal – way of conceiving a baby, surprisingly quickly, and been accompanied by a change in the public understanding of infertility. Within the Norwegian context, we have observed that, until recently, the public understanding was that a person is infertile if one needs to access a fertility clinic; today, however, one is not understood to be infertile until one has had been through the three cycles of IVF that are the norm in the public health care (Lie, Ravn and Spilker 2011). The acceptance of ARTs has also been qualified by an early change of terms from ‘artificial’ to ‘assisted’ reproductive technologies. This change was made official in Norway’s medical and legal contexts during the 1990s, on the ground that the term ‘artificial’ contributed to a stigma of the babies born by these methods.

Today, there is a parallel discussion of terminology related to surrogacy, indicating how the terms used are effectual for the way these technologies are depicted. For instance, the term ‘surrogate’, and not ‘surrogate mother’, indicates the mother of the baby, as long as the term ‘mother’ is reserved for the intended mother, only (cf. Teman 2010). The term ‘intended mother’ is likewise disputed: Can wish, intention or planning qualify a person for motherhood? These questions have triggered heated media debates in Norway related to surrogacy cases taking place in India and the US (Kroløkke 2012, Melhuus 2012).¹⁷ The case of surrogacy is mentioned as an

example of the on-going cultural meaning-making processes that occur when dealing with egg and sperm cells outside of human bodies, such as the debates surrounding travelling abroad for treatments that are illegal in the home country (Inhorn and van Balen 2002, Pande 2011).

Thus, politicians, bioethicist and other researchers acknowledge the importance of the terms that are used for ARTs for the acceptance and normalisation of the procedures. My proposition is that medical imaging produces a material that is as persuasive and effectual for the cultural meaning-making processes towards acceptance as the language used, though is less acknowledged and discussed, and that imaging has been effective in directing the attention to the gametes as cultural as well as legal objects.

Egg + sperm = baby. ART domesticated?

Images of egg and sperm cells have literally lifted the process of human reproduction out of the female body and put it on display. The analysis of cell images here has aimed to demonstrate how these images display a story of human reproduction that deviates from the story of man meets woman, or *vice versa*, and is a story of egg meets sperm. Thus, the stories of conception both inside and outside of the body are nearly transformed into one and the same story, or at least become more similar. This is supported by the fact that illustrations of conception *in vivo* are based on imaging from ART research and practice. The images display the change that, today, conception may take place inside or outside of human bodies, but with the same end result. Thus, medical imaging technologies have been important for the domestication of ARTs in two ways: firstly, they have allowed us to see and become familiar with the story that it is gametes, and not women, who make babies; secondly, the gametes have, so to say, been released from the body, and conception appears independent of it.

Cell imaging has contributed to our habit of according gametes ‘thinghood’ – even identity – through a process of *entification* (Larsen 2011). In this process, gametes are transformed into external, disposable matters; they are, in other words, disembedded. The images display gametes as matters that may be replaced, used and transformed. The transformation of cells from abstract matter to things or commodities does, in this case, not refer to the commercial aspects – which are, of course, very important in a global industry of reproductive techniques (e.g. Waldby and Mitchell 2006). Here, the point is cultural meaning-making processes that transform gametes into personal commodities. The images depict the cells as concrete matter inside of the body that may be extracted and used outside of the body – or, alternatively, used within the body.

To understand the rather rapid and wide acceptance of ARTs – in spite of the disturbance they trigger – I have pointed to the changing cultural perception of the process of human reproduction. An understanding of conception as the unification of gametes and chromosomes makes natural and assisted reproduction appear as one and the same process, and this paves the way for the normalisation of ARTs. Concluding that the difference between ARTs and natural reproduction has diminished in the cultural understanding of human reproduction may raise the question of whether this implies a successful domestication process whereby ART is seamlessly included in the cultural repertoire of conception. The heated debates over every new step of ART developments reveal that this is not the case. As mentioned, Silverstone (2006) proposes that domestication processes are successful when there remains a kind of ‘moral itch or irritation’, because this means that the potential that new technologies enable – in terms of shedding new light on established truths, sparking new public discourses, changing morals and creating new practices – is not missed. This type of moral itch is precisely what ART constantly enforces. In

this case, however, a perception of gametes as personal property is an adversary to policies of ART that understand it as a public matter in need of legal regulation.

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² Intracytoplasmic sperm injection.

³ Medical Birth Registry of Norway (http://www.fhi.no/eway/default.aspx?pid=240&trg=MainContent_).

⁴ Statistics Norway (<http://www.ssb.no/en/befolkning/statistikker/fodte/aar>).

⁵ http://www.nsd.uib.no/rapport/nsd_rapport118.pdf . In the surveys, cloning and genetically modified food were on the other side of the scale (most negative).

⁶ <http://www.sciencephoto.com/media/227357/view>, about Yorgos Nikas.

⁷ <http://www.bion.no/>

⁸ <http://www.aim.cat/innovations.html>, accessed 17.1.13.

⁹ In Norway; for example, in the popular book by gynaecologist Gro Nylander (2002). See also Martin 1992.

¹⁰ Quoting Professor Arne Sunde in the documentary film based on our research: 'The true, the good and the beautiful. A film about medical imaging'. <http://insideoutimaging.com/>

¹¹ The italics are inserted by the author.

¹² See Melhuus 2012 for a discussion of motherhood becoming more equal to fatherhood – that is, less certain than before.

¹³ The following names of the voting members are deleted by the author.

¹⁴ In Norwegian: *Et flertall bestående av nemndsmedlemmene ... mener at eggdonasjon er en forlengelse av andre typer assistert befruktning som er lovlig, akseptert og støttet av myndighetene i dag. Flertallet ønsker at menn og kvinner, og sæd- og eggceller, skal behandles så likt som mulig i loven.*

<http://www.bion.no/filarkiv/2011/11/Bioteknologinemndas-uttalelse-om-eggdonasjon.pdf> (accessed 6.2.2013), page 1. The italics are inserted by the author.

¹⁵ http://www.nsd.uib.no/rapport/nsd_rapport118.pdf . In the surveys, cloning and genetically modified food were on the other side of the scale (most negative).

¹⁶ <http://helsedirektoratet.no/kvalitet-planlegging/bio-genteknologi/Documents/bioteknologi-etikk.pdf>

¹⁷ A cronicle in the Norwegian daily Aftenposten about *intended parenthood* was followed by a particularly heated media debate (Solberg, B 2010: Hun er deres forelder (She is their parent). Aftenposten morgen, kronikk, 13.10.2010)