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Artificial Wombs and the Ectogenesis Conversation: A Misplaced Focus? Technology, Abortion, and Reproductive Freedom

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Abstract: Bioethics scholarship considering the possibility of gestating an embryo to full term in an artificial womb (ectogenesis) often overstates the capacities of current technologies and underestimates the barriers to the development of full ectogenesis. Moreover, this debate causes harm by (1) neglecting more immediate problems in the development of artificial wombs, (2) treating abortion as a "problem with a technological solution," bolstering anti-abortion rhetoric, and (3) presuming the stability of women's reproductive rights. The ectogenesis conversation must consider anticipated uses of the technology (neonatal intensive care) and acknowledge the immediate context (recognizing abortion as essential healthcare and existing reproductive inequities).

Keywords: abortion, artificial wombs, ectogenesis, feminist ethics, reproductive technologies

1. Introduction

Waves of ethico-legal scholarship theorizing that it will eventually become possible to gestate an embryo from conception to full term outside the womb (full ectogenesis) have recurred since the 1920s (Haldane 1924; Abel 1974; Tribe 1990; Lupton 1997; Smajdor 2007; Kendal 2015; Abecassis 2016). Interest in this topic began when geneticist J. B. S. Haldane (1924) presented a work of speculative fiction about full ectogenesis to the Cambridge Heretics Society. Sparking what Rosemary Tong (2004) has referred to as the first wave of debate on the artificial womb (AW), Haldane proposed that by the 1960s ectogenesis would

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overtake "natural" gestation and become the primary form of human reproduction. While significant progress has since been made in both neonatology[1] and embryology,[2] and these recent developments are rich with ethical issues for consideration, excitement over the prospect of full ectogenesis has once again become the predominant focus of bioethical debate about AWs (Cohen 2017; Blahuta 2017; Räsänen 2017; Kaczor 2018).[3]

In this paper, we argue that the present hegemony of speculative discourse about full ectogenesis results in three principal harms. We hope that our account of some current shortcomings in the literature will better direct future discussion about ectogenetic technologies. First, we contend that the focus on full ectogenesis is crowding out discussion of the immediate problems of ectogenetic technologies, which are those issues inherent to *partial* ectogenesis; gestation of a gestateling[4] ex utero after it is removed from a pregnant person's womb) as an alternative to neonatal intensive care (NIC) (Romanis 2018). Focus must be directed to more immediate realities of ectogenetic technology because we face imminent problems in the development of AWs, including the ethics of experimental treatment on extremely premature neonates and pregnant women (Romanis 2018), and equitable access to care.

Moreover, addressing these smaller, but still ethically contentious, steps toward gestation ex utero, affords us the luxury of examining intricacies that might otherwise be overlooked. Second, we believe that focus on full ectogenesis "problematizes abortion" on the basis of future uncertainties. Arguments are frequently made about an imagined future in which technology collapses the viability timeline with the consequence that even early abortion need not necessarily result in fetal death. These arguments, however, become an aspect of our present as imagined technologies encourage a causal inversion (Schick 2016) in which imagining a future without the need for abortion is itself a moral commentary undermining the necessity of abortion in the present. This commentary effectively labels contemporary abortion provision as a 'necessary evil' to be tolerated only until the development of AWs (which are often unreliably implied to be inevitable) is able to provide a better "solution." These claims provide fuel for present-day anti-abortion discourse and are of particular concern in a time when abortion rights are threatened in a number of jurisdictions. We question why abortion is being framed as a "problem to be solved."

Finally, we believe that the focus on full ectogenesis accords undue priority to imagined gender parity in heteronormative reproduction at the expense of other issues of reproductive freedom. We consider the recurring claim that full ectogenesis could result in equity of parental rights between male and female progenitors. Stratified reproduction refers to inequities of access to reproductive care and technologies across "hierarchies of class, race, ethnicity, gender, place in a global economy, and migration status" (Colen 1995, 78). Further, it refers to the burden of reproductive labor and social reproduction being inequitably distributed across these lines. We adopt a stratification framework and suggest that such claims are problematic because they presume that contemporary

reproductive rights for *all* women are equitable and stable. Moreover, these arguments label the female body itself and its capacities as the source of inequality and fail to recognize the true cause of inequality as social response to bodies gendered female. We argue that the current ectogenesis conversation does not sufficiently address larger questions of reproductive stratification, which again, should be considered in regard to immediate issues in NIC.

2. Ectogenesis: The Scientific Realities

In 2016 news broke that two teams of scientific researchers had succeeded for the first time in growing embryos in vitro beyond the point they need to implant in the womb lining to survive (Shahbazi et al. 2016; Deglincerti et al. 2016). The discovery of a technique to chemically stimulate embryos to "implant" in lab conditions has also been speculated to be genesis of the science that will eventually lead us to realizing full ectogenesis (Alghrani 2018). Domestic law and scientific guidelines in many jurisdictions, however, prohibit embryo experimentation beyond 14 days from fertilization (Hyun et al. 2016). There has been broad consensus in the international scientific community that this limitation was a fair interference with research (International Society 2006). Vocal opposition to the 14-day limitation, however, has emerged following these experiments, on the grounds that it severely hinders progress (Harris 2016). Despite this crucial breakthrough, and the call to remove restrictions, full ectogenesis remains a remote possibility.

First, it is unlikely that many countries will liberalize restrictions on embryo research in the near future. The 14-day rule is "one of the most internationally agreed rules in reproductive science and medicine to date" (Appleby and Bredenoord 2018). The rule is often presented as a compromise[5] between scientific progress and moral concerns expressed in the public consciousness about embryo research. Regardless of whether liberalizing restrictions would be ethical, in many countries public "repugnance" at human embryo experimentation limits the political capital for reform to lift restrictions. Second, it has taken over thirty years for pioneering embryologists to discover a technique capable of sufficiently mimicking the conditions of the womb in vitro to chemically stimulate implantation. Inevitably, observing, understanding, and safely managing some of the still unknown events in embryonic development will be a long process. Moreover, full ectogenesis is unlikely to be a research priority.[6] We do not suggest that full ectogenesis could *never* be a possibility but that complex socio-political factors and the uncertain realities of embryo science make it unlikely in the foreseeable future.

All attempts in the immediate future to gestate human entities ex utero will necessarily involve fetuses that were conceived (or implanted into) and partially gestated inside a pregnant person's body before being removed. There have been some significant developments in technologies designed to perform this function and provide parent(s) of premature neonates with a better alternative to neonatal intensive care (NIC) (Partridge et al. 2017; Usuda et al 2019). In 2017,

the biobag animal study demonstrated that it might be possible to remove a fetus from the womb of a pregnant person to continue the process of gestation artificially ex utero. Biobags were able to mimic the conditions in later-stage gestation on the current viability threshold of 110 days for a lamb (the equivalent of 23–24 weeks for a human fetus) for a period of four weeks. The authors were clear that the purpose of this study was to develop a better alternative to current methods of intensive care for premature infants (Partridge et al. 2017, 11). Following successful clinical trials on animals and humans, AWs will first be the domain of neonatologists as an experimental treatment and only slowly will there be moves to standardize their use as the outcomes are proved to be better than current incubators and treatment.

This technology could eventually shift perceptions of viability in medicine, because AWs do not appear to be subject to the same requirements of gestational maturity. However, there is still a long way to go before perceptions of viability shift significantly away from 20–22 weeks. It is only after a long process of clinical investigation and/or once AWs become standard treatments for just-viable preterms (24 weeks) that there is even the possibility that they may be used to routinely aid preterms slightly below the viability threshold. This would only happen as doctors making case-by-case decisions about individual patients decide to try a treatment that has already worked for more mature preterms.[7] Importantly, *even if* the biobag becomes a reliable alternative to late-term gestation, AWs will not be ready (or intended) for the embryonic product of conception in the foreseeable future.

3. Neonatal intensive care is the focal point of ectogenesis

Despite the remote nature of the possibility of the viability threshold being entirely collapsed, the ethical literature still focuses on the implications of the lack of, or a significantly reduced,[8] viability threshold. There is particular interest in the implications for abortion (Cohen 2017; Räsänen 2017; Steiger 2010; Alghrani 2009; Singer and Wells 1984). The focus on full ectogenesis in the literature neglects to reflect the scientific realities we have outlined. How exactly perceptions of viability may be reduced over time, and what happens in the process, is also in need of ethical investigation. The gradual introduction of technology not subject to the same requirements of gestational maturity as conventional NIC necessarily entails experimentation on fetuses, pregnant women, and gestatelings. Medical viability will only shift if and when the technology is successfully used to sustain very premature babies (those born before 22 weeks), but we do not know what the impact of this technology on such underdeveloped human entities ex utero will be. If the purpose of academic discourse about ectogenetic technologies is to consider the practical and ethical implications of such technologies, the focus must first be placed on the process of developing these technologies (*partial* ectogenesis). Thorough discussion of the use of AWs in NIC would examine intricacies, such as how to trial the technology and the impact of such technology on developing human entities, which will assist in

discussing the impact of a shift in perceptions of viability. There is room for discussion about whether AWs should even impact on legal and medical conceptions of viability. The AW is technology potentially capable of continuing gestation and thus does not facilitate a "complete" birth; it is not a form of assistance that effectively enables human entities to survive birth earlier in gestation (Romanis 2019b). Thus, it is arguable that those fetuses only capable of surviving if the process of gestation was facilitated after delivery from the uterus should be captured within the definition of "viable" (Romanis 2020). Moreover, given the imprecise nature of determining viability in medicine, AWs present an opportunity to continue ongoing critiques of the use of viability as a limitation to abortion rights in law (Erdman 2017; Horn 2020a; Horn 2020b). Discussion that acknowledges the incremental nature of shifting perceptions of viability, as a consequence of technology capable of supporting younger developing human entities ex utero and accompanying medical decision-making, will be more sensitive to the nuances of this shift. Considering the ethical treatment of gestatelings allows us to examine the extent to which the viability threshold will even be able to shift in the first instance. Moreover, considering the use of AWs as a process that inevitably still involves pregnant people's bodies (because a process of extraction is necessary) ensures that issues relating to bodily integrity and autonomy are not as easily disregarded as they are in the "thought experiment" approach to the issue.

We are not attempting to excoriate all speculative work on AWs. Rather, we argue that speculation without caveat is misleading. A more robust literature dealing with the immediate possibilities of partial ectogenesis needs to accompany speculative discourse. It is, of course, not mutually exclusive to suggest that there should be a focus on partial ectogenesis and women's bodies and accepting that there is room for speculative bioethics. It might be argued that if these philosophical investigations were accompanied by the caveat that they were based on a thought experiment they would do no discredit to more grounded discussions about partial ectogenesis. In attempting to create a visionary space for a discussion of these ideas, however, the vast majority of authors do not issue disclaimers about the thought experiment they are creating. Bioethicists and legal theorists approach the problem as one of a possible, likely, or even inevitable future technological reproductive scenario. Careful disclaimers are not the norm in speculative ethics. Hedgecoe (2010) observes that "bioethicists need to suggest that [the technology they write about] be seen as real, serious technology and thus something worthy of ethical debate" (172). There is thus an observable trend in overstating technological possibilities to claim legitimacy for a future of full ectogenesis, and this has become normalized over time. Even where scholars are silent as to the realities of the technological spaces that they place themselves in, this can often be just as damaging for the collapsing of future possibilities into the present, because it presupposes that the practical issues related to full ectogenesis raised in the present tense are, thus, a "present" issue.

Discussion of a speculative nature has also had the unfortunate implication of crowding out an exploration of the immediate problems with ectogenetic technologies. The literature, when taken as a whole, encourages readers to think of the future with little regard for what is required to get there. The literature has also frequently abstracted from some of the empirical facts about the development of the technology and potential users of the technology. Most scholars do not engage with, and many do not even acknowledge, issues related to experimentation on women, fetuses, or embryos. Arguments that full ectogenesis is desirable, or a moral imperative (Smajdor 2007; Kendal 2015), have the logical corollary that we must actively seek to achieve these ends. Thus, the literature creates an ethical discourse that, in asking what we should do once this technology is available, innately neglects substantive problems "such as what technologies we want to develop and why" (Schick 2016, 229) and importantly *how* and at *what cost*.

Speculative scholarship about full ectogenesis seems important to determine the normative desirability of AWs. However, unaccompanied by robust discussion of *partial* ectogenesis it becomes less useful. Accurately predicting exactly how full ectogenesis might come to fruition, the conventional account being the meeting of advances in embryology and neonatology (Alghrani 2018), and how it will impact society is almost impossible. In any event, full ectogenesis will not happen overnight, and thus there is a need for greater recognition for those steps that take us in that direction. These steps will be *partial* uses of AWs. Partial ectogenesis offers us a more concrete vision about its potential uses given that this technology is aimed at improving neonatal care. Further, discussion of full ectogenesis utilizing rhetoric about a waning viability threshold also has the significant harm of problematizing abortion.

4. Abortion is not a problem

Despite the impact of this technology on abortion being just one of the various interesting discussion points about ectogenesis, this is where the vast majority of discussion has been situated. A recurring proposal in the bioethical and legal literature that considers full ectogenesis (and the complete erasure of any viability threshold) is that AWs will solve the "problem" of abortion. Abortion rights or legislation in several jurisdictions has been premised on, or closely related to, fetal viability.[9] Thus, Singer and Wells (1984) argued that, by allowing a woman to end her pregnancy without necessitating the death of the fetus, ectogenesis could produce an alternative to conventional abortion suitable to both pro-choice and anti-abortion communities. Indeed, fascination with the fantasy of full ectogenesis has nearly always included speculation as to how the technology may impact the "abortion debate," because of shifting perceptions of viability (Cohen 2017; Abecassis 2016; Brassington 2009; Lupton 1997; Tribe 1990; Favole 1979; Goldstein 1978; Abel 1974). Conclusions range from an inevitable ban (Cohen 2017; Randall and Randall 2008; Favole 1979; Goldstein

1978; Abel 1974) to the suggestion that the procedure may still be protected through claims to bodily autonomy if fetal extraction were invasive (Alghrani 2018). Ethicists keen to establish the importance of claims about the end of, or significant erasure of, the viability threshold in the abortion context often cite the biobag and similar studies to bolster their claims (Alghrani 2018, Cohen 2017). This is misleading in the absence of nuance about the realities of the uses of the technology. These scholars are, for all intents and purposes, writing about *partial* ectogenesis because, being concerned with abortion, they are interested in those instances in which there is a pregnancy facilitated by a person. These authors are thus often making claims based on technology despite the fact that this technology does not, and will not for the foreseeable future, work in the way their argument assumes. Few issue disclaimers about the extent to which their arguments are based on thought experiment, and they are thus expressly using a possible technological future in present tense to cast doubt on the provision of abortion (in both the future and the present).

Claims in the literature about ectogenesis and abortion often treat abortion not as an essential healthcare resource but as a moral "problem" that might eventually be circumvented by advancements in reproductive technology. These claims, in attempting to establish a thought-experiment (though rarely qualifying this explicitly), attempt to question how and if abortion is justifiable if "bodily autonomy issues" are put aside. However, such discussion innately subsumes access to abortion as a vital reproductive freedom and decenters the pregnant person's body, rights, and health needs in favor of speculating about a future in which such concerns are irrelevant. In the context of the United Kingdom, such arguments fail to engage the prevailing political discourse, which is steadily moving toward securing abortion as an essential healthcare service rather than as a procedure contingent on limited and paternalistically guarded private rights. While the Abortion Act 1967 still requires that women secure the approval of two physicians before undergoing an abortion, the past several years have seen a successful move to allow people to take the second pill in a two pill medical abortion procedure in their own homes in England, Scotland, and Wales (Department of Health and Social Care 2018), and the campaign to officially strike abortion from the criminal code continues to garner public support.[10] Significantly, given the gatekeeping role carved out for doctors by the Abortion Act, the British Medical Association has fully supported decriminalization in the United Kingdom and affirmed the importance of treating abortion as a protected medical procedure (British Medical Association 2018). 2018 also marks the Republic of Ireland's vote to repeal the constitutional outlawing of abortion (Henley 2018).

Conversely, abortion rights continue to be resisted across a number of other jurisdictions,[11] and in spite of progress, anti-abortion contingents remain vocal in many parts of the United Kingdom. We argue that, particularly in scholarship on ectogenesis written in the context of jurisdictions in which the law has been

moving toward greater self-determination for women and pregnant people with regard to abortion, it is politically imperative to approach the procedure not as a problem to be solved but, as an essential form of reproductive care. This claim raises the question of whether ethico-legal scholarship does, or should have, a political agenda. The claim that "the ethical" operates in an entirely different sphere from "the political," is misguided. Firstly, deciding what should be considered an ethical issue for debate is often a political choice. In the case of abortion, positing that there is an ethical *problem* is innately political because it passes judgment on whether the community should allow the availability of a choice that many pregnant persons would consider a personal and private matter. To claim that private choices are worthy of ethical discussion is inevitably politicizing the private. Secondly, we believe it is not feasible to divorce ethical analysis from politics when making normative claims about issues that persons face, or potentially face, in their real lives. It might be argued that ethical analysis concerns what individuals should do under the circumstances, rather than what the circumstances are or should be. However, if the primary aim of analysis is to determine what people should do, or to assist persons in making decisions, it becomes inevitable that such analysis has a political end. Ethical analysis is framed in terms of the recognition of the conditions in which choices or actions are deemed permissible (or not). Finally, we argue that ethical comment does have an impact on political opinion, because ethical argumentation is often translated directly to political argumentation. If one is attempting to persuade that abortion is *morally* concerning, there is either the accompanying claim (or underlying assumption) that there should be some political interference to prevent it. Moreover, however the work is intended, academic ethical argument is often utilized by lobbying and advocacy groups to garner support for a political position. Where scholars speculate that the introduction of ectogenesis, figured in much of the literature as inevitable (Steiger 2010; Abecassis 2016: Randall and Randall 2008; Favole 1979; Abel 1974), may lead to a ban of abortion or the forced alternative of an AW as pregnant woman and fetus become separable (Kaczor 2018; Blahuta 2017; Cohen 2017; Brassington 2009; Abel 1974), we worry about a problematic investment in a discourse that has continually been used to undermine abortion rights. These claims confidently leap to a future of full ectogenesis, which both reflects a curious investment in the certainty that such a technology will be developed (which we contested above) and escapes the messiness of a contemporary and inherently political physical reality in which the body of the person who gestates and the fetus are intertwined. As Hendricks (2012) argued, "imagining a machine that could create the child in a woman's stead . . . helps construct abortion as a refusal to provide sustenance to a life in being" (436). Ultimately, claims made about limitations on abortion if AWs were available center on the contention that a fetus is a person with equal value or legal status to the pregnant person. If the ability to be continually gestated ex utero is seen as grounds to limit a woman's choice to end a pregnancy, there is

the implication that the fetus is deserving of the same (or even greater) protection than the pregnant person.

Attempts to direct the future possibilities imagined for AWs toward these ends are not unique to academia. Rhetoric that imagines the fetus will one day be an entirely separate entity from the pregnant person, and thereby abortion might justifiably be banned, lends fuel to on-going anti-abortion discourse. Committing to a thought experiment in which the fetus is ostensibly viable and therefore an autonomous legal subject prior to "birth," these claims worryingly echo anti-abortion lobbying, which postulates that the fetus is a person. Language asserting fetal personhood is central to the campaigning of international anti-abortion organizations such as the Society for the Protection of Unborn Children. While speculation that ectogenesis could eliminate the justification for abortion may engage the caveat of properly belonging to a future that has not yet arrived, this same rhetoric has resulted in the criminalization of pregnant women in multiple jurisdictions for actions against their fetuses (Paltrow and Flavin 2013).[12] This rhetoric has also been utilized to justify contemporary bans that have led to the deaths of women in the interests of saving an unborn fetus. Just one example is Dr. Savita Halappanavar, who died in Galway in 2012 as a result of a hospital's refusal to provide an abortion when she miscarried and developed sepsis at 17 weeks' gestation.

The anti-abortion lobby has frequently engaged the use of half-baked scientific claims in order to limit women and pregnant people's access to services. In the United States, the use of rhetoric and imagery related to so-called "partial birth abortions" have been monopolized and weaponized frequently by politicians in legislative attempts to limit access to abortion. This is despite the fact that "partial birth abortion" is not a medical term (Rovner 2006), and later term abortions are rarely performed.[13] It is not implausible to imagine that the anti-abortion lobby will increasingly and publicly attempt to claim AWs for increasing legitimacy. Both authors have experienced previously published work, in no way arguing for any limitations on abortion, being cited on sites such as Twitter (and other online platforms) as justification for limitations on abortion access both in the present and in the future.

We propose that it is necessary to reframe how we approach speculation about termination of pregnancy and AWs. In particular, we hold that the discourse on abortion should be grounded in present realities. First, it is important to acknowledge how claims that full ectogenesis provides the means to "ban" abortion, because women can access an alternative to gestation, are legally flawed. The legal construction of the viability threshold (*Roe v Wade* in the United States; Abortion Act 1967 in England and Wales) does not operate to offer pregnant people a choice about gestation. A pregnancy reaching viability does not mean that the pregnant person becomes legally entitled to end their pregnancy; in fact, the opposite is true—it is unlawful to induce labor at viability absent emergency circumstances. The viability threshold is constructed

to prevent pregnant people from opting out of pregnancy when the fetus is considered viable, even where there are technically alternatives to remaining pregnant, except in emergency circumstances (Romanis 2019a). If "state interest" in a fetus means that the law can demand that a pregnant person remain pregnant after viability, it will continue to make the same demands even if AWs existed unless a legal argument could be made that AWs were demonstrably "better" than natural gestation. To be clear, we believe the necessity of making this kind of argument to be an undesirable outcome and precisely the reason that abortion law requires reform. Continuing with this point, the existence of neonatal incubators has not yet been deemed sufficient grounds to allow pregnant people to induce labor when a fetus is presumed viable. Indeed, neonatal incubators have instead been deemed sufficient grounds to require a pregnancy to be continued[14] *just because* the fetus could potentially be sustained by the incubator *if* it were born. Thus, these claims about full ectogenesis fail to meet their burden of establishing that AWs can provide freedom from pregnancy whilst "ending abortion."

Furthermore, AWs cannot replace, and should not be considered a replacement for, abortion. First, *partial* ectogenesis, even if it shifts perceptions of viability, is not an "alternative" to abortion. Fetal extraction for gestation ex utero is a far more invasive method of terminating a pregnancy than conventional means of termination (Alghrani 2018, 316), especially early in a pregnancy. Notably, the vast majority of women seek to terminate a pregnancy before 13 weeks (Department of Health 2018), and AWs will not be able to sustain the embryonic products of conception for a long time. If we were to require all terminations to preserve the fetus for ex utero gestation, this would also involve requiring women to remain pregnant for longer until such a point that their fetus was sufficiently gestated for extraction, as well as requiring them to undergo a medical procedure to which they do not consent. This is a tremendously regressive stance to take. Such an approach frames pregnant persons as gestational vessels for use by the state, rather than as subjects who are entitled to make a choice about how they want to use their body. Thus, if we accept that abortion is permissible on the grounds of the impact of a person's bodily autonomy alone (Thomson 1971), partial ectogenetic technology does not change the harmful impact of preventing or limiting abortion. Our position is that, *even if* we were to accept that there is some state interest in potential life, the state should not be permitted to proscribe decisions about termination and cannot prescribe that certain methods of termination are utilized over others. How a pregnancy is terminated is a medical decision in that the method of termination will impact on a person's body, and thus a pregnant person alone is entitled to make such a decision.

Second, scholars should better appreciate the political realities in which our arguments are situated. Because of the non-complete separation of the ethical and the political, we believe that accepting and setting clear political boundaries,

such as affirming abortion as an essential healthcare service is imperative. It is crucial that scholarship acknowledges, at the very least, that contemporary abortion provision is an important healthcare service to avoid problematizing these procedures. We would also argue that we should accept this is the case even in the event of the development of full ectogenesis because termination of pregnancy should still be considered a private matter. For as long as bioethical and legal scholars have asserted that ectogenesis might "solve" abortion, those writing from an explicitly feminist standpoint have argued that suggesting ectogenesis is an "alternative" for abortion fundamentally misunderstands why abortion is protected in progressive societies (Limon 2016; Overall 2015; Langford 2008). These scholars point to the multiple individual, social, and structural factors which may lead a woman to seek an abortion, and affirm that abortion is not simply reducible to a physical desire not to be pregnant (Cannold 1995). Langford (2008) and Overall (2015) each discuss a right to choose what kind of medical procedures one undergoes and the desire not to be a genetic parent, a sense of moral responsibility toward the existence of the fetus as examples of why AWs would be an unsuitable "alternative" to abortion. A pregnant person who undertakes gestational work is subject to serious social implications as a result of their labor. Women, in particular, are often socialized to believe themselves "bad mothers" if they abandon childrearing responsibilities after gestation. Thus, even though forced gestation ex utero would remove the pregnancy from the body, the emotional and social consequences and pressures would likely remain.

In 1995, Cannold conducted a survey that demonstrated negative attitudes of both pro-choice and anti-abortion women toward "ectogenesis as an alternative to abortion." Cannold concludes from her empirical study that ectogenesis as a "solution" fails to account for women's actual experiences and motivations for abortion. In seeking termination, pregnant persons are seeking not just to avoid gestation and childbirth, but also to avoid responsibility for bringing an unwanted child into the world. Jackson (2008) explains that "very few women seek abortions solely to avoid the physical processes of pregnancy and labour" (359). The choice about whether to procreate is an incredibly personal decision and thus "control over whether one reproduces or not is central to personal identity, to dignity and to the meaning of one's life" (Robertson 1994, 26). This control for pregnant people is the only way to secure their freedom from an unwanted intimate gestational relationship (no matter how temporary) and the harmful social consequences associated with unwanted pregnancy. Moreover, even if a formerly pregnant person is able to (and it is important to acknowledge that social pressures often mean that this choice is inaccessible to many women) relinquish their offspring for adoption, the psychological reality that they have reproduced, *forcibly*, remains (Robertson 1994, 26). Termination of pregnancy provides closure; it affords pregnant people the opportunity to conclusively reject biological parenthood and/or social motherhood as this is still strongly

socially associated with biological parenthood and the gestational relationship in women. This conclusive rejection is simply not possible by other means. Pregnant persons should remain entitled to make the decision not to complete their reproduction because of the social cost of undertaking that gestational work and the attached subsequent social experiences.

We argue that it is both a political and a philosophical choice to assert a position on abortion provision in bioethical scholarship. Yet, interestingly, authors who take the position that abortion is in need of some greater justification beyond that of respecting the importance of a private choice about termination are less frequently subject to challenge for their starting presumption than those who approach ethico-legal issues from the starting point of abortion as healthcare. We are routinely asked to provide justification for our philosophical choice to assert that we will not consider the fetus "as a person." Bioethical scholarship that involves assumptions about the value of embryos or the desirability of abortion does have both philosophical and political significance. In this paper, however, we hope to contribute to a much-needed body of work that focuses not on the disputed status of fetuses but on validating the moral worth of pregnant persons and *their* entitlement to make choices regarding their health, their bodies, and their procreative status.

We, therefore, propose that a responsible literature should begin ethical assessments of the future implications of ectogenic technology from a place of affirming contemporary (and future) abortion as essential healthcare. If the goal of the ethical analysis is to consider what should be done in light of emerging technology, it is important that this analysis take account of the reasons why persons seek to make private choices about abortion. This approach is necessary in recognition of the way in which pregnancy currently involves an intimate link between the growth of a fetus to the body of the person gestating it and the gestational labor that person must do to sustain that fetus. To enter the discussion this way is to establish a clear political boundary, insisting that so long as women continue to die and to be criminalized for abortions sought in jurisdictions in which the procedure is banned or strictly regulated,[15] abortion rights must be taken as a given (for regardless of how the gestateling is to be considered, to say that abortion access is not a point of debate is to affirm women as people). Further, this approach might better situate the consideration of the immediate implications of technologies such as the biobag. While considerations of abortion rights and of the concerns of the parents of wanted prematurely born fetuses are often treated as incompatible,[16] recognizing each as concerns on a shared spectrum of reproductive health issues allows for a more nuanced consideration of the potential impact of technologies that shift perceptions of viability after pregnancy. Adopting the advocated framework will help us address questions about the conditions in which AWs could be introduced to enhance reproductive choice without undermining the recognition that abortion is healthcare.

5. Reproductive stratification should not be ignored

Adjacent to claims that ectogenesis will "end the abortion debate" are arguments that, in removing gestation from the body, AWs could introduce improved gender equality in parenting, beginning with the possibility that a male progenitor might take responsibility for a fetus that a female progenitor wished to abort (Randall and Randall 2008; Pence 2006; Welin 2004; Singer and Wells 1984). These arguments, though often presented with a view toward a radical reimagining of gender roles, limit discussion of equality between parents to relationships between men and women. In an age of emerging family forms, in which the parenting rights of lesbian, gay, queer, and trans parents remain precarious, reflections on parenting that account only for heterosexual couples for whom the technology would allegedly be "equalizing" are limiting. Full ectogenesis has been cited as an "equalizing" reproductive opportunity for LGBTQ+ couples or single persons attempting to reproduce (Kendal 2015), however we find these claims to be generally assertive. These claims have been made about assisted reproductive technologies currently available, including IVF and surrogacy, however persons falling outside of heteronormative parenting paradigms have consistently struggled to access these technologies. The law, and social circumstances, in multiple jurisdictions, have placed restrictions limiting the liberational potential of such technologies, including proscriptive rules regarding parenthood and surrogacy contracts.[17] It might be argued that even if full ectogenesis only has the potential to enhance parental equality in heterosexual relationships, at least until there is a shift in societal attitudes and relaxation in legal rules concerning family formation, this is a benefit that must be pursued. We agree, however, we find arguments claiming full ectogenesis has this capacity to be flawed. These claims reduce existing imbalances in the way the work of parenting is distributed in heterosexual relationships to the period of gestation. Jackson (2008) argues that gestation constitutes only a brief passage in raising a child. She cautions that, "without equality in the distribution of household labor after birth, most notably in relation to childcare, it is of course true that eliminating pregnancy would not necessarily eliminate gender inequality" (362). Further, displacing gestation would not redress the significant cultural, social, and institutional barriers that produce contemporary inequities in shared parenting. As with the idea that ectogenesis could "solve abortion," investment in the potential of this proposed future technology to produce parental equality problematizes human gestation, and in so doing, turns away from more pressing contemporary questions of what issues we need to address in our society if couples are unable to access the resources necessary to share or comfortably distribute the work of parenting. We argue that rather than asking how full ectogenesis might produce a new equality in parenting between male and female progenitors, it is necessary to reground the conversation in the limitations of the present. This involves continuing the important campaign for gender equality in child rearing. With regard to ectogenesis specifically, we should be asking first

which parents will have access to the biobag and where the technology's potential to save some humans born preterm and not others might feature in broader discussions of reproductive freedom.

Women's access to reproductive autonomy remains widely disparate globally and differs across classed, raced, gender identity, and sexuality-based lines. As Roberts (2015) argues, "poor and low-income women, women of color, queer [and trans] women [and] women with disabilities" continue to face significant barriers to exercising reproductive freedom across jurisdictions (n.p.). Here again, we propose that it is necessary to reground the conversation in the realities of existing reproductive stratification. The biobag, as a facilitator of partial ectogenesis rather than a fully ectogenic technology, has the capacity to side step some of the most common complications in preterm care and drastically improve patterns of mortality and morbidity that have been stagnant for some time (Romanis 2018). How it might be determined who has access to this technology both in its early experimental stages, and as it becomes increasingly available, is an issue of equality in health care. There are substantive problems in the equality of care afforded to women of different backgrounds during pregnancy, childbirth, and post-partum. Significant research has already been conducted on the extremely high relative rates of both infant and maternal mortality among black women in the United States (Matoba and Collins 2017; Howell et al. 2016). The relationship between maternal stress, which can be triggered by factors including structural discrimination and financial strain, and preterm birth is also well documented (Novoa and Taylor 2018; Althusen et al 2016). In countries with advanced neonatal technologies available, significant variation in distribution means inequity of access across regions. There are also extraordinary disparities in access to reproductive and post-partum care between middle and low-income economies.

We have concerns about how the biobag might exacerbate all of the above inequities. If women from lower socioeconomic backgrounds are more likely to be in need of this technology, they are more likely to shoulder the risks and burdens in the development of this technology. This might include, as just one example, invasive and experimental surgeries to perfect methods of fetal extraction. There is also the possibility (particularly in private health systems) that access to this technology after its development becomes effectively restricted to only those with "premium" insurance, or the ability to afford it. Such technology also might not also be routinely available in all hospitals, as is often the case in publicly funded health systems, and thus less accessible to individuals on the basis of geography or ability to travel for services. Focusing on issues of development and access in the present may contribute to considerations in the development of such technologies, such as the cost of the materials to produce them, and the question of how their design might be adaptable to different environments. Determining who has access effectively means making decisions about whose offspring should receive treatment much less likely to result in death before "birth," or much more likely to result in survival without long-term illness

or disability. Who should be given the power to make such decisions? How do we mitigate against exacerbating pre-existing inequities, and what steps should be taken to ensure these concerns are taken into account? All of these questions are in urgent need of exploration.

6. Conclusion

In this paper, we argue that the focus in the literature on the ethico-legal issues raised by full ectogenesis is misplaced. Discussion directed to full ectogenesis overstates the capacities of ectogenic technologies currently being developed and underestimates the political and scientific barriers that would need to be overcome to enable the complete gestation of a human being ex utero. We argue that not only is this focus misplaced, it is also potentially actively harmful. First, excitement about the prospect of full ectogenesis neglects to consider some of the more immediate ethical challenges in the development of new technologies including, but not limited to, experimental treatment and access to care. Second, discussion about full ectogenesis tends to focus on the ethical permissibility of abortion. Discussion about abortion must be grounded in present realities in order to prevent "problematizing" access to an essential healthcare service. Framing abortion as a "problem to be solved" by technology emboldens the rhetoric routinely used to attempt to limit access to terminations or to limit the autonomy of pregnant people. Finally, we argue that the discussion about full ectogenesis often ignores issues of reproductive stratification and the instability of reproductive rights for many women.

The ectogenesis conversation must be regrounded in the immediate anticipated uses of the technology (NIC) and in the immediate realities of abortion provision and reproductive inequities. When discussing ectogenesis, we must be mindful of the limitations of anticipated scientific technologies by paying careful attention to scientific literature. We must draw distinctions between technologies that might be described as immediate and those that remain speculative. We do not deny that there is a legitimate place for speculative ethico-legal scholarship. However, where it is necessary to explore imagined futures, responsible scholars should caveat their examples with acknowledgment of uncertainty, rather than bolstering technological visions as inevitabilities. A nuanced and careful discussion will better ensure that those most likely to be impacted by these developing technologies, women and gestatelings, are placed at the center of future ectogenesis conversation.

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NOTES

1. For example, the improvement of prospects of premature neonates, or more significant developments, such as the 2017 animal biobag study (Partridge et al. 2017; Usuda et al. 2019)
2. For example, recent studies that have demonstrated the possibility of facilitating embryo implantation in vivo (Shahbazi et al. 2016; Deglincerti et al. 2016).
3. There are some notable exceptions focusing instead on partial ectogenesis, for example, Romanis (2018) and Romanis (2020). Others include Alghrani and Brazier (2011) and Brazier and Harris (2015), but these two papers predate the recent scientific advances to which we refer.
4. A gestateling is "a human being in the process of ex utero gestation exercising, whether or not it is capable of doing so, no independent capacity for life" (Romanis 2018, 753). For an explanation of why this terminology is important, see Romanis (2018).
5. The 14-day limit attempts to navigate conflicting moral stances and strikes a balance in order to both facilitate research and maintain public trust (Cavaliere 2017).
6. Those seeking to lift the restrictions cite understanding more about the causes of miscarriage and clinical applications for stem cells as the key reasons to allow research beyond 14 days (Appleby and Bredenoord 2018).
7. This shift will therefore occur slowly, as recognition emerges that biobags have successfully supported younger fetuses in individual cases and evidence is presented to inform the practice of other doctors (Romanis 2018).
8. Sufficiently reduced so as to be an "alternative to abortion." Most abortions in England and Wales take place before 13 weeks (Department of Health 2017).
9. In England and Wales, the viability threshold is enshrined in law by criminalizing the destruction of a fetus "capable of being born alive": Infant Life (Preservation) Act 1929, s.1 (1). In the United States, the Supreme Court affirmed the right to an abortion (as an aspect of privacy) before the viability threshold in Roe v Wade 1973 410 U.S. 113 (United States Supreme Court); affirmed in Planned Parenthood v Casey 1992 112 U.S. 2791 (United States Supreme Court).
10. See the Campaign to decriminalize abortion in England and Wales: We Trust Women (2020).
11. The Center for Reproductive Rights's comprehensive map of the world's abortion laws demonstrates that 40 percent of the world's population live in countries without permissive abortion laws (Center for Reproductive Rights 2019). In spite of lobbying on the part of pro-choice activists, in August 2018, Argentina's senate rejected a bill to make abortion legal in the first 14 weeks of pregnancy. In the United States, anti-abortion legislatures continue to move to pass statutes that would significantly restrict or ban abortion entirely (Shea 2019).
12. The study by Paltrow and Flavin (2013) provides a comprehensive assessment of the use of statutes initially introduced for the protection of children to criminalize pregnant women for actions against their fetuses in the United States. Thirty-eight states have fetal homicide laws, and "women in California, Georgia, Tennessee, South Carolina, and Utah who suffered stillbirths or delivered babies who died shortly after birth have been charged directly under state feticide laws" (323).
13. In England and Wales, 90 percent of pregnancy terminations take place before the first 13 weeks of pregnancy. This figure has been consistent for the past decade (Department of Health 2018).

14. We are grateful to one of our anonymous reviewers for raising this point.
15. A joint study by the Guttmacher Institute and the World Health Organization estimates that 25 million unsafe abortions occur each year. 45 percent of abortions performed worldwide are unsafe for pregnant people (Ganatra et al 2017).
16. For example, see the current debate in the United Kingdom about determining the difference between a child stillborn and the product of a miscarriage. Currently, fetuses delivered before 24 weeks that do not survive are deemed the product of a miscarriage. Some have petitioned for legal recognition that a pre-24-week fetus was stillborn. However, because abortion provisions are constructed around a 24-week viability threshold, others are reluctant to afford this recognition for fear such a change in the Births and Deaths Registration Act 1953 (as amended by the Still-Birth Definition Act 1992) could ultimately limit access to abortion.
17. We expand on arguments about how ectogenesis might exacerbate inequalities based on the privileging of heteronormative reproduction and nuclear family structures in coauthored work elsewhere (Horn and Romanis forthcoming).

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