



Ectogenesis and Mother as Machine

IRINA ARISTARKHOVA

Nothing is more awesome than the emergence in these early weeks of a recognizable human form from a tiny, undifferentiated mass. Such unique events might be expected to need a special environment, but the uterus is just a clever incubator, and rather less sophisticated than either the ovary or the placenta. Nature's real genius is being wrought within. (Gosden, 2000: 183–4)

Recent claims with regard to ectogenesis and 'artificial womb' technologies have renewed interest in, and intensified the politics around, the maternal body and its definitions. This article aims to revisit and critically focus on a seldom-addressed issue of the mother–machine nexus, with particular reference to the discourses of ectogenesis, as instantiated in technologies of so-called artificial wombs, artificial placentas and artificial uteruses.

Ectogenesis, as it has been defined thus far in its philosophical and scientific usages, refers broadly to 'genesis outside of the womb'.¹ Thus, by its very definition, it has an inherent connection to the maternal body, even if through a desire to ultimately disconnect from it. Ectogenesis promises a technological dream of developing 'outside' the maternal body by enabling gestation 'inside' a machine that strives to simulate the conditions of the womb; a machine that acts *as if* it were a mother.

Scientific research into ectogenesis seems to have been justified historically by three main objectives: (1) removing the maternal body from reproductive processes, through an underlying assumption that it is 'just a clever incubator'

whose function can be ultimately substituted; (2) that it is socially desirable to relieve mothers of the reproductive function insofar as women thus freed of maternal obligation would be able to spend more time and energy on their professional development (Gosden, 2000: 182); and finally (3) that it affords access to and control of the processes of conception, gestation and birth at any stage through various means, such as chemical intervention, monitoring of pre-natal development, scientific observation and analysis, etc. While these arguments have enjoyed intermittent and mixed currency both within scientific and academic circles, it is more pertinent for our purposes here to understand how these diverse and somewhat problematic discourses cohere, even if tenuously. It is suggested here that there is an 'ectogenetic desire' that substantiates, informs and sustains these discourses, practices and technologies of ectogenesis, and that there is an urgency to chart the operations and topographies of this desire.

In this article I attempt to show that this ectogenetic desire is arguably aligned with, and instantiated by, a larger cultural 'anxiety with/of the maternal'; an anxiety that usually manifests itself in philosophical, literary and scientific aspirations towards 'self-creation'. Michelle Boulous Walker, in her *Philosophy and the Maternal Body*, critically analyzes '(T)he philosophical phantasy of self-generation . . . which is specifically the masculine imaginary structured by a desire to displace the maternal in order to speak both in and from the mother's place' (1998: 28). She examines the philosophical works of various women thinkers (Irigaray and Kristeva, among others) to 'reclaim' the maternal body from the Western philosophical canons that seem to have systematically devalued its importance. Taking into account this history of 'erasure of the mother', it is not surprising, then, that many feminist scholars condemn the overt or covert desire on the part of philosophers to *give birth to themselves* or to dissociate birth from the maternal body (see Oliver, 1997: Part 1; Walker, 1998; Barzilai, 1999). Ectogenetic desire, it is argued here, aims at fulfilling this philosophical 'phantasy of self-generation' through scientific and technological means. Ectogenetic desire, it can be argued, has been historically aligned with an autogenetic desire.

While the topography of the ectogenetic desire includes and complicates a variety of debates currently raging in philosophical and scientific circles (e.g. legal definitions of personhood; maternal ownership and rights over the unborn child; surrogacy; paternal body; the 'human-animal' distinction, etc.) a proper and systematic engagement with these debates is well beyond the scope of this article. This article, however, seeks more specifically to explore the renewed investment in and manifestations of this ectogenetic desire as exemplified in the medical and technological embodiments of artificial wombs, placentas and uteruses, so as to

better enable an ethical and political reckoning of notions of motherhood and its coincidences with the machinic.

This article consists of three main sections. First, I present the ectogenetic desire as manifested in the medical and scientific discourses that champion expensive research and development of artificial womb and placenta. Second, I analyze the ‘horror’ of one mother encountering the machine through a critical reading of an essay by Smith-Windsor, who employs the notion of the cyborg to describe her own experiences with an incubator that sustained her prematurely born child. Here, I argue, contrary to Smith-Windsor, that it is not useful to counterpose mother and machine when in fact the history of the life sciences has contributed to a ‘mechanization’ of the maternal body, most specifically in embryology. In the third section I critically review the feminist critique of reproductive technologies and ectogenesis. Specifically, I show how ‘the maternal body’ should not be counter-positioned to the machine, as such readings obscure the material effects of ectogenesis on ‘other’ maternal bodies, as well as following a long and uncritical tradition of denigration of the ‘machine’. Finally, I argue that the dichotomy between ‘mother’ and ‘machine’ needs to be re-evaluated in order to enable a positive and ethical positioning of the maternal body within the feminist critique of ectogenesis.

Ectogenetic Desire in Scientific and Medical Discourses

Some of the earliest examples of ectogenetic experiments seem to have begun in the 1950s in Europe, Canada and the United States. Unno (2000) provides a useful bibliography of such earlier attempts to incubate embryos by simulating intrauterine and placental environments. Though briefly abandoned for a variety of reasons (mainly, for much cheaper and effective ways to ventilate lungs of premature babies), ectogenesis research resumed in the 1980s, led by Japanese scientist, Yoshinori Kuwabara. He developed what was to become the most publicized and widely exhibited ectogenetic machine using goat fetuses – though it is noteworthy that other animals have been used in such experiments such as sheep and mice. His study was conducted with more than 50 goat fetuses (Unno, 2000: 62). The removal of the embryo from the maternal goat body was achieved through a Caesarian section, which customarily resulted in hysterectomy, and often the death of the mother goat due to heavy bleeding. A blood reservoir with both fetal and maternal blood was used, as well as a synthetic lung and a waste product filter. It is noteworthy here that effective ectogenesis requires immobilization of the fetus, as any movement complicates the procedures. Thus, very often, prematurely born babies or goat fetuses had to be heavily sedated so as not to

move too much within ectogenetic environments (though movement deficiency usually results in serious side-effects for their future development – most of the goat fetuses died shortly after being disconnected from the machine).

Another example of ectogenetic research is the work done by Helen Hung-Ching Liu, a leading expert in ectogenetic technologies and assisted reproduction. She said in an online interview in 2001:

My final goal is what I call ‘artificial uterus’. I want to see whether I can develop an actual external device with the endometrial cell and then probably with a computer system simulate the feed in medium, feed out medium, simulating the abrupt stream and also have a chip controlling the hormonal level. . . . So I want to use a computer to help me do this, and I believe if this can be achieved we could possibly have an artificial uterus so then you could grow a baby to term. (Liu, 2001: np)

Liu’s research, unlike that of Kuwabara, seems not so much focused on enabling the survival of prematurely born babies outside the mother’s womb as on finding viable substitutes for it.

The primary ‘medical’ reason often cited for ectogenetic research is the need to incubate prematurely born babies, ideally closing the current gap in the ability to medically support the embryo outside the maternal womb, that is, between 16 and 23 weeks (when the placenta develops). Another interesting reason cited for the resumption of such research in Japan at least was ‘curiosity’ – to observe how the fetus looks and behaves before being born. It is interesting that this intellectual curiosity to have continuous visual access to the growing fetus has a long history in bio-medical imaging research, which is variously justified by a concern with maternal and fetal health. However, despite the enthusiasm and excitement generated by such research, there is a general consensus among researchers today that, in its current state, ectogenetic technology is not feasible or stable enough to afford mass (re)production and wider use. Unno echoes this sentiment thus: ‘At this stage of investigation, all we can say is that long-term extrauterine fetal incubation using extracorporeal circulation would be destructively expensive as an alternative for natural intrauterine pregnancy’ (Unno, 2000: 69–70). It is therefore useful to seek the rationale for the continuation of such research in places other than scientific and medical laboratories.

According to a classic study by Wells and Singer (1984), ectogenesis, if achieved, can:

- Provide couples with their own child without the complications of IVF and surrogate motherhood;
- Create a pool of spare parts for transplantation – livers, lungs, etc., and provide material for medical research;

- Eliminate wastage of embryonic life caused by abortion;
- Stop burdening women with being ‘reproductive machines’ and hence achieve more equality in childbearing;
- And, last, reduce the possessiveness of natural mothers.

Roger Gosden, a research director in reproductive biology at the School of Medicine at McGill University in Canada, in his own study follows the logic of Singer and Wells’s arguments. He goes further, however, in comparing ectogenesis with paternal pregnancy, as well as womb transplantation (from one person to another, as is done in animal research). Unlike his predecessors, however, Gosden goes beyond utilitarian and pragmatic reasons, and seems to most fully embrace and exemplify the ectogenetic desire discussed here. In his book, *Designing Babies: The Brave New World of Reproductive Technology* (2000), Gosden treats ectogenetic research as a question of deciphering ‘life and nature’s last secrets’:

Ectogenesis would provide a great opportunity to increase knowledge of what is one of nature’s last great secrets, and it would greatly benefit fetal medicine in general. There is perhaps no subject in biology that fills us with greater awe or of which we are more ignorant than the molding of a baby in the womb. Some people may prefer us to leave nature alone, as they did when antisera and organ transplants first became available for treating ailing children and adults, but the chance to at last understand the most tender period of existence and, even more important, to cure diseases and help with the creation of life will surely prove irresistible. (Gosden, 2000: 199–200)

Ectogenesis is also discussed extensively in his suitably titled chapter ‘Other Wombs’. According to Gosden, women might seek ectogenesis for reasons of ‘social or professional convenience’ (2000: 182), meaning that women freed from the ‘burdens’ of bearing children could more easily engage in their own professional and social pursuits. Gosden also proposes some ‘biomedical grounds’ for ectogenesis. These include risk that is posed by gestation in the uterus, since ‘anything could go wrong’ there (2000: 182). He argues that not only is it ‘just a clever incubator’, it is a very dangerous apparatus that might endanger the growing fetus with maternal microbes, with viruses and bacteria, as well as diabetic byproducts, through the placenta. Gosden calls the placenta ‘a leaky sieve’ (2000: 186) in relation to drugs, medicines and carbon monoxide.

In the next two subsections, ‘Surrogate Wombs’ and ‘Devoted Fathers’, Gosden considers surrogate motherhood and paternal pregnancy, in both cases still arguing for the option of an artificial womb. While surrogate motherhood might complicate the situation legally and emotionally, paternal pregnancy’s main problem seems to be inconvenience to the father (2000: 193–7). Gosden, however, is one of the very few researchers who has considered paternal pregnancy through uterine

transfer or ectopic pregnancy (that is, pregnancy in the abdominal cavity) seriously, as one of the scientific possibilities of the future. He thus suggests that transplanting a uterus within a father's body would be of advantage to both father and child, since uterine thick walls provide a safe environment, while the risk of birth defects in ectopic pregnancies is 50 per cent. It is noteworthy here that Gosden seems to acknowledge implicitly that the uterus is not simply a cavity like any other, even though elsewhere he defends ectogenesis by de-emphasizing the peculiar importance of the uterus, calling it just a 'clever incubator'.

In conclusion, Gosden writes that 'considering the availability of safe alternatives, there is no case for engineering a male ectopic pregnancy'; the 'safe alternatives' here refers to conventional maternal pregnancy. This last anxiety and tension with male pregnancy notwithstanding, Gosden seems to posit the participation of the father in gestation as a serious scientific probability. He also shows in his work that the lack of research in this area, compared to ectogenesis, is more the result of a cultural lacuna – a refusal to acknowledge the possibility – rather than anything to do with biological improbability. It is obviously much easier to raise financial support for research in ectogenetic systems, albeit as distant and futuristic, than for research in male pregnancy. Gosden postulates that a father could become a host for the fetus until the maternal womb is ready to accept it, and if this is possible in principle, and the fetus is as safe in his abdomen as in any uterus (since the uterus is 'just a clever incubator'), the need for a surrogate mother is then dispensed with. It might also be a cheaper option that, he claims, would additionally bond father and his child at the very early stages of development, after conception. The last claim is rather an odd one, given his continued stance that the womb is just an easily replaceable 'clever incubator', which therefore does not have any inherent emotional ties attached to it.

Obviously, most researchers propose a cautious approach to reproductive technology – for financial, ethical, religious and medical reasons. Even those who are mostly enthusiastic, such as Gosden, and Wells and Singer, agree that the maternal body is the model for further research. We might conclude here that most research in ectogenesis is driven by the promises and dynamics of an ectogenetic desire, and of its visions of life and control over 'nature's deepest secrets'. It is also important to note that the rhetoric of 'saving life' and the desire for immortality (understanding/controlling birth seen as a gateway to discovering how to regenerate ourselves/our cells) operates to cover larger epistemological problems of embryology, as defined in its history (Churchill, 1970). Simplification of intrauterine processes, and the disconnection between gestational and genetic maternal bodies are invoked in order to argue that it is genes that make us, while the uterus only provides a more or less provisional space for fetal

development (Gosden, 2000). Here the machine works as a metaphor to simplify the workings of the body, as well as to allow an illusion of manageability of the process of development to be established.

Cyborg Mother/Cyborg Child

In a very interesting and revealing article published in *Ctheory* – a leading cyberculture electronic magazine – Jaimie Smith-Windsor (2004) recounts her experience of ‘sharing’ her newborn daughter with a machine, a sort of external mother-machine. Her daughter was born prematurely and was put into an incubator – an artificial placenta environment. Throughout her article Smith-Windsor positions herself as an observer of the workings of the ‘life-support machine’ on her baby. What is important for us here is how the author, in an attempt to think of herself through the notions of ‘fractured identities and broken boundaries’, reinstates and even desires to distinguish her experience of mothering from reproductive technologies.

Her language counterposes and differentiates the natural warmth of the maternal body to the cold organs of the machine, which she carefully names: the ‘incubator’, ‘cords of the support machine’, ‘Drager 2000 Ventilator’, ‘artificial umbilical line’ and ‘the electrodes’. As the narrative continues, we are introduced to a more oppositional anxiety of a ‘human’ mother, on the one hand, and a machine incapable of love and caring on the other. Throughout the text Smith-Windsor denies the machine most of the things she claims for herself – love, physical body, reality and, ultimately, goodness.

First, the machine is not capable of ‘real’ love or ‘real’ breathing – it merely simulates such actions. Everything is simulated: breathing through the pipes as if it were real breathing, simulating symbiosis as if it were natural, etc. Something that was once attributed to ‘Woman’ (Smith-Windsor’s usage), defining her as a pure ‘simulation’ of feeling and thought – all in order to disqualify her from participating in matters of state and society as well as decisions over her own life – is now attributed to a machine: ‘Technology is capable of simulating vital signs, of supporting life, of becoming Mother. The child of the techno-Mother is essentially, a virtual body’ (Smith-Windsor, 2004: 2). It is a living simulacrum, according to Smith-Windsor.

Second, the machine aims to substitute the Mother, by creating a fissure in the child–mother relationship:

The relationship between mother and child itself is mediated by technology. Technology interrupts the relation, intercepts the exchange of nurturing and needing of the infantile language. The Mother becomes redundant: technology becomes the external womb. (2004: 3)

Here we face the same rhetoric as during the Industrial Revolution – of dangerous machines substituting workers in the 19th century – ‘cold’ machines as substitutes of human labor. However, much more than a question of livelihood is at stake. Smith-Windsor uses psychoanalytic theory (Kristeva in particular) to support her claim of why it is ‘bad’: in this case a child does not go through a ‘normal’ process of entering the symbolic order and learning human communication.

Third, it is ‘evil’ since unlike a good Mother with her ‘natural’ protective body, the artificial womb is defined as the external womb. As a result, it makes the child’s body more ‘available’ for interference from the outside world, including from the medical profession. Here the traditional medical imaginary of interior/exterior is reversed: while in medical literature the maternal body is an unstable and dangerous place (as conceived by Gosden), potentially harmful for an infant, here the machine is seen as the dangerous place. Nevertheless, the ‘internal/external’ opposition is sustained in both cases, and both positions easily substitute each other, since they derive from the same ‘safe/dangerous’ opposition. For Smith-Windsor, rather than being in an enclosed protected home – the maternal body – the child’s body in the artificial womb becomes a cyborg of virtual ‘non-space’. The machine, hence, cannot protect the child’s body as *naturally* as the Mother can, from harmful effects and others (doctors), who are claiming the child as their object of study/interference.

Fourth, for Smith-Windsor, it is ultimately a question of a power struggle between life and death, good and evil:

Through the body, the machine performs the dichotomy of living and killing, life and death. It gives life only to overtake it. The technology that sustains life is ultimately nihilistic. . . . To become cyborg is to commit a slow-suicide. Ultimately, it is the nihilation of the human body, of autonomous human consciousness. (2004: 3–4)

Smith-Windsor’s totalizing conclusion leaves us with despair, drained of any options and opportunities to fight ‘evil’ machines, leading to the total cybernetic control of the individual: ‘To locate “being” outside of technology becomes an impossibility. . . . Becoming cyborg is ultimately about the sublimation of the human identity and the political imaginary’ (2004: 6).

In some sense, Smith-Windsor’s writing might seem like a critique of the cyberfeminist flirting with the notion of the female cyborg deriving from the ideas of Sadie Plant (1995), among others. There is very little in our culture that helps mothers to come to terms with their experiences vis-a-vis ectogenetic technologies. If pregnancy is taken as the most *natural* function of a woman, it is no surprise that the maternal body and experience of motherhood seems fundamentally opposed to and dissonant with such machinic substitutes as incubators.

Often, even while trying to enact alternative visions of the maternal body, we face particular difficulties when these visions involve conjunction with machines. However, being at war with the machine might be a displaced political struggle, since the maternal body itself has been traditionally coded as 'less human', being both more 'natural' as well as 'mechanical' than male bodies, as will be shown shortly. The history of the life sciences, as well as philosophy, needs to critically address its own autogenetic and ectogenetic desires. Only then can the possible alternative visions of the mother-machine connection be explored.²

Mechanization of the maternal body in philosophy and the life sciences has both derived from and served the devaluation of its participation in genesis and the birth process, as well as the disconnection of the fetus from the uterus. Ectogenesis is a workable concept only if one assumes that the embryo and the mother are two separate and therefore separable entities. Such devaluation of maternal participation in the process of human development was first achieved through privileging man as the site of soul and life force, while woman continued to be viewed as a 'clever incubator'. According to Aristotle, semen is drawn into a fork-shaped uterus when it becomes 'heated', as if into 'cone-shaped vessels which, when they have been washed out with hot water, their mouths being turned downwards, draw water into themselves' (Aristotle, quoted in Bodemer, 1973: 2). This conception, however, is not dissimilar to the imaginary that exists in other cultures. Even if some cultures ascribe a more active role to the uterus when compared to Aristotle, it is still seen as less important than the role played by the man or God(s) (Heritier-Auge, 1989; Kapani, 1989; Sissa, 1989; Upaniṣad of the Embryo, 1989; Oliver, 1997).

The concept of the cyborg, as it has been used by Smith-Windsor and others – even if seen in terms of the 'next step in evolution' – still reinforces 'natural' versus 'artificial' distinctions. And the potentiality of alternative visions seems to come from the mother-machine nexus, as we have tried to argue so far.

If negative definitions of the machine represent misogynist tendencies within European philosophy (devaluing mother *as* machine, that is, as *less* than human), then feminist thought has to imagine and set forth alternative conceptions of the machine and thus of the maternal body. There is a need to reconsider our traditional 'denigration of the machine' in Western thought, especially with reference to new reproductive technologies, and ectogenesis in particular. And this critical evaluation of the maternal and its relation to machines needs to be informed by the feminist critique of reproductive technologies.

Ectogenesis and Feminist Critique

The feminist literature on reproductive technology is diverse and plentiful, and represents probably the most consistent and systematic set of interrogations of technology engaged in by feminists. One might assume this is due to the fact that the maternal body is most directly related to women, and therefore feminist writers have a particular passion and, moreover, responsibility to focus on issues of reproductive sciences and technologies. The point is often made that if *we* do not engage in such critique, then it will be left to patriarchal medical institutions, with their misogynistic history. However, a problem (both ontological and epistemological) arises when feminist literature positions reproductive technology as a *separate* object, as something that is opposite to women and their experiences. In some sense, isolating *us* (women) versus *them* (machines) seems to have led to the formation of this 'separated-ness' as feminist doxa. Such a doxa, however, does not take into account different histories, genealogies and continuing possibilities of reproductive technology and embryology as a field of knowledge. It also obscures women's continuing involvement and investments in the formation and development of such histories, genealogies and possibilities.

Very few feminist researchers to date have articulated other than the most negative attitudes towards 'reproductive machines', mostly on the grounds that women are already being exploited as 'wombs' and 'machines for reproduction'. It is certain that most of the above-discussed researchers also see women as both obstacles and valued suppliers of materials to their research needs. What is often missing is the heterogeneity of women's positions, especially as informed by class and race differences. There is still a strong disjunction between psychoanalytic and post-structuralist readings of the 'maternal body' and the ethics of 'other' maternal bodies, with different cultural and social contexts. Marxist, non-Western and radical feminist analyses of reproductive technologies seem most informed by the differences among women, and the role played by power relations and material conditions in women's lives. Thus, Ann Oakley, in her excellent and suggestively titled book *The Captured Womb: A History of the Medical Care of Pregnant Women* consistently tried to show that the 'womb' has become a kind of competition ground among scientists and doctors for control over the female body and its reproductive power. However, her attitude to ectogenesis was negative, positioning the 'womb' as a 'safe sanctuary' versus the machine:

... nowhere, quite yet, is the spectre of an entirely laboratory-made human pregnancy. ... We may ... confidently say that the intensive care provided by the human uterus will continue for some time in the antenatal world of the future to provide a sanctuary for the fetus which is technically superior to that of any man-made [sic] substitute. (1984: 282)

It is noteworthy, though, that Oakley only conceives of control in relation to the desire on the part of the medical establishment to control reproduction and women. While announcing that ‘the absolute removal of pregnancy from women’s uteruses to laboratories could either be liberating or oppressive for women’ (1984: 282), Oakley rightly argues that this is a question of ‘Who controls it?’

Robyn Rowland (1992) seems to have divided ‘us’ and ‘them’ from the beginning as well, though she implies that women *had* control over their reproduction and that this is being taken over by men operating new technologies, for the purpose of controlling ‘maternal procreative ability’. Here, presenting gestation and birthing from within the maternal body as ‘natural’ supports the problematic opposition between maternal body and technology as aligned to that between ‘natural’ versus ‘man-controlled’:

Subtly, step by step, we are changing the nature of being human and eroding the control which women have had over procreation. In its place, male-controlled technological intervention is beginning to determine how children will be conceived, what kind of children will be born, and who is worthy of receiving these new products of our science. (Rowland, 1992: 3)

Such framing of the changes does not seem to account for alternative positions of women, placing them *in oppositional relation* to the progress of reproductive science, that is simplistically presented as just wanting to take increased control of the realm of ‘captured wombs’. By positioning women and their ‘populated wombs’ as passive, brainwashed receivers of whatever ‘doctors-men-fathers’ decide to implant there, we obscure realities of Western middle-class women, who remain the main consumers of the discourse as well as the practice of artificial reproduction, surrogate motherhood and technological research in ectogenesis. This attitude also makes those ‘guilty’ women who buy into such technologies and practices, into ‘complacent victims’ of patriarchal structures of family and community, rendering them unaccountable, as the oppressed class, for their decisions. That is, probably, the reason why a large proportion of feminist literature on reproductive biotechnologies does not address the question of the mother-to-mother relation (be it human or animal).

Though usually cast in negative terms within feminist theory, various attempts have been made to redefine the status of women by valorizing and embracing the technological and the machinic, notably through the notion of the *cyborg* (Haraway, 1991) and in cyberfeminism (Plant, 1995, among others). For example, for Sarah Franklin the embryo is both ‘one of us’ – a part of humanity in general – and a ‘cyborg’, which for her means being technological and organic at the same time. It is connected to us through ‘genes’ and communal feelings, but it is also born ‘out of science’, and it:

... inhabits the timeless ice land of liquid-nitrogen storage tanks, and feeds on special (pure) culture in its petri dish. At once potential research material (scientific object), quasi-citizen (it has legal rights), and potential person (human subject), the embryo has a cyborg liminality in its contested location between science and nature. (Franklin, 1995: 337)

Here the 'postmodern condition' of cyborg does not go further than being an occasion for the conjunction of the human and machine assumed to be *opposites* of each other.

An anthropological approach allows us to understand that we have had reproductive technologies for as long as we have had social forms of living together. What might seem today to be the intervention of machines into human existence is not that unusual, after all: 'anthropological and historical evidence reminds us that technological interventions into reproduction are ubiquitous and have been around for thousands of years' (Ginsburg and Rapp, 1995: 291). Petchesky also argues for a wider range of epistemologies and approaches in understanding the human-machine nexus. In her article 'The Body as Property: A Feminist Revision' (1995) she states that she is 'troubled' by the ongoing exploitations of women's bodies and uteruses, and their reduction to objects for sale or rent. However, her intentions are to raise crucial critical questions concerning the language in which feminist accounts of those exploitative practices are formulated, and how 'to challenge the narrow conceptual frameworks in which some feminists criticize these transactions' (1995: 388). Arguing against Pateman's views that feminists should, as far as possible, avoid 'the language of the individual', since it fashions women according to a male model, Petchesky acknowledges problems with Western conceptions of property but also argues for alternative visions rather than rejection. For one alternative vision, Petchesky turns to Afro-American women's experiences with motherhood under conditions of slavery:

The African American slave women's body was deeply enmeshed in the ties of household, kin, community, and maternity. ... Out of this experience, black feminist theory points to an ethic of women's bodily integrity that is communal and extended rather than individualized and privatized. (Petchesky, 1995: 398)

Petchesky teases out the crucial question in relation to the ethics of the maternal body, that is complicated by the issues of health, race, class and bodily processes, all being defined by cultural and historical norms. She sounds very much in line with Irigaray, who claims that we should not abandon the notion of female subjectivity just because a male subject is in crisis:

For many other women's movements around the globe, the idea of women owning their bodies is similarly not an individualist, exclusionary interest but rather a fundamental condition for

women's development and strength as a social group and thus for their full participation as citizens. (Petchesky, 1995: 403)

I would argue this 'ideal' is somewhat problematic if we take it as a utopian feminist goal for full ownership, rather than a specific claim in a specific situation. There is no such thing as 'full ownership' of one's body – in particular, of the maternal body. And even if we look at the burden of Western definition of reproductive freedom as a split between self and community, body and society, the main development that challenges this split is accelerated by reproductive technologies themselves.

Differently, Karen Newman, in an important book *Fetal Positions: Individualism, Science, Visuality* (1996) argues that it is not advisable to seek any kind of 'subject' position for the mother, since this would feed into the Western liberal humanist project. Thus she argues against 'restoring' the image of maternal body in the representation of fetuses. As much as we would like to build up a 'self' for the mother, it would be an unproductive, even destructive move, as soon as such notions of the 'self' follow the problematic notions of controlled identity and individualism (Newman, 1996: 68).

Janice Raymond has been much more complex in analyzing technologies of assisted reproduction, especially in their political relations of power. In her book, titled similarly to the one by Oakley, *Women as Wombs: Reproductive Technologies and the Battle over Women's Freedom* (1993), she presents an interesting analysis of reproductive technologies and sexual exploitation, clearly demonstrating that the issue of reproductive technologies is directly connected to questions of class, race and power. Most surrogate mothers come from minority or lower-class backgrounds. Moreover, the demand on the part of middle-class parents in the First World countries breeds supply in the Third World, causing previously unheard of exploitation of maternal bodies. She describes in detail how breeding 'baby farms' and 'gestational houses' have been operating across South America and Asia (and, according to the most recent reports, in Eastern Europe). I might add here that, despite her obvious sensitivity to the First World demand for 'fair-skinned babies' (she described cases when 'dark-skinned' girls were forced to have sex with white men, in the hope of producing 'fairer' children for the illegal baby market), Raymond fails to articulate the position of the white middle-class Western woman as the 'citizen-consumer' of reproduction and its technologies. She only refers to women who use reproductive technologies such as IVF and embryo transplantation as 'compliant' within the system of oppression and exploitation.

New reproductive technologies reinforce and *hystericize* (in the Foucauldian sense) the position of the maternal body in religious, economic or philosophical

terms. This is not to say that previously maternal bodies have not been 'harvested' for research. However, with research in need of more and more valuable maternal products (e.g. stem cells, placenta, cord blood, etc.), such 'harvesting' becomes more public, more visible and more valuable. In order to make ectogenesis possible, many more millions of maternal bodies, both animal and human, would be donating and donated for research and the development of the artificial womb – their time, pain, pleasure, life.

Conclusion

Ectogenesis, as a concept and a field of study, has come to light in the last half century, prompted by developments in reproductive technologies and the life sciences. It is constituted by various scientific, medical and philosophical arguments, and supported by the desire for external (to the maternal body) conception, gestation and birth; a desire I referred to here as the ectogenetic desire.

In the first part of this article the scientific and medical rationale for ectogenesis was examined. It was shown that expert discourses on ectogenesis position the mother as a target for replacement by the artificial mother-machine. Such positioning locks ectogenetic research on the maternal body, making it the center of anxiety and hope, as well as the locus of investment and study. As a consequence, animal and human mothers become the essential material (often 'donated') for medical and scientific research. The ectogenetic desire of recent medical and scientific discourses, as argued here, corresponds to and promises to realize the old philosophical desire for autogenesis/self-creation.

In the second part, the maternal position of Smith-Windsor vis-a-vis the machine supporting her child's life was presented as an example of the maternal rationalization of ectogenesis and its underlying desires. In the social and cultural absence of maternal discourse on the machine, Smith-Windsor adopts various approaches – psychoanalytic, feminist, post-structuralist, etc. – in an apparent attempt to find a way to disconnect herself from the machine that supports her child. The notion of the cyborg is employed to articulate the encounter between the 'natural' body of the mother and the child, and the 'technological' body of the machine; producing cyborg-mother and cyborg-child. The notion of the cyborg does not seem to move beyond the need to strengthen the opposition between the 'natural' and the 'technological' in Smith-Windsor's account, positioning the mother on the natural side and the machine on the artificial side. In the same section I argued that such positioning is blind to the mechanization of the maternal body within scientific and medical discourses, as well as to the conceptual imbrication of the maternal within the machine in Western philosophy and science.

Last, in the third part of the text, ectogenesis and its underlying desire are approached in the light of the existing feminist critique of recent reproductive technologies and medical research in so-called ‘assisted reproduction’. While acknowledging the necessity of wider feminist critique and analysis of the discourses and practices of ‘assisted reproduction’, I focused my attention on existing feminist frameworks that might be useful in dealing with the specific issue of ectogenesis and its implications for our conceptions of the mother and the machine. I argue that, rather than insisting that the mother and the machine are essentially separate, it is important to read critically the mother-machine as coextensive, and possibly mutually reinforcing, sides of the same ectogenetic desire. Such a reading would question a certain doxa within feminist theory discussed in the final section, and challenge conceptions of the maternal body as the last resort of the ‘natural’ and the ‘human’.

Ectogenesis certainly poses more questions to scholars and societies than those underlined here. The question that has been examined here – the positioning of the mother and machine couple within ectogenetic desire – is just one, albeit crucial, element in the political economy of the maternal body, and certainly more critical analysis needs to be undertaken in the future.

Notes

1. Program in History and Philosophy of Science and Technology (HPST), Stanford University. <http://www.stanford.edu/dept/HPST/ectogenesis/introduction.html>
2. One possible alternative is Canguilhem’s (1992) notion of a machine as a cultural fact, as well as *human organ*; however, a full examination of this is beyond a scope of the article.

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Dr Irina Aristarkhova is Assistant Professor at the Communications and New Media Programme, Faculty of Arts and Social Sciences, National University of Singapore, and College of Arts and Architecture, Penn State University, USA. Formerly she was Senior Lecturer at LASALLE-SIA College of the Arts where she conducted the Feminist Art Workshop. She serves on the International Academic Advisory Board for *Leonardo Electronic Almanac* (LEA, MIT press e-journals), and is currently working on a monograph on new media conceptions of space, provisionally entitled *Matrixial Technologies*.