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### Egg-Freezing, Uterine Transplants, and In Vitro Gametogenesis: Disruptive or Normalizing Reproductive Technologies?

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# **EGG-FREEZING, UTERINE TRANSPLANTS, AND IN VITRO GAMETOGENESIS: DISRUPTIVE OR NORMALIZING REPRODUCTIVE TECHNOLOGIES?**

Radhika Rao\*

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## ABSTRACT

In the last year, headlines have heralded the introduction of several radical new technologies that promise to revolutionize procreation and transform our understanding of reproduction.<sup>1</sup> In March 2021, for example, scientists revealed that mouse embryos had been grown in “artificial wombs” for 11 days, roughly half the animal’s natural gestation period.<sup>2</sup> According to Jacob Hanna, the biologist at the Weizmann Institute of Science in Israel who led the research team: “This sets the stage for other species. I hope that it will allow scientists to grow human embryos until week five.”<sup>3</sup> At the same time, two groups of researchers reported the creation of synthetic human embryos generated from skin and stem cells, which they term “blastoids” to differentiate them from blastocysts created through the joinder of sperm and egg.<sup>4</sup> These technological breakthroughs have already provoked regulatory reform.<sup>5</sup> In May 2021, the International Society for Stem Cell Research (ISSCR) relaxed the famous 14-day rule for embryo research and replaced it with a recommendation for case-

<sup>1</sup> See, e.g., Carolyn Y. Johnson, *Scientists create synthetic mouse embryos, a potential key to healing humans*, THE WASHINGTON POST (Aug. 1, 2022), <https://www.washingtonpost.com/science/2022/08/01/synthetic-mouse-embryo/>; Gina Kolata *Scientists Grow Mouse Embryos in a Mechanical Womb*, THE NEW YORK TIMES (Mar. 17, 2021), <https://www.nytimes.com/2021/03/17/health/mice-artificial-uterus.html>; David Cyranoski, *Embryo-like Structures Created from Human Stem Cells*, NATURE 119-124 (Sep. 11, 2019), <https://www.nature.com/articles/d41586-019-02654-w>; Alejandro Aguilera-Castrejon et al., *Ex Utero Mouse Embryogenesis from Pre-gastrulation to Late Organogenesis*, 593 NATURE 119-124 (Mar. 17, 2021), <https://www.nature.com/articles/s41586-021-03416-3>; *First Birth After Robot-Assisted Uterus Transplant*, UNIVERSITY OF GOTHENBURG (Apr. 9, 2019), <https://www.gu.se/en/news/first-birth-after-robot-assisted-uterus-transplant#:~:text=A%20boy%2048%20centimeters%20long,leading%20research%20on%20uterine%20transplantation>.

<sup>2</sup> Antonio Regalado, *A mouse embryo has been grown in an artificial womb – humans could be next*, MIT TECH. REV. (Mar. 17, 2021), <https://www.technologyreview.com/2021/03/17/1020969/mouse-embryo-grown-in-a-jar-humans-next/>.

<sup>3</sup> See *id.*

<sup>4</sup> Rob Stein, *Scientists Create Living Entities in the Lab that Closely Resemble Human Embryos*, NPR (Mar. 17, 2021), <https://www.npr.org/sections/health-shots/2021/03/17/977573846/scientists-create-living-entities-that-closely-resemble-human-embryos>.

<sup>5</sup> Insoo Hyun, et al., *Embryology Policy: Revisit the 14-day Rule*. 533 NATURE 169–171 (May 4, 2016), <https://doi.org/10.1038/533169a>.

by-case consideration, which would entail scientific review and a public approval process.<sup>6</sup>

However, previous experience with assisted reproductive technology suggests that techniques that once began as experimental, such as IVF, have often been translated to clinical practice with little or no regulatory oversight.<sup>7</sup> For example, once the “experimental” label on egg-freezing was dropped, use of this technology has become widespread, with egg-freezing rates rising by dramatic percentages over the last decade, despite scant evidence regarding safety or efficacy. Indeed, the data indicates that the rate of egg-freezing increased even more during the pandemic, contrary to the expectations of fertility clinics and physicians.<sup>8</sup> Similarly, in the wake of the first successful womb transplant in Sweden, the practice seems to have proliferated widely across the world, even though early trials demonstrated limited success. These developments suggest that technological breakthroughs in assisted reproductive technology often trigger the relaxation of regulatory restrictions, and that once-experimental techniques rapidly become prevailing practices.

The potentially speedy progression from scientific discovery to commercial process raises a number of questions regarding revolutionary new reproductive technologies. What will be the impact of these seemingly radical new reproductive technologies? Should they be regarded as “disruptive reproductive technologies”<sup>9</sup> with the potential to transform existing social structures, or should they be normalized as simply providing new methods to engage in age-old practices? And will they actually enhance autonomy and expand opportunities for disadvantaged individuals and groups, or will they reinforce and perpetuate existing inequalities? This paper will attempt

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<sup>6</sup> Nidhi Subbaraman, *Limit on lab-grown human embryos dropped by stem-cell body*, NATURE (May 26, 2021), <https://www.nature.com/articles/d41586-021-01423-y>.

<sup>7</sup> See Debora L. Spar, *Fertility Industry is a Wild West*, NY TIMES (Sept. 13, 2011) (describing the US as an unregulated “Wild West of procreative possibilities.”); see also Debora L. Spar, *THE BABY BUSINESS: HOW MONEY, SCIENCE, AND POLITICS DRIVE THE COMMERCE OF CONCEPTION* (2006).

<sup>8</sup> Eliana Dockterman, *Data Show More Women Are Freezing Their Eggs During The Pandemic, Defying Doctors' Expectations*, TIME MAGAZINE (Jan. 13, 2021), <https://time.com/5927516/egg-freezing-covid-19-pandemic/>.

<sup>9</sup> I. Glenn Cohen et al., *Disruptive Reproductive Technologies*, 9 SCI. TRANSLATIONAL MED. 372 (Jan. 11, 2017), <https://www.science.org/doi/abs/10.1126/scitranslmed.aag2959>.

to explore some of these questions, focusing upon three relatively new types of assisted reproductive technology: egg-freezing, uterine transplants, and in vitro gametogenesis (IVG). All three of these technologies promise to liberate individuals from the limits of biology by supplying them with the biological resources necessary to create children who are the product of their own genes and gestation.<sup>10</sup> This enables individuals to keep reproduction all in the family, free from the need to procure gametes or gestational services from third parties, who could trigger concerns about the possibility of coercion or exploitation, or become entangled in relationships and assert claims to the resulting children. In so doing, these technologies offer hope for a scientific solution to the complex ethical, legal, and social problems posed by prior methods of assisted reproduction, such as gamete donation and surrogacy. Yet in reality, each of these technologies merely substitutes one set of complications for another, and all of them present new perils.

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<sup>10</sup> See discussion *infra* pages 130-131.

## INTRODUCTION

Although cryopreservation of embryos has long been standard practice in conjunction with in vitro fertilization, the freezing of unfertilized ova was not possible until relatively recently. In October 2012, the American Society of Reproductive Medicine (the ASRM) issued a new guideline declaring that egg-freezing should no longer be considered “experimental,”<sup>11</sup> thereby opening the door to broader use of this technology. The ASRM recommended that egg-freezing be confined to women facing infertility due to chemotherapy and cautioned that “[m]arketing this technology for the purpose of deferring childbearing may give women false hope and encourage women to delay childbearing.”<sup>12</sup> Despite these warnings, egg-freezing is being touted as the latest technological fix to appease anxiety about the ticking biological clock and declining fertility by providing women with a form of fertility insurance that enables them to “reschedule motherhood.”<sup>13</sup> Indeed, egg-freezing has already become so pervasive that many employers, following in the path of companies such as Apple and Facebook, have elected to offer it to their employees as an employment benefit.<sup>14</sup>

Uterus transplants are not yet common, but several attempts were made without success until October 2014, when Dr. Mats Brannstrom, a professor of gynecology and obstetrics at the University of Gothenburg who led a Swedish team of physicians, announced the first birth of a baby born from a transplanted womb.<sup>15</sup> Since then,

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<sup>11</sup> Caitlin Hagan, *Experts: Egg Freezing No Longer “Experimental”*, CNN: HEALTH (Oct. 19, 2012), <https://www.cnn.com/2012/10/19/health/egg-freezing/index.html>.

<sup>12</sup> *Mature Oocyte Cryopreservation: A Guideline*, *The Practice Committees of the American Society for Reproductive Medicine and the Society for Assisted Reproductive Technology*, 99 FERTILITY & STERILITY 37, 41 (2013) [hereinafter *Mature Oocyte Cryopreservation: A Guideline*].

<sup>13</sup> Sarah Elizabeth Richards, *Motherhood, Rescheduled: The New Frontier of Egg Freezing and the Women Who Tried It* (1st ed. 2013).

<sup>14</sup> Avery Stone, *More and More Companies Are Covering the Cost of Egg-Freezing. But Who Is It Really For?*, VICE MAGAZINE, May 26, 2020, <https://www.vice.com/en/article/ep448j/more-companies-are-covering-the-cost-of-egg-freezing-who-is-it-really-for-v27n2?series=96vbx6>; see also Mark Tran, *Apple and Facebook Offer to Freeze Eggs for Female Employees*, THE GUARDIAN (Oct. 15, 2014), <https://www.theguardian.com/technology/2014/oct/15/apple-facebook-offer-freeze-eggs-female-employees>.

<sup>15</sup> Bill Chappell, *A First: Uterus Transplant Gives Parents a Healthy Baby*, NPR: THE TWO-WAY (Oct. 4, 2014), <https://www.npr.org/sections/thetwo-way/2014/10/04/353691555/a-first-uterus->

China<sup>16</sup> and India<sup>17</sup> have also announced the first successful transplant of a womb, from mother to daughter in both countries. The first uterus transplant in the U.S. was performed at the Cleveland Clinic in February 2016, this time using a deceased donor, but the transplant failed due to a yeast infection and the organ had to be removed two weeks after surgery.<sup>18</sup> The first successful uterine transplant in the U.S. took place as part of a clinical trial at Baylor University Medical Center involving 10 women with absolute uterine factor infertility.<sup>19</sup> It resulted in the first U.S. birth of a baby from a transplanted womb in November 2017, and a second baby was born to another participant in the Baylor clinical trial in March 2018.<sup>20</sup> Following these two milestones, Baylor started a second phase of its uterus transplant clinical trial and will transplant uteruses into 10 more women. Currently, more than 400 women have volunteered to be donors for the Baylor program, and over 1,000 individuals have indicated an interest in being a recipient.<sup>21</sup>

All of the previous live births resulted from uterus transplants from living donors, but the first successful transplant from a deceased donor occurred in Brazil. In December 2017, a woman in Brazil gave birth to a baby girl in the first successful uterus transplant from a deceased donor.<sup>22</sup> The donor was a 45-year-old woman who died of a

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transplant-gives-parents-a-healthy-baby; Mats Brannstrom et al., *Livebirth After Uterus Transplantation*, 385 THE LANCET 607 (2015).

<sup>16</sup> Zhuang Pinghui, *Woman in China Undergoes Country's First Successful Womb Transplant After Mother Donates Organ*, S. CHINA MORNING POST, Nov. 26, 2015; Ma Lie, *Nation's 1st Successful Uterus Transplant Performed in Xi'an*, CHINA DAILY, Nov. 27, 2015.

<sup>17</sup> Medhavi Arora, *Mom Donates Womb to Daughter in India's First Uterus Transplant*, CNN (May 19, 2017), <http://www.cnn.com/2017/05/19/health/India-uterus-womb-transplant/index.html>.

<sup>18</sup> Rob Stein, *A Transplanted Uterus Offers Hope, But Procedure Stirs Debate*, NPR: MORNING EDITION (June 1, 2016), <https://www.npr.org/sections/health-shots/2016/06/01/478733899/a-transplanted-uterus-offers-hope-but-procedure-stirs-debate>.

<sup>19</sup> *Uterus Transplant at Baylor University Medical Center: Shaping A New Medical Innovation*, BAYLOR SCOTT & WHITE HEALTH, <https://news.bswhealth.com/en-US/uterus-transplant-at-baylor-university-medical-center> (last visited Aug. 19, 2022).

<sup>20</sup> *Id.*

<sup>21</sup> Alexandra Sifferlin, *Thousands of Women are Born Without a Uterus. A New Procedure Offers Them Hope.*, TIME (Jan. 3, 2019), <https://time.com/5492635/uterus-transplant-baby/>.

<sup>22</sup> Kate Kelland, *World's First Baby Born via Womb Transplant from Dead Donor*, REUTERS (Dec. 4, 2018), <https://www.reuters.com/article/us-health-womb-transplant/worlds-first-baby-born-via-womb-transplant-from-dead-donor-idUSKBN1O32WS>.

stroke, but her donation enabled the recipient of the uterus transplant to deliver a six-pound baby girl through C-section at the Hospital das Clínicas da Universidade de São Paulo in Brazil.<sup>23</sup> While Dani Ejzenberg, a doctor at the teaching hospital of the University, referred to this event as “a medical milestone,” Richard Kennedy, president of the International Federation of Fertility Societies cautioned that a “uterine transplant . . . should be regarded as experimental.”<sup>24</sup>

To date, more than 80 attempts to perform uterine transplants have taken place worldwide, and over 40 babies have been delivered as a result.<sup>25</sup> Despite these small numbers, excitement about the procedure continues to mount and there are proposals to attempt uterine transplant all over the world, with clinical trials and pilot programs under way at the Institute for Clinical and Experimental Medicine in the Czech Republic, as well as Baylor University Medical Center, Brigham and Women’s Hospital, and Penn Medicine in the United States.<sup>26</sup>

The third revolutionary reproductive technology is in vitro gametogenesis (IVG), the generation of sperm and eggs from pluripotent stem cells in a petri dish.<sup>27</sup> This technology is still in the experimental phase, but a team of Japanese researchers has already derived in vitro gametes from mice and succeeded in producing live offspring from them.<sup>28</sup> And in 2018, the same Japanese team

<sup>23</sup> Emily Baumgaertner, *From a Deceased Woman’s Transplanted Uterus, A Live Birth*, THE N.Y. TIMES (Dec. 5, 2018), <https://www.nytimes.com/2018/12/05/health/uterus-transplant-birth.html>.

<sup>24</sup> *Baby Thriving After Interfile Mum Receives Dead Woman’s Uterus*, THE AUSTRALIAN (Dec. 5, 2018), <https://www.theaustralian.com.au/nation/world/baby-thriving-after-interfile-mum-receives-dead-womans-uterus/news-story/4c7577cd7991d422ad63fd85c1afd997>.

<sup>25</sup> Brännström M, Belfort MA, & Ayoubi JM, *Uterus Transplantation Worldwide: Clinical Activities and Outcomes*, 26 CURRENT OPINION IN ORGAN TRANSPLANTATION 616-626 (Dec. 1, 2021), <https://pubmed.ncbi.nlm.nih.gov/34636769/>.

<sup>26</sup> *Uterus Transplants: A New Door Opens*, PENN MED. NEWS (Apr. 29, 2019), <https://www.pennmedicine.org/news/internal-newsletters/system-news/2019/may19/uterus-transplants-a-new-door-opens> (last visited Aug. 19, 2022).

<sup>27</sup> Joanna J. Gell & Amanda T. Clark, *Restoring Fertility with Human Induced Pluripotent Stem Cells: Are We There Yet?*, 23 CELL STEM CELL 777-779 (Dec. 6, 2018), <https://www.sciencedirect.com/science/article/pii/S1934590918305393>.

<sup>28</sup> Sonia M. Suter, *In Vitro Gametogenesis: Just Another Way to Have a Baby?*, 3 J. L. & BIOSCIENCES 87, 119 (2016); Cohen, et al., *supra* note 9, at 372 (2017), <https://stm.sciencemag.org/content/9/372/eaag2959/tab-pdf>.



announced the creation of immature human eggs from stem cells, suggesting that the derivation of functional gametes from human cells may soon be possible.<sup>29</sup> IVG could enable production of a virtually unlimited supply of oocytes and thus embryos, without obliging women to undergo the risks of ovarian stimulation or the physical burden of harvesting eggs. Currently, the capacity to engage in genetic selection at the embryonic stage is limited by the scarce supply of eggs. Thus, plentiful access to frozen oocytes could significantly facilitate the genetic selection of embryos, and even genetic alteration, if IVG is combined with the latest gene-editing technologies, such as CRISPR.<sup>30</sup> Of course, IVG is not actually necessary to engage in gene-editing. Indeed, He Jiankui—the rogue Chinese scientist who shocked the world with the announcement that he had created the world’s first gene-edited babies in November 2018—apparently did so using conventional ART techniques, combined with CRISPR.<sup>31</sup> He was sentenced to three years in prison for “illegal medical practice” in January 2020.<sup>32</sup>

Egg-freezing, IVG, and uterine transplants promise to liberate single women, infertile persons, and gay and lesbian couples from the limits of biology by supplying them with cryogenically-preserved ova, synthetic gametes, and transplanted uteruses in order to have children who are the products of their own genes and gestation.<sup>33</sup> Each of these technologies provides individuals with the power to reproduce free from entanglement with third parties, in a way that seems to deftly sidestep the ethical, legal, and social issues raised by existing forms of assisted reproduction. For example, egg-freezing allows young women to freeze their own ova for future use, permitting them to

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<sup>29</sup> Rob Stein, *Scientists Create Immature Human Eggs from Stem Cells*, NPR (Sep. 20, 2018), <https://www.npr.org/sections/health-shots/2018/09/20/649552734/scientists-create-immature-human-eggs-from-stem-cells>.

<sup>30</sup> Steve Connor, *First Human Embryos Edited in U.S.*, MIT TECH. REV.: REWRITING LIFE (July 26, 2017), <https://www.technologyreview.com/s/608350/first-human-embryos-edited-in-us/>.

<sup>31</sup> Maria Burke, *Rogue Chinese Geneticist Jailed for His Role in Creation of Gene-edited Babies*, ROYAL SOC’Y CHEMISTRY (Jan. 6, 2020), <https://www.chemistryworld.com/news/rogue-chinese-geneticist-jailed-for-his-role-in-creation-of-gene-edited-babies/4010977.article>.

<sup>32</sup> *Id.*

<sup>33</sup> Amel Alghrani, *Uterus Transplantation in and Beyond Cisgender Women: Revisiting Procreative Liberty in Light of Emerging Reproductive Technologies*, 5 J.L. & BIOSCIENCES 301-328 (Jul. 10, 2018), <https://academic.oup.com/jlb/article/5/2/301/5051211>.

postpone reproduction to a time when it fits in with their other goals and aspirations, while at the same time releasing them from reliance upon egg donors. Egg-freezing would also free women from the complications that could result from fertilizing their ova with the sperm of a partner and cryogenically preserving the resulting embryos for future use, only to risk a dispute over the frozen embryos in the event of divorce or dissolution of the relationship. Similarly, uterine transplants offer women suffering from uterine factor infertility the opportunity to gestate their own children and experience some of the physical aspects of pregnancy, while simultaneously relieving them of the risks of employing a gestational surrogate and entering into a surrogacy contract. Of the three technologies, IVG appears to be the most radical: it could potentially permit couples of the same-sex to have children that are as genetically connected to them as the children produced by opposite-sex couples through sexual reproduction. Indeed, some scholars suggest that IVG might even be used to create more radical forms of families, for example, by permitting polygamous or polyamorous persons to have children who are the product of more than two genetic parents, in order to engage in “multiplex parenting.”<sup>34</sup> IVG would also render sperm and egg donors superfluous by enabling infertile individuals to generate their very own personalized gametes, so that they can produce their own genetic children.<sup>35</sup> Moreover, by providing the means to produce a virtually unlimited supply of eggs and thus embryos, it could also greatly expedite the process of genetic selection and genetic enhancement of embryos, especially if combined with gene-editing technologies.

As a consequence, all of these technologies offer freedom from the need to procure gametes or gestational services from third parties, who could become entangled in relationships that pose a threat to the integrity of the technologically-formed family. This enables individuals to keep reproduction all in the family, without involving prior partners or strangers who may assert claims to the resulting child. In addition, the employment of gamete donors and surrogates triggers broader concerns about the potential for lack of informed

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<sup>34</sup> Cesar Palacios-González et al., *Multiplex Parenting: IVG and the Generations to Come*, 40 J. MED. ETHICS 752-758 (2014) (available at <https://jme.bmj.com/content/40/11/752>).

<sup>35</sup> Hannah Bourne et al., *Procreative Beneficence and in vitro Gametogenesis*, 30 MONASH BIOETHICS REV. 29-48 (2012) (available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3590899/>).

consent, coercion, and even exploitation of vulnerable third parties. Third parties may not comprehend all of the physical and emotional risks involved in donating gametes or contracting to serve as a surrogate, and thus be unable to provide truly informed consent. Moreover, the payment of gamete donors and surrogates may be criticized as "coercive" if the market value is too high, enticing them to consent with the prospect of financial gain. On the other hand, payment may be condemned as "exploitative" if the market value is too low, providing a level of compensation that is inadequate to attract all but those who are desperate to make money.<sup>36</sup> And market transactions involving the purchase and sale of reproductive goods and services also arouse anxiety about the consequences of commodification of women's bodies and their reproductive capacity, as well as the impact upon the resulting children.<sup>37</sup> For all these reasons, Dr. Andreas Tzakis, the physician who performed the first uterus transplant at the Cleveland Clinic in the U.S., suggests that uterus transplantation is ethically superior to surrogacy because surrogacy "create[s] a class of people who rent their uterus, rent their body, for reproduction. . . . It has some gravity. It possibly exploits poor women."<sup>38</sup> Thus, the new technologies of egg-freezing, uterine transplantation, and IVG appear to evade many of the ethical dilemmas that are associated with earlier forms of assisted reproduction.

## I. EGG-FREEZING

All of this suggests that we should welcome these technological developments, which apparently emancipate individuals from the constraints of biology and which could expand opportunities for previously disadvantaged individuals or groups. But, at the same

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<sup>36</sup> Jeffrey P. Kahn, *Bidding on the Future? The Limits of Paying for Gametes*, 20 J. ANDROLOGY 586 (1999), <https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1939-4640.1999.tb02558.x>.

<sup>37</sup> John A. Robertson, *Other Women's Wombs: Uterus Transplants and Gestational Surrogacy*, 3 J. L. & BIOSCIENCES 68-86 (2016).

<sup>38</sup> Denise Grady, *Uterus Transplants May Soon Help Some Infertile Women in the U.S. Become Pregnant*, N.Y. TIMES: HEALTH (Nov. 12, 2015), <https://www.nytimes.com/2015/11/13/health/uterus-transplants-may-soon-help-some-infertile-women-in-the-us-become-pregnant.html>.

time, each of these technologies may present new perils. For example, egg-freezing may offer women an illusory assurance that they can postpone childbearing. Indeed, when the ASRM first removed the “experimental” label from egg-freezing in 2012, it recommended that the technique be confined to women facing infertility due to chemotherapy and expressly cautioned that “marketing this technology for the purpose of deferring child-bearing may give women false hope and encourage women to delay childbearing.”<sup>39</sup>

Despite these warnings, egg-freezing is being touted as a technological fix to the problem of the ticking biological clock, a form of fertility insurance that allows women to “reschedule motherhood” and thereby “have it all.” Sarah Elizabeth Richards, the author of the book *Motherhood, Rescheduled*, also wrote an article published in the *Wall Street Journal* titled *Why I Froze My Eggs (And You Should, Too)*,<sup>40</sup> in which she celebrates egg-freezing as enhancing gender equality: “Amid all the talk about women ‘leaning in’ and ‘having it all,’ the conversation has left out perhaps the most powerful gender equalizer of all – the ability to control when we have children.” Other successful women also appear to advocate egg-freezing as a career option.<sup>41</sup> Anne-Marie Slaughter, President and CEO of New America and a Professor at Princeton, formerly Director of Policy Planning at the U.S. State Department, wrote a widely-read article titled *Why Women Still Can’t Have It All*, stating: “I recommend establishing yourself in your career first but still trying to have kids before you are 35—or else freeze your eggs.”<sup>42</sup> And *Newsweek* published an article titled *The Vitrification Fertility Option*, describing how egg-freezing may be utilized by some employers as a technological solution to work/family conflicts: “Diane Sawyer counsels her colleagues on freezing their eggs.”<sup>43</sup> The anchor of ABC’s *World News* has long been a sounding board for her famously

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<sup>39</sup> *Mature Oocyte Cryopreservation: A Guideline*, supra note 12.

<sup>40</sup> Sarah Elizabeth Richards, *Why I Froze My Eggs (and You Should, Too)*, WALL ST. J. (May 3, 2013), <https://www.wsj.com/articles/SB10001424127887323628004578458882165244260>.

<sup>41</sup> Anne-Marie Slaughter, *Why Women Still Can’t Have It All*, THE ATLANTIC (Jul.-Aug., 2012), <https://www.theatlantic.com/magazine/archive/2012/07/why-women-still-cant-have-it-all/309020/>.

<sup>42</sup> *Id.*

<sup>43</sup> Rebecca Dana, *The Vitrification Fertility Option*, NEWSWEEK (Jan. 23, 2012), <https://www.theatlantic.com/magazine/archive/2012/07/why-women-still-cant-have-it-all/309020/>.

hard-working staff on a host of personal issues. . . . A recurring theme with women: finding time away from the office to meet a partner and have kids before they hit 40. It doesn't always happen . . . [and] [w]hen it doesn't, Sawyer sends her workers to New York University's Fertility Clinic."<sup>44</sup>

Yet it is not clear that the egg-freezing procedure will actually prove to be successful for all the women to whom it is being marketed. In 2016, physicians from Shady Grove Fertility published a report on the success rates of egg vitrification from all autologous IVF procedures performed using frozen ova at their clinic from August 2009 through January 2015.<sup>45</sup> The results revealed that birth rates varied widely depending on the age of the woman at the time her eggs were frozen: for women under 30, the clinic reported oocyte to child efficiency of 8.7%, but for women aged 43-44 at cryopreservation, the rate was only 1.1%.<sup>46</sup> These statistics suggest that egg-freezing may be a viable option only for young women in their 20's and early 30's. Despite the low odds of success, egg freezing is rapidly gaining popularity.<sup>47</sup> Records from the Society for Assisted Reproductive Technology (SART) indicate that only 500 women opted to freeze their eggs in 2009, but the number jumped to 5,000 by 2013.<sup>48</sup> By 2017, SART reported that 10,936 women froze their eggs.<sup>49</sup>

Moreover, egg-freezing is an invasive and risky procedure that carries a high price tag. It requires women to undergo hormonal treatment and hyperstimulation of their ovaries in order to induce egg production and the release of multiple eggs, as well as laparoscopic surgery to retrieve the eggs.<sup>50</sup> The Mayo Clinic cautions that the use of

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<sup>44</sup> *Id.*

<sup>45</sup> Joseph O. Doyle et al., *Successful Elective and Medically Indicated Oocyte Vitrification and Warming for Autologous In Vitro Fertilization, with Predicted Birth Probabilities for Fertility Preservation According to Number of Cryopreserved Oocytes and Age at Retrieval*, 105 *FERTILITY & STERILITY* 459 (2016).

<sup>46</sup> *Id.* at 464.

<sup>47</sup> Charlotte Alter et al., *What You Really Need to Know About Egg Freezing*, *TIME MAGAZINE* (Jul. 16, 2015), <https://time.com/3959487/egg-freezing-need-to-know/>.

<sup>48</sup> *Id.*

<sup>49</sup> Alexandra Peyser & Avner Hershlag, *Is the Increase in Egg Freezing Cycles Related to Increased Numbers of Single Women in the United States?*, *SCI. DIRECT* (Sep. 1, 2019), [https://www.fertstert.org/article/S0015-0282\(19\)31036-2/fulltext](https://www.fertstert.org/article/S0015-0282(19)31036-2/fulltext).

<sup>50</sup> *Egg Freezing*, *MAYO CLINIC* (Apr. 23, 2021), <https://www.mayoclinic.org/tests->

fertility drugs could produce adverse side effects, such as weight gain and bloating, and it might even result in ovarian hyperstimulation syndrome (OHSS), a serious medical condition which could lead to kidney failure and even death.<sup>51</sup> The Human Fertilisation and Embryology Authority reported that 30,000 cases of OHSS were recorded between 1991 and 2007, with symptoms ranging from chest pains and shortness of breath to kidney failure.<sup>52</sup> Egg-freezing also necessitates that the eggs themselves be bombarded with cryoprotectants, chemicals which prevent the formation of ice crystals during the freezing process.<sup>53</sup> These chemicals may be toxic to embryos, yet there is little data regarding the extent of cryoprotectants that are absorbed by eggs during the freezing process.<sup>54</sup> Thus, egg-freezing might also result in harm to the children who are ultimately born from the process.

In addition, one cycle of egg-freezing, including the hormonal treatment to induce egg production, costs around \$10,000, and women generally require multiple egg-freezing cycles in order to collect enough eggs for several successful pregnancies.<sup>55</sup> Furthermore, most fertility centers also charge an annual fee for storage of the eggs once they are frozen, which is usually around \$500 per year.<sup>56</sup> And the costs of in vitro fertilization, which would be necessary to fertilize the frozen

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procedures/egg-freezing/about/pac-20384556.

<sup>51</sup> *Female Infertility*, MAYO CLINIC (Aug. 27, 2021), <https://www.mayoclinic.org/diseases-conditions/female-infertility/diagnosis-treatment/drc-20354313#:~:text=Injecting%20fertility%20drugs%20to%20induce,%2C%20nausea%2C%20vomiting%20and%20diarrhea>.

<sup>52</sup> *State of the Fertility Sector 2019/2020*, HUM. FERTILISATION & EMBRYOLOGY AUTH., (Nov. 2020), <https://www.hfea.gov.uk/about-us/publications/research-and-data/state-of-the-fertility-sector-2019-2020/>.

<sup>53</sup> *Female Infertility*, MAYO CLINIC (Aug. 27, 2021), <https://www.mayoclinic.org/diseases-conditions/female-infertility/diagnosis-treatment/drc-20354313#:~:text=Injecting%20fertility%20drugs%20to%20induce,%2C%20nausea%2C%20vomiting%20and%20diarrhea>.

<sup>54</sup> Benjamin P. Best, *Cryoprotectant Toxicity: Facts, Issues, and Questions*, 18(5) REJUVENATION RES. 422-436 (2015) (available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4620521/>).

<sup>55</sup> Patti Neighmond, *Women Can Freeze Their Eggs for the Future, but at a Cost*, NPR: ALL THINGS CONSIDERED (Oct. 16, 2014), <https://www.npr.org/sections/health-shots/2014/10/16/356727823/freezing-a-womans-eggs-can-be-emotionally-and-financially-costly>.

<sup>56</sup> *Id.*

eggs, is \$5,000 for each attempt.<sup>57</sup> In spite of all these obstacles, egg-freezing companies are advertising expensive egg-freezing procedures to women and hosting egg-freezing parties with appealing monikers such as “Let’s Chill,” even though it is not yet clear that frozen eggs will actually prove viable and produce healthy offspring.<sup>58</sup> All of this suggests that the fertility industry is promoting egg-freezing, despite the fact that it is an expensive and invasive technique which poses real health risks to women and children that may not be worth the trade-off in terms of actually producing tangible benefits.<sup>59</sup>

Yet there is an even greater threat posed by the process of egg-freezing than merely creating false hopes and luring desperate women into undergoing risky, invasive, and expensive medical procedures. The danger is that what is technologically possible often becomes normalized, routinized, and then imposed, subtly or not so subtly, upon those who would wish to choose otherwise. For example, companies like Apple and Facebook,<sup>60</sup> and even the U.S. military<sup>61</sup> have provoked controversy by offering to pay for egg-freezing services for their employees. In 2014, Apple and Facebook both reported that they would cover the costs of egg-freezing for their employees beginning in 2015.<sup>62</sup> Facebook offered to cover up to \$20,000 in egg freezing costs pursuant to its “lifetime surrogacy reimbursement” program.<sup>63</sup> And many other companies have already followed suit.<sup>64</sup> In an interview with Bloomberg, Virgin CEO Richard Branson

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<sup>57</sup> *Id.*

<sup>58</sup> Ayana Harry, *Fertility Company Throws ‘Let’s Chill’ Parties for Women Interested in Egg Freezing*, NEXSTAR MEDIA INC. (Nov. 10, 2014), <https://pix11.com/news/local-news/fertility-company-throws-lets-chill-cocktail-party-for-women-interested-in-freezing-their-eggs/>.

<sup>59</sup> See Amanda Mull, *The New, Invasive Ways Women Are Encouraged to Freeze Their Eggs*, THE ATLANTIC: HEALTH (Mar. 4, 2019), <https://www.theatlantic.com/health/archive/2019/03/egg-freezing-instagram/584053/>.

<sup>60</sup> Tran, *supra* note 14.

<sup>61</sup> Michael Schmidt, *Pentagon to Offer Plan to Store Eggs and Sperm to Retain Young Troops*, N.Y. TIMES (Feb. 3, 2016), <https://www.nytimes.com/2016/02/04/us/politics/pentagon-to-offer-plan-to-store-eggs-and-sperm-to-retain-young-troops.html>.

<sup>62</sup> Tran, *supra* note 14.

<sup>63</sup> *Id.*

<sup>64</sup> Charlotte Alter, *Sheryl Sandberg Explains Why Facebook Covers Egg-Freezing*, TIME (Apr. 24, 2015), <https://time.com/3835233/sheryl-sandberg-explains-why-facebook-covers-egg-freezing/>.

indicated that his company would like to “steal the idea” and offer the benefit to his employees.<sup>65</sup>

Viewed closely, such policies dress-up burdens in the garb of benefits: they ostensibly free women to work longer hours by emancipating them from anxiety about the ticking biological clock, while at the same time subtly pressuring them to postpone childbearing. In 2015, Sheryl Sandberg, the chief operating officer of Facebook, and Virgin CEO Richard Branson appeared together on national television to defend Facebook’s \$20,000 egg-freezing benefit for female employees.<sup>66</sup> Branson responded to the criticism that these policies effectively coerce women to delay having children by retorting: “How can anybody criticize them for doing that? It’s the woman’s choice.”<sup>67</sup> But workplace policies that offer women such “choices” may not actually enhance women’s autonomy and enable them to achieve gender equality. “Employers may come to expect women to postpone childbearing through egg freezing. Women may be pushed into a burdensome and costly medical procedure that cannot provide guaranteed future fertility outcomes. . . . Moreover, promoting egg freezing as a quick-fix technological solution does not solve the unfavorable employment policies that cause women to lean out of their careers,” explains Marcia Inhorn, Professor of Medical Anthropology at Yale University.<sup>68</sup> Instead of trying to transform the workplace conditions that make it difficult for everyone to manage career and family, egg-freezing appears to offer a technological fix to a broader social problem that merely privatizes the problem and shifts responsibility to individual women. Ultimately, it may distract attention from, and even undermine, the struggle to achieve meaningful societal solutions.

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<sup>65</sup> *Id.*

<sup>66</sup> Mary Ann Mason & Tom Ekman, *No, Companies Shouldn’t Pay Women to Freeze Their Eggs*, WIRED (Apr. 11, 2017), <https://www.wired.com/2017/04/no-companies-shouldnt-pay-women-freeze-eggs/>.

<sup>67</sup> *Id.*

<sup>68</sup> *Id.*



## II. UTERINE TRANSPLANTATION

Along the same lines, each of these technologies may be viewed as a scientific fix to circumvent the ethical, legal, and social problems posed by the use of existing modes of assisted reproduction, yet each new technology actually substitutes one set of complications for another. All three technologies may be viewed as part of a broader move from relatively low-tech to ever more high-tech methods of reproduction, which involve more expensive, more invasive, and ultimately more dangerous techniques, all in the pursuit of biological connections and legal legitimacy. This trend mirrors the technological shift in the last few decades from traditional surrogacy, which required only artificial insemination, to gestational surrogacy, which necessitates the use of IVF, a much more expensive, invasive, and dangerous technology.<sup>69</sup> Yet this shift cannot be explained solely by the demand for a genetic child because gestational surrogacy often involves use of a donor egg. Instead, the move from traditional surrogacy to gestational surrogacy may actually be an artifact of the law, as the legal rules in many jurisdictions clearly enforce gestational surrogacy contracts while leaving the status of traditional surrogacy in legal limbo.<sup>70</sup> Likewise, resort to uterine transplant may be the result of legal rules that prohibit surrogacy, or a reaction to the ethical and social concerns associated with surrogacy. Thus, Dr. Mats Brannstrom observes that it is not a coincidence that uterine transplants were first attempted in Islamic countries, which frown upon the alternatives of surrogacy and adoption. Indeed, surrogacy is illegal in almost all of the countries at the forefront of uterine transplantation, including Sweden, which currently prohibits commercial surrogacy and is contemplating a broader ban, and China, where all surrogacy is proscribed.<sup>71</sup>

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<sup>69</sup> See Radhika Rao, *Hierarchies of Discrimination in Baby Making? A Response to Professor Carroll*, 88 IND. L.J. 1217 (Fall 2013) (arguing that the preference for gestational surrogacy is a consequence of legal rules that clearly enforce gestational surrogacy contracts, while leaving open the status of traditional surrogacy).

<sup>70</sup> *Id.*; see also Courtney G. Joslin, *Nurturing Parenthood Through the UPA*, YALE L.J.F. 589-613 (Jan. 7, 2018).

<sup>71</sup> *Help wanted; As Demand for Surrogacy Soars, More Countries are Trying to ban it*, THE ECONOMIST (May 13, 2017), <https://www.economist.com/international/2017/05/13/as-demand-for-surrogacy-soars-more-countries-are-trying-to-ban-it>.

Uterine transplant is a relatively new phenomenon, even though the earliest documented case of a womb transplant occurred almost a century ago, in 1931, on transgender Danish painter Lili Elbe (the subject of the recent film *The Danish Girl*), who died tragically three months after her surgery following complications.<sup>72</sup> Two more recent attempts were also unsuccessful, although they did not result in death. In 2000, in Saudi Arabia, a uterus was transplanted from a 46-year-old living donor into a 26-year-old woman, but unfortunately, the uterus had to be removed after 3 months due to necrosis, a deterioration of the organ due to blood clots.<sup>73</sup> The second attempt occurred in 2011, in Turkey, when a uterus from a deceased donor was transplanted into a recipient who became pregnant through IVF but suffered a miscarriage.<sup>74</sup> In 2012, a Swedish team initiated the first human uterus transplantation clinical trials, transplanting uteri from live donors into 9 women with absolute uterine-factor infertility. The researchers reported that the uterus donor surgeries ranged from 10 to 13 hours, and the recipient surgeries ranged from 4 to 6 hours.<sup>75</sup> All but one of the donors were the mother or a close relative of the recipient, such as the maternal aunt, sister, or mother-in-law.<sup>76</sup> Seven of the uteri were viable, but the remaining 2 uterine transplants were unsuccessful due to uterine artery occlusions and persistent intrauterine infection.<sup>77</sup> In October 2014, the Swedish team hailed the first successful live birth of a child born from a transplanted womb.<sup>78</sup> They transplanted a uterus from a 61-year-old post-menopausal donor into a 35-year-old patient, waited a year for the recipient to heal, and then implanted an embryo created through in vitro fertilization.<sup>79</sup> During her pregnancy, the

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<sup>72</sup> Erin Biba, *Something Borrowed*, 290 *POPULAR SCI.* 36-37 (2018).

<sup>73</sup> Fageeh et al., *Transplantation of the Human Uterus*, *INT'L J. GYNECOLOGY & OBSTETRICS* (Apr. 2018), <https://pubmed.ncbi.nlm.nih.gov/11880127/>.

<sup>74</sup> Mats Brännström et al., *Uterus Transplant: A Rapidly Expanding Field*, *TRANSPLANTATION* (May 2014), <https://pubmed.ncbi.nlm.nih.gov/29210893/>.

<sup>75</sup> Mats Brännström et al., *First Clinical Uterus Transplantation Trial: A Six-month Report*, *FERTILITY & STERILITY* (May 2014), [https://www.fertstert.org/article/S0015-0282\(14\)00177-0/fulltext](https://www.fertstert.org/article/S0015-0282(14)00177-0/fulltext).

<sup>76</sup> See *id.*

<sup>77</sup> See *id.*

<sup>78</sup> Simon Johnson, *Swedish woman world's first to give birth after womb transplant*, *REUTERS* (Oct. 4, 2014), <https://www.reuters.com/article/us-sweden-transplant/swedish-woman-worlds-first-to-give-birth-after-womb-transplant-idUSKCN0HT0GC20141004>.

<sup>79</sup> Mats Brännström et al., *supra* note 75.

mother took immunosuppression medications in order to prevent organ rejection.<sup>80</sup> The baby was born prematurely at 32 weeks and delivered by cesarean section, but ultimately survived. And in June 2016, Dr. Brannstrom announced that a transplant recipient was pregnant with her second child.<sup>81</sup>

More recently, China and India have followed in the footsteps of Sweden. In November 2015, the Chinese media reported the successful transplant of a uterus from a living donor to her 22-year-old daughter. In January 2019, the same recipient gave birth to a baby boy.<sup>82</sup> And in May 2017, India also achieved a successful uterine transplant from a 43-year-old donor to her 21-year-old daughter. The first uterine transplant in the U.S. was performed using a deceased donor at the Cleveland Clinic in February 2016, but unfortunately, the transplant failed when the 26-year-old recipient suffered complications from a yeast infection, which required removal of the organ two weeks after surgery. In September 2016, four more American women received uterine transplants, this time from living donors, at Baylor University Medical Center in Dallas, but three of the organs were removed after tests revealed that they were not receiving normal blood flow. To date, there have been more than 80 attempts to perform uterine transplantation around the world, and more than 40 babies have been delivered as a result.<sup>83</sup> Moreover, excitement about the procedure continues to mount, with clinical trials and pilot programs under way at numerous clinics in the US, including the Cleveland Clinic and Baylor University Medical Center. Indeed, Baylor's clinical trial boasts 12 live births as a result of 20 uterine transplants, 14 of which were technically successful, resulting in a live-birth success rate of 55% per attempted transplant and 79% per successful transplant, thus the clinic now plans to offer the service more broadly.

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<sup>80</sup> See *id.*

<sup>81</sup> *Second Baby for Womb Transplant Mum*, BBC NEWS (June 20, 2016), <https://www.bbc.com/news/health-36577453>.

<sup>82</sup> Zhuang Pinghui, *China's First Womb Transplant Recipient Gives Birth to a Healthy Baby Boy*, S. CHINA MORNING POST: SOC'Y (Jan. 24, 2019), <https://www.scmp.com/news/china/society/article/2183441/chinas-first-womb-transplant-recipient-gives-birth-healthy-baby>.

<sup>83</sup> Mats Brännström et al., *Uterus transplantation worldwide: clinical activities and outcomes*, 26 CURRENT OP. IN ORGAN TRANSPLANTATION 616-626 (Dec. 1, 2021), <https://pubmed.ncbi.nlm.nih.gov/34636769/>.

A womb transplant may be especially appealing to women in countries such as Sweden and China, where surrogacy is illegal. But ethical and social concerns about surrogacy lead some physicians to suggest that uterine transplant is preferable even where surrogacy is legal. "There are women who won't adopt or have surrogates, for reasons that are personal, cultural or religious," states Dr. Andreas Tzakis, the physician who performed the first uterine transplant at the Cleveland Clinic in the U.S. Indeed, he envisions uterus transplantation as ethically superior to surrogacy because surrogacy "create[s] a class of people who rent their uterus, rent their body, for reproduction...It has some gravity. It possibly exploits poor women."<sup>84</sup> But womb transplants also present ethical issues because they pose grave risks to the safety of the donor, if a live donor is used, as well as to the safety of the recipient and the potential fetus.<sup>85</sup>

A uterine transplant requires at least four complicated and expensive surgeries, one to extract the uterus from the donor and another two upon the recipient, first to insert and then to remove the uterus, plus a fourth caesarean surgery to extract the fetus from the womb.<sup>86</sup> A live donor must undergo a radical hysterectomy, which would remove a larger portion of the tissues surrounding the uterus than in a typical hysterectomy, so that those tissues could be connected with tissues of the recipient.<sup>87</sup> Such surgery could cause excessive bleeding or injury to the bowel or the ureters, and could lead to an infection that could develop into sepsis.<sup>88</sup> Similar risks confront the recipient, who would also require ongoing treatment with immune suppressants to ensure that her body did not reject the transplanted organ, which might also increase her risk of cancer.<sup>89</sup> Finally, any fetus in the transplanted womb would be in potential danger because of the

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<sup>84</sup> Grady, *supra* note 38.

<sup>85</sup> Avner Hershlag, *Uterine Transplants*, THE N.Y. TIMES (Nov. 20, 2015), <https://www.nytimes.com/2015/11/21/opinion/uterine-transplants.html>.

<sup>86</sup> *Uterus Transplant*, U.A.B. MED., <https://www.uabmedicine.org/patient-care/treatments/uterus-transplant> (last visited Aug. 19, 2022).

<sup>87</sup> See Jeremy C. Fox, *Womb Transplant Marks Birth of New Legal and Ethical Dilemmas*, BOS. GLOBE, (Oct. 13, 2014), <https://www.bostonglobe.com/lifestyle/health-wellness/2014/10/12/womb-transplant-marks-birth-new-legal-and-ethical-dilemmas/1ySDBm0Q0Mb5oR3taiCdbj/story.html>.

<sup>88</sup> See *id.*

<sup>89</sup> See *id.*

difficulty of connecting the complex web of blood vessels that support the uterus, and the risk of rejection for the transplanted organ.<sup>90</sup> The team of Swedish physicians responsible for the first successful uterine transplant confessed that they did not anticipate the complexity of the donor surgery, which required not just removal of the uterus but also careful extraction and preservation of the surrounding veins and blood vessels.<sup>91</sup> They estimated that the surgery upon the uterus donor would take only three to four hours, but it actually took ten to thirteen hours<sup>92</sup>. Thus, uterine transplants pose grave risks to the women who donate the uterus, without even the possibility of compensation.

Faced with a choice, many women might actually prefer to serve as a paid gestational surrogate. Hence, it is not obvious that uterine transplants are actually ethically superior to gestational surrogacy. The fact that they are altruistic does not necessarily ensure that they are truly voluntary, and not coercive or exploitative.<sup>93</sup> Indeed, familial pressures upon a mother or sister to donate her uterus to an infertile daughter or sibling may render uterine transplants even more coercive than surrogacy contracts that involve arms-length transactions with strangers.<sup>94</sup> In addition, the proposed ethical equivalence between womb transplant and gestational surrogacy may also be challenged from the standpoint of the fetus, based upon the risks of gestation in a transplanted womb and the potential effects of exposure to immunosuppressants.<sup>95</sup>

Despite the risks of uterine transplant to all the parties involved, the drive to push forward with this technology continues.<sup>96</sup> And even

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<sup>90</sup> See *id.*

<sup>91</sup> Brännström et al., *supra* note 75.

<sup>92</sup> See *id.*

<sup>93</sup> Therese E. Amaya, *Uterus Transplantation - Ethically Just as Problematic as Altruistic Surrogacy*, NEWS AT LINKÖPING UNIV. (Sept. 26., 2018), <https://liu.se/en/news-item/transplantation-av-livmoder-ar-etiskt-lika-problematiskt-som-altruistiskt-surrogatmodraskap>.

<sup>94</sup> Mary Rose Somarriba, *The Overlooked Risks of Surrogacy for Women*, INST. FOR FAM. STUD. (Nov. 22, 2017), <https://ifstudies.org/blog/the-overlooked-risks-of-surrogacy-for-women>.

<sup>95</sup> See Judith Daar & Sigal Klipstein, *Refocusing the Ethical Choices in Womb Transplantation*, 3 J.L. & BIOSCIENCES 383 (2016).

<sup>96</sup> See Shawana Alleyne-Morris, *Uterus Transplants Allow Successful Pregnancies in U.S Women-study*, REUTERS (July 6, 2022), <https://www.reuters.com/business/healthcare-pharmaceuticals/uterus-transplants-allow-successful-pregnancies-us-women-study-2022-07-06/>.

though three out of four of the first uterine transplants at Baylor University Medical Center failed, Dr. Giuliano Testa, the lead surgeon and surgical chief of abdominal transplantation at Baylor, remains optimistic: "If you look at this from the science [perspective], it's something we've learned a lot from, and we have a patient who is doing well . . . This is the beginning of hopefully a great history for medicine."<sup>97</sup> According to Testa, "[y]ou cannot discount the desire of a woman to have a normal pregnancy, bear her own child, and deliver. . . . This is part of human nature."<sup>98</sup>

Indeed, Lindsey McFarland, the first woman to obtain a uterine transplant in the U.S., volunteered for the clinical trial at the Cleveland Clinic precisely because she longed to experience pregnancy, even though she already had two adopted children: "I crave that experience . . . I want the morning sickness, the backaches, the feet swelling. I want to feel the baby move."<sup>99</sup> But ironically, uterine transplant cannot provide women with the complete pregnancy experience because the transplanted womb is not connected to nerves, so the woman will be unable to feel the movement of the fetus or to experience contractions.<sup>100</sup> Instead, uterine transplants offer women only the superficial semblance of pregnancy, while potentially tying them to their biological role and perpetuating social stereotypes: "It further reinforces this idea that to be a 'real woman,' you need to have a genetically related child that you gestate yourself," states Lisa Campo-Engelstein, a bioethicist at Albany Medical College.<sup>101</sup> Thus, it is not clear whether there is actually an inherent demand for extreme technologies such as uterine transplant, rather than a supply of medical resources seeking to stimulate demand and create new markets for new technology. Instead, the drive to push forward with such radical technologies across the world may be the result of these market forces, as well as scientific competition and the technological imperative, the assumption that new technologies are inevitable and necessarily advance the public welfare. And instead of liberating

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<sup>97</sup> See Alexandra Sifferlin, *4 Breakthrough Uterus Transplants Performed in the U.S.*, TIME (Oct. 4, 2016), <https://time.com/4517816/baylor-womb-uterus-transplants/>.

<sup>98</sup> *Id.*

<sup>99</sup> Grady, *supra* note 38.

<sup>100</sup> Robertson, *supra* note 37.

<sup>101</sup> Stein, *supra* note 4.

women, the option of uterine transplantation may merely bind them to biological roles and perpetuate pervasive gender-role stereotypes.

### III. IN VITRO GAMETOGENESIS

Similarly, IVG offers the hope that it will empower single persons and same-sex couples to have genetic children without the assistance of sperm or egg donors.<sup>102</sup> In 2020, Debora Spar published an op-ed in the *New York Times*, titled "the Poly-Parent Households are Coming," boldly predicting that IVG will ultimately "dismantle completely the reproductive structure of heterosexuality."<sup>103</sup> But it was the employment of gamete donors and gestational surrogates that furthered the radical uncoupling of ART-formed families from the dominant ideology of the natural biological family by revealing that biological connections were neither necessary nor sufficient to confer parental status.<sup>104</sup> This process helped to forge new definitions of collaborative and intent-based parenthood, which may in turn have contributed to the movement for marriage equality.<sup>105</sup> IVG, on the other hand, would enable same-sex couples to have their own genetic children in a manner that mimics heterosexual reproduction, reinforcing and perpetuating the preeminence of the natural biological family. This means that, instead of challenging heteronormativity, gametogenesis might actually reify and enshrine it!

The process of IVG may permit those who fall outside the norm, such as same-sex couples, to generate their own biological families in the mirror-image of the traditional, heterosexual family. Indeed, some scholars recommend IVG as an option not only for gay and lesbian couples, but also for other nontraditional families, such as polygamous or polyamorous families seeking to create children who are the product of more than two genetic parents, in order to engage in

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<sup>102</sup> See Lauren Notini et al., *Drawing the Line On in vitro Gametogenesis*, 34 *BIOETHICS* 123, 125 (2019).

<sup>103</sup> See Debora Spar, *The Poly-Parent Households Are Coming*, *THE N.Y. TIMES* (Aug. 12, 2020), <https://www.nytimes.com/2020/08/12/opinion/ivg-reproductive-technology.html>.

<sup>104</sup> See Radhika Rao, *Assisted Reproductive Technology and the Threat to the Traditional Family*, 47 *HASTINGS L.J.* 951, 961 (1996).

<sup>105</sup> See Douglas NeJaime, *Marriage Equality and the New Parenthood*, 129 *HARV. L. REV.* 1185, 1187 (2016).

“multiplex parenting.”<sup>106</sup> If it is used in this way, Glenn Cohen suggests that gametogenesis holds the potential to be a “disruptive reproductive technology” because it could challenge conventional biological definitions of parenthood and lead to the formation of completely new types of family.<sup>107</sup> But although IVG appears to liberate individuals and unconventional minorities by allowing them to construct bold new configurations of family, there is a risk that it may actually reinforce and perpetuate what is ultimately a very conservative vision of family, which places even more emphasis on genetic ties and biological kinship. As a consequence, it is not clear whether IVG will actually prove to be a “disruptive reproductive technology,”<sup>108</sup> or whether it will turn out to be “just another way to have a baby.”<sup>109</sup>

Moreover, the most likely use of IVG is not to challenge or disrupt prevailing social norms, but to further entrench and perhaps even exacerbate existing forms of inequality. Currently, scarcity in the supply of eggs provides a practical constraint upon the process of genetic selection and manipulation of embryos.<sup>110</sup> But IVG technology might make it possible to generate a virtually unlimited supply of eggs and thus embryos, which could dramatically increase the rate of genetic selection of embryos and gene-editing in order to produce offspring with desirable traits. Indeed, Professor Hank Greely predicts that easy access to eggs could significantly facilitate the preimplantation genetic diagnosis (PGD) and selection of embryos based upon genetic characteristics, and that widespread use of “easy PGD” would in turn ultimately result in “the end of sex,” at least for purposes of reproduction.<sup>111</sup> But if IVG is used in this fashion, there is a possibility that it would not only aggravate existing forms of

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<sup>106</sup> See César Palacios-González et al., *Multiplex parenting: IVG and the generations to come*, 40 J. MED. ETHICS 752, 756 (2014).

<sup>107</sup> Cohen et al., *supra* note 9, at 372.

<sup>108</sup> Cohen, *supra* note 9, at 372.

<sup>109</sup> Suter, *supra* note 28.

<sup>110</sup> Rich Vaughn, *Why is there is Shortage of Black Egg Donors and Black Sperm Donors?*, INT’L FERTILITY L. GRP. (Mar. 12, 2021), <https://www.iflg.net/black-egg-donor-sperm-donor-shortage/>.

<sup>111</sup> Greta Lorge, *The End of Sex?: Hank Greely and the Reproductive Revolution*, 94 STAN. L. MAG. (Jun. 1, 2016), <https://law.stanford.edu/stanford-lawyer/articles/the-end-of-sex-hank-greely-on-the-coming-reproduction-revolution/>.



discrimination against those with disabilities, but also unleash new types of genetic discrimination and hierarchy. Widespread use of genetic selection by those with economic power could result in a DNA-divide, further segmenting society into classes of genetic haves and have-nots. In 1942, in *Skinner v. Oklahoma*, the Supreme Court recognized the dangers of eugenic sterilization, declaring: "[t]he power to sterilize, if exercised, may have subtle, far-reaching and devastating effects. In evil or reckless hands it can cause races or types which are inimical to the dominant group to wither and disappear."<sup>112</sup> While state-sponsored eugenics poses a grave threat to equality, there is a danger that unfettered free market forces in the realm of reproductive and genetic technology could achieve similar results.

## CONCLUSION

Egg-freezing, uterine transplant, and IVG are all examples of cutting-edge reproductive technologies which may be marketed to supply a desperate demand for babies. Yet it is not clear whether there is actually an inherent demand for such medical technologies, or whether they are instead the result of a supply of medical resources seeking to stimulate demand and create new markets for baby-making technology. And although each technology promises to liberate individuals and enhance opportunities, all of them may ultimately entrench existing structures of inequality or even lead to new kinds of discrimination. For example, egg-freezing is often characterized as a form of fertility insurance that promises to free women from the constraints of biology, while simultaneously enhancing gender equality. Yet in reality, egg-freezing is being promoted by the fertility industry despite the fact that it is an expensive and invasive technique which poses significant health risks to women that may not be worth the trade-off in terms of actually producing tangible results. It may function as an employment burden dressed-up in the garb of a benefit, liberating women to work longer hours by emancipating them from anxiety about the ticking biological clock, while at the same time pressuring them to postpone childbearing. Thus, it may actually undermine rather than enhance gender equality.

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<sup>112</sup> *Skinner v. Oklahoma*, 316 U.S. 535, 541 (1942).

Similarly, uterine transplants seem to offer women suffering from uterine factor infertility the opportunity to gestate their own child and experience some of the physical aspects of pregnancy, while simultaneously freeing them from the risks and ethical complications associated with employment of a gestational surrogate. Yet living donor uterine transplants also pose grave risks to the women who donate the uterus, as well as to the children born from such technology, and the fact that they are altruistic does not necessarily ensure that they are not coercive or exploitative. Indeed, familial pressures may render uterine transplants even more coercive than surrogacy contracts negotiated in arms-length transactions with strangers. Moreover, uterine transplants offer women only the superficial semblance of pregnancy, while potentially binding them to their biological role and perpetuating pervasive gender-role stereotypes.

Lastly, IVG appears to liberate individuals and unconventional minorities such as same-sex or polyamorous couples by allowing them to construct bold new configurations of family. But in the end, the technology may actually reinforce and perpetuate what is ultimately a very conservative vision of family, which places even more emphasis on genetic ties and biological kinship. As a consequence, it is not clear whether IVG will actually prove to be a “disruptive reproductive technology,”<sup>113</sup> or whether it will turn out to be “just another way to have a baby.”<sup>114</sup> Moreover, IVG might make it possible to generate a virtually unlimited supply of eggs, which could dramatically increase the rate of genetic selection of embryos in order to produce offspring with desirable traits. Hence, the most likely use of this technology is not to challenge or disrupt prevailing social norms, but rather to exacerbate existing forms of discrimination against those with traits perceived as undesirable, and perhaps even to unleash new forms of genetic discrimination and hierarchy.

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<sup>113</sup> Cohen, *supra* note 9, at 372.

<sup>114</sup> Suter, *supra* note 28.

