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ECTOGENESIS: IS THERE A CONSTITUTIONAL RIGHT TO SUBSTRATE-INDEPENDENT WOMBS?

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I. INTRODUCTION

Ectogenesis is the gestation of a fetus independent of a woman's body.[1] The technology is sometimes called an "artificial womb," "uterine replicator," or "exowomb."[2] The term "ectogenesis" was first used by J.B.S. Haldane in a 1923 lecture to the Heretics Society at Cambridge entitled "Daedalus or Science and the Future."[3] Haldane's address predicted that by 1945, scientists would make successful use of an external uterus to support an embryo from conception to birth at nine months.[4] He estimated that by the year 2073, ectogenesis would be a universally accessed technology, with only thirty percent of new births being "of woman."[5] *Daedalus* directly inspired Aldous Huxley's 1932 novel, *Brave New World*, perhaps the most widely-known depiction of ectogenesis.[6] In that story, the individual's complete subjugation to the omnipresent state is effectuated, in part, by the restriction of reproduction to state-controlled hatcheries where children are gestated in artificial wombs, subjected to chemical conditioning, and raised on a diet of brainwashing and drugs intended to cultivate obedient citizens.[7]

Since the term originated, ectogenesis has been woven into countless works of science fiction and science fantasy, often encapsulating humanity's deepest insecurities about the locus of women's bodies in the perpetuation of our species, the source of life, and the

* Adjunct Professor of Law, Santa Clara University School of Law, Santa Clara, California. This is dedicated to Honor Galadriel, my precious womb-fruit, in hopes that she is empowered by technology and blessed with liberty. My gratitude to Kerry Macintosh and Marina Hsieh for their guidance, comments, and support. Michael W. Flynn, thank you for being my jetpack. Mary Sexton, research librarian to the stars, helped enormously. Elaina Chambers provided valiant editing assistance.

[1] *See infra* Section II.

[2] Archuman, *Ectogenesis and Exowombs: Will Sex Become Extinct?*, HUMANITY+ (June 29, 2017), https://humanityplus.wordpress.com/2017/06/29/will-sex-become-extinct/; LOIS MCMASTER BUJOLD, ETHAN OF ATHOS 34 (1986).

[3] J.B.S. HALDANE, DAEDALUS OR SCIENCE AND THE FUTURE (1924).

[4] *Id.*

[5] *Id.* at 63, 65.

[6] Elle Shan Wei, *1923 – Term 'Ectogenesis' Coined*, NEXT NATURE NETWORKS (May 24, 2017), https://nextnature.net/magazine/story/2017/1923-term-ectogenesis-coined.

[7] ALDOUS HUXLEY, BRAVE NEW WORLD (1932).

uniqueness of human labor. Lois McMaster Bujold's 1986 novel *Ethan of Athos* depicts a colony populated by males alone.[8] Their planetary religion holds women "to be inciters to sin, or sin [is] inherent in them, like juice in an orange, or sin [is] caught from them like a virus."[9] All children born on Athos (sex-selected males, of course), are inseminated in artificial wombs called "uterine replicators," which combine the prospective father's sperm with ovarian tissue cultures brought to the planet by Athos' Founding Fathers.[10] To the Athosians, living women are imagined as little more than "uterine replicators with legs."[11] This dystopian vision reflects a fear echoed by numerous feminists: without the leverage women obtain from their status as reproductive hosts, women will lose a primary source of their already limited social power.[12] Andrea Dworkin cautioned that ectogenesis will render women "biologically expendable," "make reproduction controllable by men on a scale heretofore unimaginable," and usher in an era of "absolute state control of the uterus."[13] Dworkin predicts a coming "gynocide," the elimination of women en masse due to their reproductive obsolescence.[14] Feminists are divided on the issue of "natural" childbirth.[15] Shulamith Firestone's 1970 *Dialectic of Sex* held that until views of a woman's choice "not to have children or not to have them 'naturally' is at least as legitimate as traditional childbearing, women are as good as forced into their female roles."[16] Firestone asserts that ectogenesis would enable equalization of the "natural reproductive difference" that was the origin of the first division of labor and thus "furnished the paradigm" of "discrimination based on biological characteristics."[17] She concludes that the introduction of the technology will be liberating for women, "unless … improperly used."[18]

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[8] BUJOLD, *supra* note 2.

[9] BUJOLD, *supra* note 2.

[10] BUJOLD, *supra* note 2, at 10.

[11] BUJOLD, *supra* note 2, at 12.

[12] *See* ROBYN ROWLAND, CRUMBLING MOTHERHOOD: REPRODUCTIVE TECHNOLOGY CREATING WOMEN'S PROCREATIVE ALIENATION (1987); JANICE RAYMOND, WOMEN AS WOMBS: REPRODUCTIVE TECHNOLOGIES AND THE BATTLE OVER WOMEN'S FREEDOM (1994).

[13] ANDREA DWORKIN, RIGHT-WING WOMEN 187, 192–93 (1983).

[14] *Id.* at 194.

[15] *See* Lizzie Garret Mettler, *Is "Natural Motherhood" More Feminist?*, LOS ANGELES TIMES (Nov. 17, 2017, 4:00 AM), https://www.latimes.com/opinion/op-ed/la-oe-mettler-natural-motherhood-breastfeeding-attachment-parenting-20171117-story.html.

[16] SHULAMITH FIRESTONE, THE DIALECTIC OF SEX 200 (1970).

[17] *Id.* at 9.

[18] *Id.* at 196 (improper use, to Firestone, includes state control of the technology and application to governmental aims).

Dystopian criticisms and fantasies betray the untested, but presumably widely held expectation that gestation bestows at least part of what makes humans human. Even Macbeth, all but invincible with "a charmed life, which must yield not/To one of woman born," was ultimately slain by Macduff who was "untimely ripp'd" from his mother's body.[19] Long before futurist depictions of artificial wombs, gestational status marked Macduff as somehow exempt from the rules governing other human agents. Some have held forth that the transition from viviparous gestation to ectogenesis would lead to the production of offspring that are "nothing but psychological monsters."[20]

Much of scientific fact was once science fiction. Due to ongoing progress in reproductive medicine and technology, the naissance of ectogenesis is forthcoming. The already ample body of artistic and academic work relating to ectogenesis indicates that were ectogenesis to be perfected, its adoption would induce significant social change and might induce political crisis. In hopes of contributing to the situation of ectogenesis in the body of substantive due process jurisprudence, the focus of this manuscript will be the constitutional interests implicated by the invention of ectogenesis, specifically limited to the context of the Due Process Clause of the 14th Amendment.

This paper argues that the scope of procreative liberty is broad enough, as currently defined and reasoned, to encompass the use of ectogenetic and other reproductive biotechnologies. First, I will present the essential technological background details, including the present state of research on ectogenesis and developments relating to neonatal and reproductive care.[21] Second, is an overview of Supreme Court jurisprudence regarding the liberty interest in having decisional autonomy regarding procreative choices and child-rearing decisions limited to the context of the DPC.[22] Third, I apply that jurisprudence to the issue of ectogenesis, arguing that the current state of Fourteenth Amendment jurisprudence strongly suggests that ectogenesis is a fundamental procreative liberty deserving of heightened protection from state interference.[23] Finally, I address potential state interests that might be raised in support of a ban on ectogenesis, or laws that might otherwise substantially curtail an individual's access to ectogenetic technology.[24]

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[19] WILLIAM SHAKESPEARE, THE TRAGEDY OF MACBETH act 5, sc. 8, l. 2489–94.

[20] 117 CONG. REC. 12744 (1971) (citing *Man Into Superman: The Promise and Peril of The New Genetics*, TIME (1971)).

[21] *See infra* Section II.

[22] *See infra* Section III.

[23] *See infra* Sections IV.–V.

[24] *See infra* Section VI.

Haldane's 1923 address to the Heretics contained a poignant warning about the "profound emotional and ethical effect" of scientific advances on humanity.[25] He states:

> "There is no great invention, from fire to flying, which has not been hailed as an insult to some god…There is hardly one which, on first being brought to the notice of an observer from any nation which had not previously heard of their existence, would not appear to him as indecent and unnatural."[26]

In the realm of reproductive care and ectogenetic technology, moral appeals to nature and stereotypes based on dystopian science fiction carry the risk of veering into unconstitutional denials of fundamental liberties for those who would rely on this technology for their safety and self-determination.

II. BACKGROUND

Ectogenetic technology may be applied to multiple goals. Partial ectogenesis, "the growth and development of fetuses between 14 and 35 weeks of pregnancy," describes the preservation of premature fetal life via the application of technology outside of the uterus following a preterm birth.[27] This has also been called "neonatal incubation" and is distinguished from true "ectogestation."[28] Partial ectogenesis is an accurate description of the life-saving measures used in neonatal intensive care units (NICUs) across the globe.[29] These methods could be applied to spontaneous preterm births, as well to those early deliveries necessary to preserve maternal or fetal health and life.[30] Full ectogenesis, "the implantation and full development of fetuses *in vitro*," has long been anticipated but is predicated upon the development of both a functional, external uterus and the ancillary technologies for providing nutrients,

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[25] HALDANE, *supra* note 3, at 43.

[26] HALDANE, *supra* note 3, at 44.

[27] Carlo Bulletti et al., *The Artificial Womb,* 1221 ANNALS N.Y. ACAD. SCI. 124, 127 (2011).

[28] Elselijn Kingma & Suki Finn, *Neonatal incubator or artificial womb? Distinguishing ectogestation and ectogenesis using the metaphysics of pregnancy,* 34 BIOETHICS 354, 356 (2020).

[29] Bulletti et al., *supra* note 27.

[30] THE AMERICAN COLLEGE OF OBSTETRICIANS & GYNECOLOGISTS COMMITTEE ON OBSTETRIC PRACTICE, MEDICALLY INDICATED LATE-PRETERM AND EARLY-TERM DELIVERIES (Feb. 2019), https://www.acog.org/clinical/clinical-guidance/committee-opinion/articles/2019/02/medically-indicated-late-preterm-and-early-term-deliveries.

oxygen, and hormones to, and removing waste from, the developing fetus.[31] Full ectogenesis would allow women without uteruses, or with uterine malformations and deformities, as well as gay men to procreate without the involvement of a surrogate.[32] Heterosexual couples seeking a more egalitarian division of parental labor might also prefer full ectogenesis to maternal gestation. Ectogenesis might be a compelling option for women who wish to have genetically related children but do not wish to gestate, or whose professional commitments render gestation impossible, difficult, or unsafe. The loss of bodily integrity that women face during gestation may be unacceptable to some women, who, without ectogenesis, face a choice between parenthood and bodily integrity.[33] Furthermore, the risks of physical gestation are non-trivial, even with modern obstetrics.[34] Women might choose to pursue elective ectogenesis to avoid the risks inherent to physical gestation and delivery.[35]

In 1997, Lee Silver claimed that ectogenetic technology was on the "more distant horizon," and that while its development was possible, the development timescale is on the order of centuries, not decades.[36] In part, Silver based this conclusion on the once true twenty-fifth week viability mark, noting that even when utilizing "the best neonatal technology available, we cannot push the point of viability back any further simply because a younger fetus cannot breathe."[37] Silver held that solving the problem of immature fetal lungs was such an "extremely difficult technical problem" and that pushing the date of viability back further would be a very slow process.[38] Per a June 2016 joint publication by the American College of Obstetricians and Gynecologists and the Society for Maternal-Fetal Medicine, the published data regarding premature newborns in the United States, England, and Australia indicates a substantial improvement in the survival rates of periviable infants in the past decade.[39] The report reveals that the rates of "survival

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[31] Bulletti et al., *supra* note 27, at 124.

[32] For a discussion of the ethics and potential conflicts emerging from procreation via surrogate, see JOHN A. ROBERTSON, CHILDREN OF CHOICE: FREEDOM AND THE NEW REPRODUCTIVE TECHNOLOGIES 130–37 (1994).

[33] EVIE KENDAL, EQUAL OPPORTUNITY AND THE CASE FOR STATE SPONSORED ECTOGENESIS 6 (2015).

[34] *See infra* Part VII–A.1.

[35] *See infra* Part VII–A.1.

[36] LEE M. SILVER, REMAKING EDEN: HOW GENETIC ENGINEERING AND CLONING WILL TRANSFORM THE AMERICAN FAMILY 67 (1997).

[37] *Id.* at 66.

[38] *Id.*

[39] THE AMERICAN COLLEGE OF OBSTETRICIANS AND GYNECOLOGISTS, SOCIETY FOR MATERNAL-FETAL MEDICINE, OBSTETRIC CARE CONSENSUS: PERIVIABLE BIRTH 2 (2017),

to discharge" is 23-27% for births at twenty-three weeks, 42-59% at twenty-four weeks, and 67-76% at twenty-five weeks.[40] For these surviving periviable infants, the "incidence of moderate-to-severe neurodevelopment impairment" decreases with each additional week of gestation from 43% at twenty-two weeks to 24% at twenty-five weeks.[41] From Silver's vantage point, these figures illustrate unexpected rapid progress in the world of obstetrics, a departure from the limitations of 1997 where "survival [was] *possible* as early as 25 weeks with sophisticated neonatal care."[42]

Several researchers have made progress on the development of bioprosthetic and synthetic uteruses.[43] In 1996, Yoshinori Kuwabara, then-chairman of Tokyo's Jutendo University Department of Obstetrics and Gynecology, had successfully developed a technique for gestating periviable goat fetuses in a synthetic uterus termed "extrauterine fetal incubation."[44] While Kuwabara's team faced eventual "problems with circulatory failure" and other "technical difficulties," they preserved the lives of goat fetuses for three weeks.[45] Despite these difficulties, their successes with supplying "the fetuses with oxygenated blood while suspending them in incubators that contain artificial amniotic fluid heated to body temperature" were widely-reported as important advances in embryology.[46]

Dr. Hung-Ching Liu, a researcher at Cornell University's Department of Reproductive Medicine, whose ultimate goal is to develop a functioning "external womb," grew a bioprosthetic uterus by "adding engineered endometrium tissue to a bio-engineered, extra-uterine 'scaffold.'"[47] In 2003, her team successfully gestated a mouse embryo in this bioprosthetic uterus, almost to full term.[48] Following that success, Dr.

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https://www.acog.org/clinical/clinical-guidance/obstetric-care-consensus/articles/2017/10/periviable-birth (providing the definition of periviable as a "delivery occurring from 20 0/7 weeks to 25 6/7 of gestation").

[40] *Id.*

[41] *Id.*

[42] SILVER, *supra* note 36, at 68 (emphasis added).

[43] To avoid applying the term "artificial" to the technology, I use bioprosthetic to mean a uterus grown in a lab from human tissue and synthetic to mean a non-tissue uterus, made of inorganic materials.

[44] Perri Klass, *The Artificial Womb Is Born,* N.Y. TIMES (Sept. 29, 1996), http://www.nytimes.com/1996/09/29/magazine/the-artificial-womb-is-born.html?_r=0.

[45] *Id.*

[46] *Id.*

[47] Soraya Chemaly, *What Do Artificial Wombs Mean for Women?,* REWIRE (Feb. 23, 2012), https://rewire.news/article/2012/02/23/what-do-artificial-wombs-mean-women/.

[48] *Id.* (At this time, Dr. Liu was serving as the Director of the Reproductive Endocrine Laboratory at the Center for Reproductive Medicine and Infertility at Cornell.)

Liu grew a human embryo in a similar bioengineered uterus for ten days, terminating the incubation prior to the fourteen-day limit placed on embryological researchers.[49] The fourteen-day rule emerged from a 1979 report by the United States Ethics Advisory Board (an outgrowth of the Department of Health, Education, and Welfare) and was later adopted in at least seventeen countries, either via specific legislation or government-commissioned scientific guidelines.[50] The rule prohibits research on growing human embryos beyond fourteen days from fertilization.[51]

In 2016, the movement to revisit the fourteen-day rule began gaining international momentum amongst bioethicists and researchers, given the advances in embryology and the potential medical value of research on early human development.[52] In May of 2016, groups of researchers at Cambridge University and Rockefeller University in New York announced their successful maintenance of human embryos in vitro for thirteen days.[53] These advances, likely attributable to "[a]n improved culture medium and a better substrate for embryo attachment," have reopened the conversation regarding ethical limitations on embryological research.[54] With this research, scientists have narrowed the window of time where ex vivo gestation is impossible to the period between two and twenty-two weeks.[55] Given the irregular rate of advancement in this field and the uncertain legal landscape undergirding it, it could be anywhere from a few years to several decades until that gap is filled.

In April of 2017, researchers at the Children's Hospital of Philadelphia (CHOP) Research Institute published the results of their fetal lamb study of an innovative sealed "biobag," which was designed to mimic the conditions of the uterus as much as possible.[56] Their system enabled the extracorporeal gestation of extremely premature fetal lambs for four weeks "without apparent physiologic derangement or organ failure."[57] The researchers' system includes a pumpless, low-resistance oxygenator circuit (to oxygenate the fetal blood), a closed biobag filled with synthetic amniotic fluid (within which the fetus was incubated),

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[49] *Id.*

[50] Insoo Hyun, et al., *Embryology Policy: Revisit the 14-day Rule,* 533 NATURE 170 (2016).

[51] *Id.* at 171.

[52] *Id.* at 169–70.

[53] Sarah Knapton, *'Artificial Womb' Breakthrough Sparks Row Over How Long Human Embryos Should Be Kept in Lab,* THE TELEGRAPH, May 4, 2016, http://www.telegraph.co.uk/science/2016/05/04/artificial-womb-breakthrough-sparks-row-over-how-long-human-embr/.

[54] Janet Rossant, *Implantation Barrier Overcome,* 533 NATURE 182 (2016).

[55] Knapton, *supra* note 53; THE AMERICAN COLLEGE OF OBSTETRICIANS AND GYNECOLOGISTS, SOCIETY FOR MATERNAL-FETAL MEDICINE, *supra* note 39.

[56] Emily Partridge et al., *An extra-uterine system to physiologically support the extreme premature lamb*, NATURE COMMUNICATIONS 1, 1–3 (2017).

[57] *Id.* at 2.

and an umbilical interface with the oxygenator.[58] The oxygenator circuit is pumpless due to the risk of overloading the fragile fetal heart; the circuit is powered by the beating of the fetus' heart.[59] The researchers' results were "superior to all previous attempts at extracorporeal support of the extreme premature fetus in both duration and physiologic well-being."[60] The lambs grew up normally.[61]

In October of 2019, researchers at the Dutch Eindhoven University of Technology were awarded a grant of 2.9 million Euros to build a new prototype of an artificial womb.[62] The grant, awarded through the Horizon 2020 EU Program, enables the Dutch researchers to build on the successful incubation of lambs at CHOP, this time using 3D printed replicas of human babies monitored with sensors to test an environment built to more accurately model the experience of a human baby in utero.[63] Announcements of such highly visible advances are always accompanied by predictable, short-lived bioethicist handwringing.[64] The news reports rarely fail to mention the imminent Huxleyan dystopia and never fail to ignore the millions of infants who need improved incubation, parents who need alternatives to gestation or gestational surrogacy, or the role of reproductive privacy in American constitutional jurisprudence.[65] Advances in the unsexy sub-components of these artificial womb prototypes likewise march forward, but without fanfare: better fluid filtration, tubing, substrates, and scaffolds.[66]

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[58] *Id.* at 4, fig. 1.

[59] *Id*. at 2.

[60] *Id.*

[61] Nicola Davis, *Artificial womb: Dutch researchers given €2.9m to develop prototype,* THE GUARDIAN (Oct. 8, 2019), https://www.theguardian.com/society/2019/oct/08/artificial-womb-dutch-researchers-given-29m-to-develop-prototype.

[62] *Id.*

[63] *Id.*

[64] *E.g.*, Katarina Lee, *Ectogenesis*, VOICES IN BIOETHICS (Mar. 21, 2016), https://journals.library.columbia.edu/index.php/bioethics/article/view/5961 (last visited Jan. 16, 2021); Anna Smajdor, *The Moral Imperative for Ectogenesis*, 16 CAMBRIDGE Q. OF HEALTHCARE ETHICS 336 (2007); Vernellia Randall & Tshaka C. Randall, *Built in Obsolescence: The Coming End to the Abortion Debate*, SSRN (Aug. 22, 2008), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1112367.

[65] *E.g.*, Joseph Krol, *Ectogenesis: a brave new world?*, VARSITY ONLINE (2017), https://www.varsity.co.uk/science/14017; Michael Cook, *BioEdge: We must prepare for artificial wombs, say bioethicists*, BIOEDGE (2020), https://www.bioedge.org/bioethics/we-must-prepare-for-artificial-wombs-say-bioethicists/13415 (last visited Jan 16, 2021); Paula Mejia, *Fetuses in Artificial Wombs: Medical Marvel or Misogynist Malpractice?*, NEWSWEEK (2014), https://www.newsweek.com/fetuses-artificial-wombs-medical-marvel-or-misogynist-malpractice-263308 (last visited Jan 16, 2021).

[66] *See* STEPHEN COLEMAN, THE ETHICS OF ARTIFICIAL UTERUSES: IMPLICATIONS FOR REPRODUCTION AND ABORTION (2018). Coleman draws a distinction between research aimed

Whether it takes years or decades, we should be prepared to grapple with the right to procreate via ectogenesis whenever the perfected technologies arrive. Beyond ectogenesis, the same body of law ensuring a robust right to reproductive privacy under the Due Process Clause ought to protect the use of other forms of reproductive biotechnology. If the fundamental right to reproduce extends to ectogenesis, which I argue herein that it does, so does it extend to protect the individual use of *in vitro* fertilization, traditional gestational surrogacy, and other forms of reproductive biotechnology as of yet unknown to us.

III. THE FUNDAMENTAL RIGHT TO PROCREATE

The Due Process Clause of the Fourteenth Amendment of the United States Constitution provides that no state shall "deprive any person of life, liberty, or property, without due process of law."[67] The plenary power afforded to the states is broad, and the Court will uphold a legislative act as long as "there is an evil at hand for correction, and that it might be thought that the particular legislative measure is a rational way to correct it."[68] This "rational basis test" is "enormously deferential to the government and rarely have laws been declared unconstitutional for failing to meet this standard of review."[69] However, when a law violates a fundamental right, the Fourteenth Amendment's protections activate the "strict scrutiny" standard of review that shifts the burden to the governmental actor to prove the law is necessary to fulfill a compelling government interest.[70] While not expressly enumerated in the Constitution, the fundamental right to procreate, derived from the liberty interest set forth in the Due Process Clause, has been repeatedly affirmed by the Supreme Court.[71] While the boundaries and limitations of this procreative liberty are not demarcated, the case law establishing the right to procreate is extensive.

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toward developing artificial wombs ("direct") and incidental progress made towards their development resulting from "research aimed at solving the problems of human infertility, and research aimed at improving the survival rates of premature infants" ("indirect"). *Id.* He concludes that the "most important breakthroughs [advancing the development of full reproductive ectogenesis] will come from indirect research." *Id.*

[67] U.S. CONST. amend. XIV, § 1.

[68] Williamson v. Lee Optical of Okla., Inc., 348 U.S. 483, 488 (1955).

[69] ERWIN CHEMERINSKY, CONSTITUTIONAL LAW 938 (4th ed. 2013).

[70] *Id.* at 938–39.

[71] *See generally*, Skinner v. Oklahoma, 316 U.S. 535 (1942); Meyer v. Nebraska, 262 US 390 (1923); Pierce v. Society of Sisters, 268 US 510 (1925); Griswold v, Connecticut, 381 US 479 (1965); Carey v. Population Services, Int'l., 431 US 678 (1977) (illustrating the fundamental right to procreative liberty is protected by the Due Process Clause).

In the 1923 case of *Meyer v. Nebraska*, the Court overturned a statute prohibiting any person from teaching non-English languages to children who had not completed an eighth grade education.[72] The petitioner in *Meyer* was a parochial school teacher convicted for teaching a ten year old child the German language.[73] The Court asserted that the Fourteenth Amendment "denotes not merely freedom from bodily restraint" but also the right "to enjoy those privileges long recognized at common law as essential to the orderly pursuit of happiness by free" people, including marriage, rearing children, and acquiring useful knowledge.[74] While this case was decided under the rational basis standard, the Court held that the prohibition on teaching non-English languages was not even reasonably related to "some purpose within the competency of the State to effect."[75] The Court affirmed the right of the teacher to teach and the parents to engage him in the instruction of their children, holding that the Due Process Clause of the Fourteenth Amendment preserves the "power of parents to control the education of their own."[76]

The *Meyer* decision and the subsequent decision in *Pierce v. Society of Sisters* form the foundation of substantive due process jurisprudence and have long been cited as defining the liberty interest held by parents in rearing their children in accordance with their preferences and values.[77] In *Pierce*, the Court overturned an Oregon law mandating, on criminal penalty, that all "normal" children between the ages of 8 and 16 attend public school.[78] Referring to the "doctrine" set forth in *Meyer* that parents and guardians have a liberty interest in "direct[ing] the upbringing and education of children under their control," the Court overturned the statute as violating the Due Process Clause.[79] Together, *Meyer* and *Pierce* provide foundational support for the parental liberty interest in rearing children without interference from the state.

Nineteen years after *Meyer*, in 1942, the Supreme Court in *Skinner v. Oklahoma* held that an Oklahoma statute providing for the forced sterilization of certain types of criminals infringed upon procreation, which is "fundamental to the very existence and survival of the race"

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[72] 262 U.S. 390, 396 (1923).
[73] *Id.* at 397.
[74] *Id.* at 399.
[75] *Id.* at 402.
[76] *Id.* at 401.
[77] Susan E. Lawrence, *Substantive Due Process and Parental Rights: From Meyer v. Nebraska to Troxel v. Granville*, 8 J.L. & FAM. STUD. 71, 72 (2006).
[78] Pierce v. Soc'y of Sisters, 268 U.S. 510, 530 (1925).
[79] *Id.* at 534–35.

and "one of the basic civil rights of man."[80] The statute at issue enumerated certain crimes as warranting sterilization, such as theft, but excluded other crimes, which were "intrinsically the same quality of offense," such as embezzlement.[81] Since the interest at stake, procreation, was found to be a "basic liberty," the Court held that the State's classification upon which the order to sterilize was determined (here, the type of crime) ran afoul of the Equal Protection Clause of the Fourteenth Amendment and could be justified only if the classification was narrowly tailored to satisfy a compelling state interest.[82]

In *Griswold v. Connecticut*, the director of a Planned Parenthood clinic and a physician challenged a Connecticut state law prohibiting the distribution of contraceptives to married persons and the use of those contraceptives.[83] The Court held that a "zone of privacy" is "created by several fundamental constitutional guarantees" and that the marital relationship, including the marital bedroom and choices made therein, is protected by this right of privacy.[84]

The Court in *Carey v. Population Services International* overturned a New York statute prohibiting the sale of contraceptives, except by licensed pharmacists, along with other restrictions on the sale and advertisement of contraceptives.[85] In its opinion, the Court affirmed that the right of privacy protects personal decisions regarding marriage, procreation, child rearing and education, family relationships, and contraception, from unjustified state interference.[86] Referring to *Griswold* and "its progeny," the Court held that "the Constitution protects individual decisions in matters of childbearing from unjustified intrusion by the State" and clarified that the "decision whether or not to beget or bear a child is at the very heart of this cluster of constitutionally protected choices."[87] In *Eisenstadt v. Baird*, the Court held that a Massachusetts law prohibiting the distribution of contraceptives to unmarried persons violated the Equal Protection Clause of the Fourteenth Amendment.[88] It held that "if under *Griswold* the distribution of contraceptives to married persons cannot be prohibited, a ban on distribution to unmarried persons would be equally impermissible."[89] Finding no rational basis upon

[80] 316 U.S. 535, 541 (1942).
[81] *Id.* at 537, 541.
[82] *Id.* at 541.
[83] 381 U.S. 479, 480 (1965).
[84] *Id.* at 485.
[85] Carey v. Population Servs., Int'l, 431 U.S. 678, 681 (1977).
[86] *Id.* at 684–85.
[87] *Id.* at 685, 687.
[88] 405 U.S. 438, 453 (1971).
[89] *Id.*

which the state could distinguish between married and unmarried individuals, who were similarly situated with regards to regulating contraception, the Court struck down the Massachusetts law.[90] This holding explained that the right of privacy underpinning the protection of decisional autonomy, if it "means anything…is the right of the individual, married or single, to be free from unwarranted governmental intrusion into matters so fundamentally affecting a person as the decision whether to bear or beget a child."[91]

Abortion jurisprudence may also bear on the right to use ectogenesis, which is a matter involving both the right to procreate and the right to in bodily integrity implicated by the protection of the *refusal to gestate*.[92] In *Roe v. Wade*, the Supreme Court held that a Texas statute criminalizing the performance or procurement of an abortion, except where necessary to preserve the woman's life, violated the Due Process Clause of the Fourteenth Amendment.[93] The Court affirmed that the right to privacy includes a woman's right to seek an abortion, but also stated that this right to privacy is not absolute.[94] Acknowledging the state interests in protecting health, regulating medical standards, and preserving prenatal life, the Court described the co-existence of these interests with the woman's right to privacy, noting that each state interest "grows in substantiality as the woman approaches term, and, at a point during pregnancy, each becomes 'compelling.'"[95] Prior to those state interests becoming compelling, late in the pregnancy, a physician and patient are entitled to effectuate abortion "free of interference by the State."[96] Nineteen years later in *Planned Parenthood v. Casey*, the Court affirmed this central holding and recognized that in pregnancy, a woman's "suffering is too intimate and personal for the State to insist, without more, upon its own vision of the woman's role, however dominant that vision has been in the course of our history and our culture."[97] The Court replaced the trimester framework set forth in *Roe* and instead established that viability is the point at which the State may more readily impose upon a woman's right to obtain an abortion.[98] In a further

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[90] *Id.* at 454.

[91] *Id.* at 453.

[92] *See* Julie Dalzell, *The Impact of Artificial Womb Technology on Abortion Jurisprudence*, 25 WM. & MARY J. RACE, GENDER & SOC. JUST. 327 (2019) (discussing how artificial wombs and other reproductive biotechnology might influence the abortion jurisprudence).

[93] 410 U.S. 113, 164 (1973).

[94] *Id.* at 155.

[95] *Id.* at 162–63.

[96] *Id.* at 163.

[97] 505 U.S. 833, 845–46, 852 (1992).

[98] *Id.* at 876.

attempt to clarify the relationship between a woman's privacy interest and the interests of the State, the Court held that only "where state regulation imposes an undue burden on a woman's ability to make this decision does the power of the State reach into the heart of the liberty protected by the Due Process Clause."[99] This "undue burden" test, which prohibits a state's creation of a "substantial obstacle to the woman's exercise of the right to choose" has not yet been applied to assisted reproduction technologies like ectogenesis, but could quite logically be applied in the future.[100]

In the 2003 case of *Lawrence v. Texas*, the Supreme Court struck down a Texas law criminalizing sodomy between same-sex individuals, reaffirming the right to privacy relating to personal and family decisions.[101] The Court acknowledged that the choice in matters of sexual conduct "involves liberty of the person both in its spatial and more transcendent dimensions."[102] Noting that *Griswold* and *Eisenstadt* "were part of the background for the decision" in *Roe*, the Court in *Lawrence* emphasized the non-spatial elements of liberty, and the centrality of a person's right to "make certain fundamental decisions affecting her destiny" implicit in the Due Process Clause.[103] In essence, the bodily freedoms at issue in the referenced cases are manifestations of less visible, but no less necessary, aspects of self-determination. The Court explained that the drafters of the Due Process Clauses of the Fifth and Fourteenth Amendments "did not presume" to know "the components of liberty in its manifold possibilities" and declined the impossible task of enumerating every possible liberty that might one day be deserving of protection.[104] In overturning the Texas anti-sodomy law, the *Lawrence* Court affirmed the central holding from *Casey* that "our laws and tradition afford constitutional protection to personal decisions relating to marriage, procreation, contraception, family relationships, child rearing, and education."[105] It affirmed that choices regarding "these matters could not define the attributes of personhood were they formed under the compulsion of the State" and that these "most intimate and personal choices…central to personal dignity and autonomy" are not only within the scope of the Fourteenth Amendment, but "central" to the liberty it

[99] *Id.* at 874.
[100] *Id.* at 877.
[101] 539 U.S. 558, 563 (2003).
[102] *Id.* at 562.
[103] *Id.* at 565.
[104] *Id.* at 578–79.
[105] *Id.* at 574 (citing Planned Parenthood of Se. Pa. v. Casey, 505 U.S. 833, 851 (1992)).

guarantees.[106] The Court unambiguously asserted that purely moral objections, even those traditionally held by a governing majority, are not legitimate state interests and, again citing *Casey,* defined the Court's obligation as "to define the liberty of all, not to mandate our own moral code."[107]

The Court's reluctance to apply majoritarian morality to the intimate decisions of individuals is not unlimited, and it has been cautious about "extending constitutional protection" to newly-asserted liberties because doing so "place[s] the matter outside the arena of public debate and legislative action."[108] In *Washington v. Glucksberg*, petitioners brought a challenge to a Washington statute criminalizing assisted suicide on the grounds that it violated the liberty interest protected by the Due Process Clause of the Fourteenth Amendment.[109] In its opinion, the Court described its process for applying substantive due process to asserted liberties and defined a two-part method.[110] First, it limited the application of substantive due process to those "fundamental rights and liberties which are, objectively, 'deeply rooted in this Nation's history and tradition… [and] implicit in the concept of ordered liberty,' such that "neither liberty nor justice would exist if they were sacrificed.""[111] Second, it stated that proponents of an asserted substantive due process liberty must provide a "'careful description' of the asserted fundamental liberty interest," meaning that the interest must be stated with specificity.[112] The Court in *Glucksberg* further held that, in applying this two-part method, the right to assisted suicide is "not a fundamental liberty interest protected by the Due Process Clause" and ultimately upheld the statute.[113] In doing so, the Court referenced *Casey* and clarified that simply because "many of the rights and liberties protected by the Due Process Clause [of the Fourteenth Amendment] sound in personal autonomy does not warrant the sweeping conclusion that any and all important, intimate, and personal decisions are so protected."[114]

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[106] *Id.*

[107] Lawrence v. Texas, 539 U.S. 558, 571 (2003) (citing *Casey*, 505 U.S. at 850).

[108] Washington v. Glucksberg, 521 U.S. 702, 720 (1997).

[109] *Id.* at 705–06.

[110] *Id.* at 720.

[111] *Id.* at 720–21 (citing Moore v. E. Clev., 431 U.S. 494, 502–03 (1977); Snyder v. Massachusetts, 291 U.S. 97, 105 (1934); and Palko v. Connecticut, 302 U.S. 319, 325–26 (1937)).

[112] *Glucksberg*, 521 U.S. at 721 (citing Reno v. Flores*,* 507 U.S. 292, 302 (1993); Collins v. Harker Heights, 503 U.S. 115, 125 (1992); and Cruzan v. Dir., Mo. Dep't of Health*,* 497 U.S. 261, 277–78 (1990)).

[113] *Glucksberg*, 521 U.S. at 728. The Court does recognize the right to die, and the right to refuse medical care. *Id.* However, they refuse to extend these rights to having a medical professional intentionally induce the death of a patient. *Id.*

[114] *Id.* at 727.

With regards to decisions implicating personal autonomy, the existing jurisprudence leaves much to be desired in terms of floors and ceilings. It remains to be seen how the Court's conclusion in *Glucksberg* affects future substantive due process claims, but, even so, there is a clear history of protection of decisional autonomy in matters relating to childrearing, sex, contraception, and reproduction.[115] John A. Robertson concluded that "one could reasonably view the Court's decisions as having established a broad principle of negative reproductive freedom, both to avoid reproduction and to engage in it without state interference" absent a sufficiently important state interest to justify an imposition on that negative liberty.[116] Self-determination in these matters has been recognized by the Court as essential to our sense of individuality and fundamental to American concepts of liberty.[117] While even fundamental liberties are not absolute, the fundamental, personhood-altering, and defining nature of decisions regarding marriage, procreation, contraception, sexual activity, childrearing, and abortion, render them especially unsuitable to government interference. As illustrated above, the Court has held that where the liberty interest at stake falls within this realm of reproductive and familial choices, the state must provide a sufficiently important government interest to justify the intrusion on decisional autonomy.[118]

In the sections that follow, I argue that the decision to use ectogenesis is squarely within this realm of protected choices. Furthermore, the state interests that might be foreseeably raised in support of restrictions on or prohibitions of the use of ectogenesis shall not rise to the level that the state's burden would require, absent the Court's substantial departure from existing jurisprudence.[119] While moral and philosophical objections will undoubtedly be raised against ectogenesis, *Lawrence* makes clear that moral objections are *not* legitimate state interests.[120] That something might be repulsive or offensive to some does not, on its own, give the state special authority to regulate it. An attempt by the government to prohibit access to ectogenetic technology, or to place an undue burden on its use, would likely fail for want of a sufficiently important state interest to justify infringement upon a liberty so fundamental as how to gestate one's offspring.

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[115] John A. Robertson, *Procreative Liberty in the Era of Genomics*, 29 AM J.L. & MED. 439, 453 (2003).
[116] *Id.*
[117] *Id.* at 154.
[118] *See supra* Part III.
[119] Robertson, *supra* note 115, at 455.
[120] Lawrence v. Texas, 539 U.S. 558, 571 (2003).

IV. THE SCOPE OF PROCREATIVE LIBERTY IS BROAD ENOUGH TO ENCOMPASS REPRODUCTION VIA ECTOGENESIS

Coital reproduction has been found to be a fundamental interest deserving of protection from state interference, absent a compelling government interest to justify its infringement.[121] There remains a question as to whether the use of non-coital reproductive technologies, such as ectogenesis or in vitro fertilization, is similarly protected and, if so, whether the fertility status of the individual is relevant to the level of protection provided by the Constitution. Whether the scope of procreative liberty is broad enough to encompass procreation via assisted reproduction technology has not been addressed directly by the Supreme Court.[122] This is due, at least in part, to the fact that legislative efforts to limit access to reproductive technologies have occurred only rarely, which has limited the need for Supreme Court guidance.[123] Robertson speculates that this reflects "how widespread and deep is the social understanding of the right to reproduce through sexual intercourse."[124] In this section, I argue that the existing bounds of procreative liberty are broad enough to encompass reproduction with technological assistance, including ectogenesis.[125] Based on the reasoning underlying the decisions that have solidified the recognition of a fundamental right to procreate, as well as persuasive reasoning from legal scholars and non-Supreme Court cases, one should surmise that the Supreme Court would overturn most instances and forms of state interference with the right to procreate via reproductive ectogenesis. Whether the scope of procreative liberty is broad enough to encompass ectogenesis and other reproductive technologies will likely turn on the Court's model of the interests underlying technology-assisted procreation. The outcome of that analysis will situate the use of reproductive technology in the procreative liberty jurisprudence and determine the level of protection its use is afforded.

Robertson articulates the essence of the inquiry well. He suggests that the recognition of a fundamental right to procreate via reproductive technologies will depend on "the extent to which the procreative liberty of individuals and couples establishes the right to acquire children non-coitally, including the right to separate and recombine the

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[121] *See* Skinner v. Oklahoma, 316 U.S. 535, 541 (1942) (stating that "procreation [is] fundamental to the very existence and survival of the race").

[122] Robertson, *supra* note 115, at 453.

[123] ROBERTSON, *supra* note 32, at 36.

[124] John A. Robertson, *Embryos, Families, and Procreative Liberty: The Legal Structure of the New Reproduction,* 59 S. CAL. L. REV. 942, 955 (1986).

[125] *See infra* Part IV.

various factors of reproduction as necessary to produce a child."[126] Robertson holds that the underlying interests of individuals seeking to reproduce with technological assistance are nearly identical to the interests of individuals seeking to reproduce through traditional coital means.[127] He states that "their desire to have a family – to beget, bear, and rear offspring – is as strong" and thus, should be protected to the same degree as those reproducing without technological assistance.[128] He asserts that if "bearing, begetting, or parenting children is protected as part of personal privacy or liberty, those experiences should be protected whether they are achieved coitally or non-coitally."[129] Even where technology "disaggregates or alters ordinary reproductive practices," Robertson concludes, "if an important reproductive interest exists, then use of the technology should be presumptively permitted."[130]

Robertson's views are not unanimously held. Matthew R. Eccles' exploration of whether procreative liberty encompasses the right to utilize reproductive technologies posits that there are three factors involved in "every aspect of reproduction: genetic make-up and conception, gestation and labor, and childrearing."[131] Eccles notes that the availability of in vitro fertilization "makes procreation possible for those who lack one of the necessary factors of reproduction" and that whether constitutional protections "extend to a couple's use of IVF" depends on whether "the absence of any of those factors lessens a person's interest in procreation."[132] Eccles concludes "it is the sum of those values that equals the whole of the natural reproductive experience" and that the lack of any one factor "logically lessens the significance of the reproductive experience."[133] While Eccles seems to single out only technology-assisted procreators, the logical conclusion of his line of reasoning is that males, who do not participate in the gestation and delivery of a traditionally born child, have a less significant parental experience regarding the resulting child and therefore should have diminished parental rights.[134] Without citing scientific or sociological evidence, Eccles

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[126] Robertson, *supra* note 124, at 953.
[127] ROBERTSON, *supra* note 32, at 39.
[128] ROBERTSON, *supra* note 32, at 39.
[129] ROBERTSON, *supra* note 32, at 39.
[130] ROBERTSON, *supra* note 32, at 41.
[131] Matthew R. Eccles, *The Use of in Vitro Fertilization: Is There a Right to Bear or Beget a Child By Any Available Medical Means?*, 12 PEPP. L. REV. 1033, 1041 (1985).
[132] *Id.* at 1042.
[133] *Id.*
[134] I could find no scientific support for this conclusion, nor could I find legal precedent suggesting that the father's non-gestating parental role should limit recognition of his constitutional right to parent.

offers bare assertions that couples using gamete donors, adoptive parents, and others who become parents through non-traditional, or non-coital means love their children less (in the case of a father raising the child conceived with another man's sperm) or derive "less significant" meaning from parenthood.[135] Therefore, Eccles concludes, "[g]overnment restrictions on the use of IVF invade lesser interests and should require lesser justifications."[136] Undoubtedly, Eccles would argue that ectogenesis, which removes the gestation factor from the equation, should require lesser justifications for state infringement on its use.

In the same paragraph, and in seeming contradiction with his ultimate assertion, Eccles states "it is the fact that a couple joins to reproduce their unique genes, biological traits, and social character in a child that makes procreation so deeply personal that it should receive utmost protection from governmental intrusion."[137] In the case of in vitro fertilization where the rearing parents are also the gamete providers, each of these factors is present. In the case of the use of a gestational surrogate, each of these factors is present. In the case of ectogenesis, each of these factors is present. Eccles has not substantiated his claim that children conceived of in vitro fertilization have a weaker connection to their parents (and thus, the parents should be entitled to lesser protection from government interference), but even if he had, there are countless applications of reproductive technologies that satisfy his stated criteria for "procreation so deeply personal" that its protection from state interference should be strictly scrutinized.[138]

To cast doubt on the Court's possible recognition of the use of assisted reproduction technologies as a fundamental procreative liberty, Eccles argues that at the time *Carey v. Population Services International* was decided, in vitro fertilization was not an available means of conception and "if other alternatives like artificial insemination did exist, they were not brought to the attention of the Court."[139] This statement carries the implication that the Court's decision in *Carey* and strong precedential support for procreative liberty, is somehow tempered or qualified by the Court's lack of awareness of other methods of conception, such as artificial insemination. If the applicability of the Court's reasoning in *Carey* was limited to "natural" conception and procreation, it did not say so. Eccles' argument in favor of imputing the limitation, based on the Court's lack of awareness of artificial

[135] Eccles, *supra* note 131, at 1042–43.
[136] Eccles, *supra* note 131, at 1043.
[137] Eccles, *supra* note 131, at 1043.
[138] Eccles, *supra* note 131, at 1043.
[139] Eccles, *supra* note 131, at 1045.

insemination and other reproductive technologies, is unsupportable. His suggestion that the Court's decision in *Carey* was written blind to the existence of other methods of conception, including artificial insemination, is demonstrably false. While it is true that artificial insemination and other available reproductive technologies were not raised in argument before the Court in *Carey*, potentially due to the lack of relevance to state regulation of contraception, this fact does not suggest a lack of *awareness* of such technologies by the Court.

Aside from centuries of documented use of artificial insemination going back to at least 1700, the Court specifically mentions artificial insemination in the 1976 decision in *Planned Parenthood v. Danforth*, as well as in the 1973 decision in *Roe v. Wade*.[140] In fact, in *Roe*, the Court speaks to the difficulty of reconciling traditional views of conception with "new embryological data that purport to indicate that conception is a 'process' over time, rather than an event, and by new medical techniques such as menstrual extraction, the 'morning-after' pill, implantation of embryos, artificial insemination, and *even artificial wombs*."[141] Therefore, the Court's 1977 decision in *Carey* affirmed the protection of procreative liberty with full awareness of emerging reproductive technologies, and without any express limitation on the applicability of its holding to "natural" procreative methods. In other words, it is an untenable position to suggest that the timing of the *Carey* decision suggests probable constitutional protection for only those engaging in "natural reproduction, not in reproduction by medical means."[142]

The Court's probable position on whether ectogenesis is within the scope of fundamental procreative rights is unclear. Carl H. Coleman states that "[l]ike all questions about the scope of substantive due process protections, the concept of procreative liberty is susceptible to multiple interpretations, depending on the level of generality at which the principle is defined."[143] Whether the use of ectogenesis and other "ARTs [Assisted Reproductive Technologies] *should* be considered part of procreative liberty is as much about values and policy as it is about

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[140] *See* Planned Parenthood v. Danforth, 428 U.S. 52, 68 (1976); *see also* Roe v. Wade, 410 U.S. 113, 161 (1973). Note that in November of 1975, Associate Justice William Douglas resigned and was succeeded by Associate John Paul Stevens in December of the same year. Eight of the nine justices were identical for the decisions in *Roe, Danforth*, and *Carey*, suggesting at least awareness of these reproductive technologies by the justices sitting in *Carey*. *Id.*

[141] *Roe*, 410 U.S. at 161 (emphasis added).

[142] Eccles, *supra* note 131, at 1045.

[143] Carl H. Coleman, *Assisted Reproductive Technologies and the Constitution,* 30 FORDHAM URB. L.J. 57, 68 (2002) (citing Laurence H. Tribe & Michael C. Dorf, *Levels of Generality in the Definition of Rights*, 87 U. CHI. L. REV. 1057, 1058 (1990)).

precedent."[144] In 1986, Robertson declared that "IVF [would] force elucidation of the concept of reproductive responsibility, for actions done to create or manipulate fertilized eggs may directly hurt offspring or others."[145] This sentiment extends to ectogenesis, a technology on the near horizon of technological reality, which will force us to consider the reproductive nature of the human species and the ethical guidelines that should govern our adoption of technological tools for procreation.[146]

It is necessary to discuss three sub-issues relating to the scope of procreative liberty and ectogenesis. The first is the right to privacy and whether the use of reproductive technologies, including ectogenesis, implicates lesser privacy interests than traditional coital reproduction.[147] The second issue is whether the fertility status of the prospective parents should influence the degree to which we protect their procreative rights.[148] The third issue is the degree of deference to parental preference given in early pregnancy, given the right to terminate a pregnancy via abortion prior to fetal viability.[149] As to privacy and fertility status, I argue that ectogenesis is functionally identical to traditional, in vivo gestation and ought to be given the same heightened protection under the doctrine of procreative liberty.[150] Regarding deference to parental choice regarding pre-viability medical decisions, I will argue that the *Lifchez* case, while not a Supreme Court ruling, contains persuasive reasoning in support of the right to utilize ectogenetic technology.[151]

A. Right to Privacy

A source of procreative liberty under the Due Process Clause is the due process right to privacy.[152] Whether ectogenesis and other reproductive technologies are subject to the same protections as coital procreation may hinge on whether comparable privacy concerns are implicated by their use.[153] Eccles asserts that because procreation through in vitro fertilization occurs in "the openness of a laboratory," the "procedure diminishes the privacy surrounding the circumstances of conception."[154] He contends that even where "no donor or surrogate may be

[144] Coleman, *supra* note 143, at 68 (emphasis in original).
[145] Robertson, *supra* note 124, at 956.
[146] Robertson, *supra* note 124, at 955.
[147] *See infra* Section A.
[148] *See infra* Section B.
[149] *See infra* Section C.
[150] Robertson, *supra* note 124, at 955.
[151] *See infra* Section C.
[152] Eccles, *supra* note 131, at 1045.
[153] Eccles, *supra* note 131, at 1045.
[154] Eccles, *supra* note 131, at 1045.

used, the procedure involves doctors and assistants who must make vital decisions about an IVF birth."[155] Presumably, Eccles would apply this reasoning to other reproductive methods requiring medical advice and treatment, like ectogenesis, concluding lesser privacy interests are implicated with ex vivo gestation.[156]

While in the year 1900, "almost all births occurred outside a hospital," approximately 98.6 percent of all births in the United States now occur in hospital settings.[157] Based on reports from the 46 states which collect data on prenatal care, only 6 percent of women begin prenatal care late (in the third trimester) or receive no prenatal care at all.[158] This data does not distinguish between women conceiving coitally and via in vitro fertilization.[159] Eccles' premise that fewer privacy rights should be recognized for parents who conceive via reproductive technologies versus coitally ignores the reality that the vast majority of people utilize the services of doctors and other professionals in bringing forth children into the world.[160] In a country where the receipt of medical services is an almost universal experience from conception through delivery, any attempt to distinguish coital reproduction from assisted reproduction on the grounds of the involvement of "doctors and assistants who must make vital decisions about an IVF birth" is irrational.[161]

Furthermore, there are few relationships "imbued with a special ethos of confidentiality" to the same degree as the doctor-patient relationship.[162] Ilene Moore argues that this "ethos of confidentiality derives from the privacy interests of the patient" and "medical information is often much more sensitive" than other types of private information.[163] While the legal history of physician-patient confidentiality is beyond the scope of this paper, the pursuit of medical advice or technology-assisted reproduction should not constitute a waiver or diminishment of constitutionally-protected privacy interests.[164] Just as within the spousal relationship, the physician-patient relationship often involves the revelation

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[155] Eccles, *supra* note 131, at 1046.

[156] Eccles, *supra* note 131, at 1046.

[157] *See* Marian F. MacDorman et al., CTRS. FOR DISEASE CONTROL & PREVENTION, U.S. DEP'T OF HEALTH AND HUMAN SERV., 144 NAT'L CTR. FOR HEALTH STAT. DATA BRIEF, TRENDS IN OUT-OF-HOSPITAL BIRTHS IN THE UNITED STATES, 1990-2012, at 1 (Mar. 2014), https://www.cdc.gov/nchs/data/databriefs/db144.pdf.

[158] *Id.* at 9, Appendix 1.

[159] *Id.* at 1.

[160] Eccles, *supra* note 131, at 1045.

[161] Eccles, *supra* note 131, at 1046.

[162] Ilene N. Moore et al., *Confidentiality and Privacy in Health Care from the Patient's Perspective: Does HIPAA Help?*, 17 HEALTH MATRIX 215, 219 (2007).

[163] *Id.* at 220, 223.

[164] *Id.* at 220–21.

of a person's most sensitive confidences and is thus deserving of protection. Where more than 98.6 percent of mothers give birth in hospitals and only 6 percent forgo all forms of pre-natal care, the privacy interests that underlie constitutional protections of procreative liberty must extend equally to those beneficiaries of assisted-reproductive healthcare.[165] Those who would use reproductive technologies such as in vitro fertilization or ectogenesis have privacy interests identical to those reproducing via traditional, coital means.[166] Accordingly, their constitutional rights should be identically protected.

B. Fertility Status

As to the fertility status of the plaintiff, in *Children of Choice*, John A. Robertson argues that "the principles that underlie a constitutional right to reproduce would seem to apply to the infertile as well" and "[i]f so, they would have a negative constitutional right to use a wide variety of reproductive technologies to have offspring."[167] Robertson rejects the arguments of those who assert that the right to reproduce is only recognized where one has the "physical ability to do so."[168] He draws an analogy to the "effect of blindness on the First Amendment Right to read books" noting that the "receipt of the book's information is protected…the means by which the information is received does not itself determine the presence or absence of First Amendment rights."[169] In the case of ectogenesis, if a woman has the right to procreate through traditional, in utero gestation, her right to procreate cannot rationally be abridged merely because the means of gestation is different.[170] Ex vivo gestation of genetic offspring is so similar to traditional gestation that it should be equally protected, "with the state having the burden of showing severe harm if the practice is unrestricted."[171]

Robertson acknowledges that "[t]he unique risks posed by noncoital reproduction may provide independent justifications for limiting its use."[172] However, the fertility status of prospective parents should not justify differential treatment because the ultimate goals of the parents (reproduction and childrearing) are the same regardless of

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[165] *Id.*

[166] Eccles, *supra* note 131, at 1045.

[167] ROBERTSON, *supra* note 32, at 38–39.

[168] ROBERTSON, *supra* note 32, at 39.

[169] ROBERTSON, *supra* note 32, at 39.

[170] ROBERTSON, *supra* note 32, at 39.

[171] ROBERTSON, *supra* note 32, at 39 (Robertson's discussion here is limited to non-coital reproductive methods such as in vitro fertilization or artificial insemination).

[172] ROBERTSON, *supra* note 32, at 32.

the method of procreation used.[173] The same reasoning applies to ectogenesis: a parent who wishes to gestate a child to term via ectogenesis and a parent wishing to gestate a child within a woman are both motivated by the desire to bring a healthy child into the world.[174] If procreative liberty is protected on the grounds that decisions relating to parenthood and procreation "could not define the attributes of personhood were they formed under the compulsion of the State," the choice of procreative method should be similarly protected for fertile and infertile people alike.[175]

C. Lifchez: Deference to Parental Preference in Early Pregnancy

In 1990, the *Lifchez v. Hartigan* case spoke to the application of the right of privacy to *in vitro fertilization* and chorionic villi sampling.[176] While *Lifchez* was not a Supreme Court decision, the reasoning in *Lifchez* is persuasive and ought to apply to the question of whether the right to procreate includes the right to utilize ectogenesis in procreation.[177]

Section 6(7) of the Illinois Abortion Law, at issue in *Lifchez*, prohibited "experimentation" on a human fetus unless that experimentation was "therapeutic."[178] Citing *Griswold*, *Carey*, *Eisenstadt*, *Roe*, and others, the *Lifchez* court decided that since the Fourteenth Amendment protects a woman's right to abort a fetus in the first trimester, it "must also include the right to submit to a procedure designed to give information about that fetus which can then lead to a decision to abort."[179] Further, because there can be no compelling state interest "sufficient to prevent a woman from terminating her pregnancy during the first trimester…there can be no such interest sufficient to intrude upon these other protected activities during the first trimester."[180]

This reasoning is persuasive in the context of ectogenesis. If a woman has the right to make decisions about her pregnancy, including chorionic villi sampling and abortion, so should she be able to elect her method of gestation (a private medical decision) during that time period where the state's interests in regulating pregnancy cannot defeat a

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[173] ROBERTSON, *supra* note 32, at 32.
[174] ROBERTSON, *supra* note 32, at 32.
[175] Lawrence v. Texas, 539 U.S. 558, 574 (2003).
[176] 735 F. Supp. 1361, 1376 (1990).
[177] *Id.*
[178] *Id.* at 1363.
[179] *Id.* at 1377.
[180] *Id.*

woman's reproductive decisional autonomy.[181] Were a woman to elect to utilize full ectogenesis to procreate, she would make that decision during the first trimester, before or immediately following conception. Before conception, or shortly thereafter, she would elect to gestate her child ex vivo. Per the analysis in *Roe*, where the state's interest in preserving fetal life increases as a pregnancy progresses, the state's interest in the potential life contained in a fertilized ovum is dwarfed by the woman's interest in determining the means of exercising her procreative liberty.[182] Up until the point of viability, the woman's interest in choosing to gestate, or declining to gestate, supersedes the state interest in dictating the fate of the fetus.[183] After the point of viability, the state's interest in preserving fetal life may be compelling; however, the most likely method of preserving that life at the point of viability will be preserving the gestational status quo.[184] Absent evidence that ectogenesis will cause harm to that viable infant, to be discussed later, the state will be unable to articulate a reason for prohibiting the mother's exercise of ex vivo gestation, especially during the gestational period prior to viability.[185] If the mother has the right to abort the fetus, surely she has the right to gestate it ex vivo.[186]

V. MEYER AND PIERCE: THE RIGHT TO REAR CHILDREN

In this section, I propose that even if the Supreme Court did not ultimately recognize the use of reproductive biotechnologies as within the scope of procreative liberty, the Due Process Clause of the Fourteenth Amendment protects the right to freely make *child-rearing decisions*, including medical decisions during gestation.[187] Such decisions might include the gestational format most suitable for fetal welfare, particularly where in vivo gestation would expose the fetus to the risk of harm.

The right of parents to raise their children in accordance with the dictates of their consciences, as established by *Meyer* and *Pierce*, further support a Fourteenth Amendment right for parents to choose to gestate via ectogenesis.[188] Gestation is one of the most fundamental acts of childrearing. Every day, from conception to birth, the parents of the fetus

[181] *Id.* at 1376.
[182] Roe v. Wade, 410 U.S. 113, 162–63 (1973).
[183] *Id.* at 163.
[184] *Id.*
[185] *See infra* Part VII–A.ii.
[186] *Roe*, 410 U.S. at 164–66.
[187] Meyer v. Nebraska, 262 U.S. 390, 399–400 (1923).
[188] *See supra* notes 71–79 and accompanying text.

make decisions about how to nurture that child's development, whether by nutrition or other types of prenatal care.[189] This section argues that child-rearing begins before birth and that the choices of parents during gestation, particularly the choices of mothers, are subject to fundamental protection pursuant to the Fourteenth Amendment.[190]

Having been unable to find a legal definition of child-rearing, I default to the plain meaning of the word "child-rearing." The Oxford English Dictionary (OED) defines child-rearing as "the process of bringing up a child or children," which is ambiguous as to the starting point of the rearing process.[191] While the OED does not specify the point in time that this "process" begins, I argue that the logical beginning is when there is an entity (a child or proto-child) subject to the decision-making of its parent or parents and where those parental decisions have a measurable impact on the health, welfare, and/or nature of existence of that entity.[192] All parents, but especially gestating ones, make decisions about the health and welfare of their child starting long before the child is born, arguably beginning with conception.[193] Prior to viability, a gestating parent may choose not only how to care for the child, but *whether* to do so.[194]

A large body of research supports the conclusion that maternal lifestyle and dietary choices have a substantial impact on a wide range of physical and neurological outcomes for a gestating child.[195] Maternal supplementation with folic acid decreases the risk of neural tube defects by 50-70%.[196] Smoking during pregnancy "increases the risk for several adverse birth outcomes, including infant death, preterm birth, low birth weight, and poor intrauterine growth."[197] The effects of "prenatal smoking on child neurodevelopment may include poor language development and reduction in cognitive functioning."[198] Alcohol consumption by the

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189 *See infra* Part V, explaining some of the child-rearing choices parents make before birth and during gestation.

190 U.S. CONST. amend. XIV, § 1.

191 *Child-rearing*, OXFORD DICTIONARY, http://en.oxforddictionaries.com/definition/child-rearing (last visited Dec. 7, 2016).

192 *See infra* text accompanying notes 193–228.

193 *See generally* Planned Parenthood of Se. Pa. v. Casey*,* 505 U.S 833 (1992).

194 Throughout the following section, I use "gestating parent" and "mother"/"maternal" interchangeably. I want to validate the existence of gestating people who do not identify as "mothers" or "women."

195 *See infra* text accompanying notes 196–200, 207–11, and 221–28.

196 NAT'L CTR. ON BIRTH DEFECTS AND DEVELOPMENTAL DISABILITIES OFF. OF THE DIR., CTRS. FOR DISEASE CONTROL AND PREVENTION, STRATEGIC PLAN 2011-2015 12 (2011), https://stacks.cdc.gov/view/cdc/11701.

197 George L. Wehby et al., *The Impact of Maternal Smoking During Pregnancy on Early Child Neurodevelopment,* 5 J. HUM. CAP. 207, 208 (2011).

198 *Id.* at 209.

gestating mother, when "moderate-to-heavy" is "associated with neurocognitive deficits across several domains, including IQ."[199] Studies also demonstrate "global volume reductions as well as absolute reductions in the frontal, temporal, and parietal lobes in individuals with a history of heavy in utero exposure" to alcohol.[200]

Mothers with fetus-or-infant-impacting medical conditions, such as gestational diabetes or human immunodeficiency virus (HIV), make decisions that can substantially influence the life-long outcomes for their children.[201] These decisions should be characterized as child-rearing decisions to the extent they involve behavioral modifications made for the purpose of influencing fetal development.[202]

Gestational diabetes, defined as "glucose intolerance…first diagnosed during pregnancy" has been found to have "serious, long-term consequences for both baby and mother."[203] The transfer of maternal glucose but not insulin, which does not transfer to the fetus from the mother, "force[s] the fetus to increase its own insulin production."[204] The impact on the fetus can be severe and may result in excessive fetal growth and subsequent increased risk of delivery by caesarean or harm to the infant during vaginal delivery, "infant respiratory distress syndrome, cardiomyopathy, hypoglycemia, hypomagnesaemia" and other post-delivery physical issues.[205] Furthermore, children "born to mothers with gestational diabetes have nearly double the risk of developing childhood obesity, metabolic syndrome, or both" as well as a "life-long increased risk of glucose intolerance and obesity."[206]

This serious gestational complication is influenced by maternal choices during the pregnancy.[207] While the efficacy of dietary interventions for certain groups of at-risk mothers is an unsettled question, the "ADA recommends that women with gestational diabetes receive nutrition counselling and follow a diet that adequately meets the needs of their pregnancy but restricts carbohydrates to 35-40% of daily

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[199] Kristen L. Eckstrand et al., *Persistent Dose-Dependent Changes in Brain Structure in Young Adults with Low-to-Moderate Alcohol Exposure in Utero,* 36 ALCOHOLISM: CLINICAL & EXPERIMENTAL RSCH. 1892, 1892 (2012).

[200] *Id.*

[201] *See infra* text accompanying notes 196–218.

[202] *See infra* text accompanying notes 203–17.

[203] E. Albert Reece, Gustavo Leguizamón & Arnon Wiznitzer, *Gestational Diabetes: The Need for a Common Ground,* 373 THE LANCET 1789, 1789 (2009).

[204] *Id.* at 1790.

[205] *Id.*

[206] *Id.* at 1790–91.

[207] *Id.* at 1794.

calories."[208] The restriction of carbohydrates to 35-40% of the maternal diet "decreases maternal [and fetal] glucose concentrations" thus mitigating harm to both mother and fetus.[209] Exercise is also recommended, as it has been shown that "prenatal exercise can delay or prevent the development of gestational diabetes, and…can prevent complications to the baby."[210] The impact of maternal diet and exercise decisions on the health outcomes of the fetus and post-delivery child therefore strongly suggests that the process of child-rearing begins before birth.[211]

The prevention of mother-to-infant transmission of HIV is a clear example of the impact that parental decision-making can have on the health and upbringing of a child during gestation.[212] Globally, 90% of children infected with HIV contract the infection from their mothers in utero.[213] The avenues for mother-to-child transmission of HIV include "during pregnancy… childbirth…or breastfeeding."[214] Without pre- and post-natal medical interventions, the rate of mother-to-child transmission is between 15-45%.[215] This transmission rate can be brought below 2.7% with effective intervention.[216] Recommended interventions include maternal use of antiretroviral medication during pregnancy and delivery and a scheduled cesarean delivery.[217] In addition to these, the post-delivery administration of antiretroviral therapies to the child to minimize the risk of infection, along with avoiding breastfeeding the infant to prevent viral transmission through breast milk.[218] The decisions an HIV-positive mother makes during her gestation and delivery, including treatment with antiretroviral drugs and scheduled cesarean delivery, can be physically invasive and interfere with the mother's sense of bodily integrity.[219] Yet these choices are made for the purpose of

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[208] *Id.*

[209] Reece, *supra* note 203, at 1794.

[210] Reece, *supra* note 203, at 1794.

[211] *See supra* text accompanying notes 203–10.

[212] Vanessa Terezinha Gubert de Matos et al., *Epidemiology of HIV Vertical Transmission,* 8 J. ANTIVIRALS & ANTIRETROVIRALS 72, 73 (2016).

[213] *Id.* at 72.

[214] NAT'L INST. OF ALLERGY & INFECTIOUS DISEASES, U.S. DEP'T OF HEALTH & HUMAN SERVS., PREVENTION OF MOTHER-TO-CHILD TRANSMISSION OF HIV (2016), https://aidsinfo.nih.gov/education-materials/fact-sheets/20/50/preventing-mother-to-child-transmission-of-hiv#.

[215] Matos, *supra* note 212, at 72.

[216] Matos, *supra* note 212, at 73.

[217] Matos, *supra* note 212, at 73; NAT'L INST. OF ALLERGY & INFECTIOUS DISEASES, *supra* note 214.

[218] NAT'L INST. OF ALLERGY & INFECTIOUS DISEASES, *supra* note 214.

[219] NAT'L INST. OF ALLERGY & INFECTIOUS DISEASES, *supra* note 214.

influencing the child's health and wellbeing, and thus should be protected as child-rearing decisions.[220]

Gestating parents begin the process of child-rearing, decision-making for the purpose of bringing up a healthy child, via the careful consideration of medical, occupational, and lifestyle choices.[221] For example, new research suggests that the use of selective serotonin reuptake inhibitors (anti-depressants, such as Prozac and Zoloft) during the second and third trimesters of pregnancy is "associated with an increased risk of [autism spectrum disorder]," even after controlling for maternal depression.[222] In response to this finding, Susan Hyman, a "former chairperson of the American Academy of Pediatrics committee on autism," recommended that "prospective mothers…have a serious discussion with their doctor about the possibility of other types of therapies for depression and anxiety, such as counseling."[223] Whether the finding of this study is supported by further research and whether the risks of maternal depression exceed the increased risks of autism, decisions regarding maternal health and welfare during pregnancy are made in light of possible risks to the fetus and subsequent child.[224] A meta-analysis of twenty-nine English-language studies on maternal work and pregnancy outcomes found an association of "physically demanding work, prolonged standing, and shift and night work, with an adverse outcome of pregnancy."[225] Occupational exposure to "environmental chemicals" such as pesticides, formaldehyde, anesthetic gases, certain metals, plastics, and solvents can cause serious, sometimes life-long harm to the fetus.[226] Those in professions involving risk-inducing physical demands or chemical exposure, such as manufacturing, agriculture, and

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[220] *See* Troxel v. Granville, 530 U.S. 57, 66 (2000) (holding "that the Due Process Clause of the Fourteenth Amendment protects the fundamental right of parents to make decisions concerning the care, custody, and control of their children").

[221] CTRS. FOR DISEASE CONTROL & PREVENTION, DURING PREGNANCY (2020), https://www.cdc.gov/pregnancy/during.html.

[222] Takoua Boukhris et al., *Antidepressant Use During Pregnancy and the Risk of Autism Spectrum Disorder in Children,* 170 JAMA PEDIATRICS 117, 123 (2016).

[223] Ariana Eunjung Cha, *Maternal exposure to anti-depressant SSRIs linked to autism in children*, WASH. POST (Dec. 17, 2015), https://www.washingtonpost.com/news/to-your-health/wp/2015/12/14/maternal-exposure-to-anti-depressant-ssris-linked-to-autism-in-children/.

[224] Boukhris, *supra* note 222, at 117.

[225] Ellen L. Mozurkewich et al., *Working Conditions and Adverse Pregnancy Outcome: A Meta-Analysis,* 95 OBSTETRICS & GYNECOLOGY 623, 633 (2000).

[226] For a discussion of environmental toxins and occupational exposure in gestating women, see THE AM. COLL. OF OBSTETRICIANS & GYNECOLOGISTS COMM. ON HEALTH CARE FOR UNDERSERVED WOMEN, EXPOSURE TO TOXIC ENVIRONMENTAL AGENTS (2013), https://www.acog.org/-/media/Committee-Opinions/Committee-on-Health-Care-for-Underserved-Women/ExposuretoToxic.pdf.

healthcare, may choose to sacrifice career development or income to influence the health of their developing fetus.[227] This balancing of parental welfare with child welfare is arguably the essence of parental decision-making.[228]

The array of maternal choices during gestation that influence fetal development are too numerous to thoroughly discuss in this paper.[229] The few examples I have highlighted demonstrate that maternal decision-making during gestation can affect the child for the duration of the child's life.[230] This suggests that the process of child-rearing should be viewed as a decisional continuum beginning with conception and continuing at least until the child reaches maturity.[231] The decisions made during pregnancy can influence child development to at least the same degree as post-delivery decisions about education, medical treatment, and religious upbringing.[232] Since these gestation-concurrent decisions are at least as influential on the child, and the motivations for them are the same (promoting child-welfare), the line of cases beginning with *Meyer* and *Pierce* should accordingly protect those decisions made by parents during gestation as child-rearing decisions.[233]

In summary, the decision to gestate one's child ex vivo is comparable to any other decision made during gestation and should be comparably protected.[234] A mother who is HIV-positive or who suffers from psychiatric conditions requiring treatment with teratogenic medication might choose to gestate via ectogenesis to avoid physical harm to the developing fetus.[235] Women who work in high-risk professions might also elect to do the same. Parents wishing to have an egalitarian division of parental involvement might choose ectogenesis to preserve the equality of their contributions.[236] In nearly any case, the decision to gestate

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[227] Barbara Grajewski et al., *Occupational Exposures and Reproductive Health: 2003 Teratology Society Meeting Symposium Summary,* 74 BIRTH DEFECT RSCH. PART B: DEVELOPMENTAL & REPROD. TOXICOLOGY 157, 158 (2003).

[228] *See* ADMIN. FOR CHILD. & FAMS., U.S. DEP'T OF HEALTH AND HUMAN SERVS., UNDERSTANDING PARENTS' CHILD CARE DECISION-MAKING (2016), https://www.acf.hhs.gov/sites/default/files/opre/parents_childcare.pdf (discussing child care decision-making in the context of parents' employment, finances, and other relevant factors).

[229] *See* CDC, *supra* note 221.

[230] AM. COLL, *supra* note 226.

[231] *See* Skinner v. Oklahoma, 316 U.S. 535, 541 (1942); *see also* Meyer v. Nebraska, 262 U.S. 390, 398 (1923).

[232] *See supra* text accompanying notes 196–228.

[233] *See supra* text accompanying notes 196–228.

[234] *See supra* text accompanying notes 222–28.

[235] *See supra* text accompanying notes 212–20, 222–23.

[236] See Gretchen Livingston, *Stay-at-Home Moms and Dads Account for About One-in-Five U.S. Parents*, PEW RESEARCH CENTER (Sept. 24, 2018), https://www.pewresearch.org/fact-

one's child utilizing ectogenetic technology is as influential on the child's welfare as any post-delivery parenting decision, and thus should be protected as a child-rearing decision under the Due Process Clause.[237] Should the Court find that the use of ectogenesis outside the scope of procreative liberty, the protection of parental rights to rear their children provides another possible avenue for enabling the use of the technology.[238]

VI. UNDUE BURDEN

In *Planned Parenthood v. Casey*, the Court established "the undue burden test in an effort to balance fairly the interests between potential life and a woman's privacy."[239] This decision revised some portions of the holding in *Roe*, clarifying that it is permissible to regulate the receipt of an abortion pre-viability "provided the regulation does not place a substantial obstacle in the path of the woman seeking an abortion."[240] The Court considered each of the five provisions of the Pennsylvania abortion law at issue, asking whether any of the provisions imposed such an obstacle.[241] The Court found no undue burden imposed by the Pennsylvania law's medical emergencies definition, informed consent requirement, mandatory 24-hour waiting period, reporting requirements, and parental consent provisions.[242] However, finding that a spousal notification requirement would grant husbands a "troubling degree of authority" over their wives, the Court invalidated the provision as imposing an undue burden on a woman's fundamental right to seek an abortion.[243]

Whether the undue burden test would be applied in a challenge to a ban on ectogenesis is unclear. In this section, the argument is made to apply the undue burden test to such a challenge, as it is uniquely well-suited to balancing the possible state interests with procreative liberty. Should the Court encounter a challenge to a regulation of ectogenesis, it should consider whether the regulation places a "substantial obstacle

tank/2018/09/24/stay-at-home-moms-and-dads-account-for-about-one-in-five-u-s-parents/, which shows a rise in the percent of stay-at-home dads between 1989 to 2016, while the rate of state-at-home moms largely remained the same.

237 *See supra* Part IV.

238 *See supra* Part V.

239 Elizabeth A. Schneider, *Workability of the Undue Burden Test*, 66 TEMP. L. REV. 1003, 1003 (1993).

240 *Id.* at 1004.

241 Planned Parenthood of Se. Pa. v. Casey, 505 U.S. 833, 844, 879 (1992).

242 *Id.* at 880–81, 885, 899, 900–01.

243 *Id.* at 898.

in the path" of a parent seeking to procreate.[244] Accordingly, this paper argues that a ban on ectogenesis would pose an undue burden on the fundamental right to procreate for many people.[245]

A. Surrogacy as an Alternative

An opponent to the use of ectogenesis may argue that a prohibition would never place a substantial obstacle in the path of an individual's right to procreate, given the possibility of gestational surrogacy. The "resort to donor gametes or surrogates is not an easy choice for infertile couples" and is typically only utilized where "previous attempts at pregnancy have failed."[246] Surrogacy can strain the marital or parent-child relationship because "it intrudes a third party … into the usual situation of a two-party parenthood."[247] Imposing the intrusion of an unwanted third party into the marital and parenting relationship is arguably a violation of marital or parental liberty protected by the Due Process Clause, particularly where a privacy-protecting alternative (such as ectogenesis) is available.[248] The enforceability of surrogacy contracts varies by jurisdiction, and thus, many intended parents must bear the risk of uncertainty that their genetic child will not be transferred to them at birth.[249] Parents in non-enforcing states invest "considerable time, energy, and emotion in finding the [chosen] surrogate and initiating pregnancy in reliance on [the gestational mother's] promise" to relinquish the child at birth.[250] Gestational surrogacy is more expensive than traditional surrogacy (where the gestational mother is also the genetic donor) because the intended parents must bear the additional costs of in vitro fertilization.[251] The uncertainty, financial exposure, and emotional strain render surrogacy an unviable option for many.[252]

Importantly, the mere availability of alternatives does not suggest that the denial of access to ectogenesis is not an undue burden on the right to procreate. The decision in *Lawrence* speaks to the likely

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[244] *Id.* at 877.

[245] *See infra* Part VI.A–B.

[246] ROBERTSON, *supra* note 32, at 119.

[247] ROBERTSON, *supra* note 32, at 119.

[248] *See supra* text accompanying note 32.

[249] Deborah L. Forman, *Embryo Disposition, Divorce & Family Law Contracting: A Model for Enforceability*, 24 COLUM. J. GENDER & L. 378, 387 (2013).

[250] ROBERTSON, *supra* note 32, at 131.

[251] Jennifer Jackson, *California Egg Toss: The High Costs of Avoiding Unenforceable Surrogacy Contracts*, 15 J. HIGH TECH. L. 230, 233 (2015).

[252] The mere shifting of gestational role from one woman to another, which occurs in both gestational and traditional surrogacy, introduces questions about the Equal Protection Clause and ectogenesis. This inquiry, however, is beyond the scope of this paper.

protection of ectogenesis as a matter of procreative decisional autonomy, even when not the only procreative method available, if one considers the specific right adjudicated in that case. The Texas statute criminalized sodomy, defined as sexual intercourse involving oral or anal copulation with a member of the same sex.[253] The statute did not criminalize homosexuality generally, but rather specific methods of intercourse between same-sex couples falling outside of traditional, heterosexual penis-in-vagina sex.[254] The Court's task in *Lawrence*, then, was not to evaluate whether petitioners had the right to choose *whether* to engage in sexual activity but to *choose the manner* of romantic interaction (heterosexual vs. homosexual) or *method* of sexual activity (sodomy vs. non-sodomy). Presumably, the petitioners in *Lawrence* faced no material barrier to engaging in heterosexual relationships or non-sodomitic intercourse.[255] Sodomy was not the petitioners' only physically available option for exercising the right to engage in sex and relationships, but the option most suitable to their pursuit of self-actualization and personal happiness.[256] The Court affirmed that decisional autonomy in matters regarding such intimate activities as love, sex, family, and reproduction was fundamental, and intrusion upon that autonomy by the state cannot be based on moral arguments.[257] In other words, the Court found that denying the participants privacy regarding their choice of sexual partner imposed an undue burden on a fundamental liberty interest.[258]

The opinion did not condition the right of privacy upon sodomy being the only available sexual option to an individual. The decision was not a recognition of the right to engage in homosexual relationships or sodomy only in those extreme cases where no heterosexual option existed. Instead, the Court recognized that "[t]he State cannot demean [petitioners'] existence or control their destiny by making their private sexual conduct a crime."[259] Importantly, the Court found that a person's liberty to choose the *method* of satisfying their fundamental human needs is a matter requiring the utmost protection from state intrusion.[260] The Court specifically elaborates upon other like personal decisions

[253] Lawrence v. Texas, 539 U.S. 558, 563 (2003).
[254] *Id.*
[255] *Id.*
[256] *Id.*
[257] *Id.* at 578.
[258] *Id.*
[259] *Lawrence*, 539 U.S. at 578.
[260] *Id.*

requiring this level of protection, including procreation and childrearing.[261]

Since a fundamental right to procreate has been recognized, and repeatedly affirmed, the reasoning in *Lawrence* should suggest that it is not merely the right to procreate versus not procreate that is protected by the Due Process Clause of the Fourteenth Amendment, but the right to choose the *method* or *manner* of procreation that enables a person to satisfy their most fundamental human aspirations. To protect the right to choose *whether* to procreate but not *how* to procreate contravenes the reasoning in *Lawrence*, for if the Court intended to carve out a specific exception for sodomy, it could have done so. Instead, the Court held that in the broad realms of family, sex, relationships, and procreation, the choices an individual makes regarding whether and how to accomplish these basic intimacies cannot be limited or controlled without a sufficiently important government interest.[262] In terms of elective ectogenesis, which is simply traditional sexual reproduction with gestation in an extracorporeal womb, *Lawrence* seems to provide protection. The fundamental right to procreate exists, as discussed previously, and *Lawrence* suggests that the right to choose the method or manner of exercising this right can likewise not be infringed upon without the state unduly burdening the right itself.

An intended parent's decision to gestate via ectogenesis is an expression of fundamental decisional autonomy in matters of procreation, child-rearing, and bodily integrity. The availability of surrogacy does not remove the undue burden on procreative liberty that would occur from a ban on access to ex vivo gestational technologies. Therefore, given this undue burden, any prohibition on the use of ectogenesis should be reviewed under strict scrutiny.

B. Additional Circumstances Suggesting Undue Burden

Fetal welfare, financial stability, and professional development are implicated in the trade-offs made by most mothers or prospective mothers. As of 2018, the most common occupations for women in the United States included janitorial/cleaning, licensed nursing, education, waitressing, retail, and other like positions.[263] Such positions involve "physically demanding work, prolonged standing, and shift and night work," and occupational exposure to environmental chemicals that are

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[261] *Id.* at 574.

[262] *Id.* at 578.

[263] WOMEN'S BUREAU, U.S. DEP'T OF LAB., *100 Years of Working Women*, https://www.dol.gov/agencies/wb/data/occupations-decades-100 (last visited Nov. 8, 2020).

associated with increased risk of birth defects.[264] Women engaged in these occupations may experience a particularly undue burden from infringement on the negative liberty to utilize ectogenesis because they are subject to the choice between a healthy child and financial stability. Currently more than 40 percent of American mothers are the sole or primary source of income for their families.[265] Where those mothers are also employed in occupations that might undermine fetal welfare, a prohibition on access to ectogenesis would amount to a substantial obstacle to procreation.

A 2001 meta-analysis revealed that the wage gap between mothers and non-mothers is greater than the wage gap between women and men.[266] Childbirth imposes a substantial decrease in career development and earnings to women, and while the precise causes are not fully understood, it has been suggested that an important portion of this cost is the time expended giving birth and recovering from the physical demands and complications of childbirth.[267] Perceptions of pregnant mothers as "receiving special treatment" or having "diminished dedication to … their career" may compound these material affects.[268] Studies conclude that visibly pregnant women are perceived as "less committed to their jobs, less dependable, and less authoritative" which, if true, is a cost borne by all working women who wish to bear children.[269] Ectogenesis would alleviate these professional costs.

Maternal health status is another condition that might render a prohibition on ectogenesis an undue burden. HIV- positive women must often take steps to prevent the transmission of HIV to their children.[270] Ectogenesis would enable these women to instead gestate their children ex vivo, avoiding the chance of infection and the invasion of bodily integrity that a cesarean delivery might entail. Women at risk of other medical complications from pregnancy would also have access to safe procreation. For women whose health and safety are compromised by

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[264] Mozurkewich et al., *supra* note 223; *see also supra* text accompanying note 224.

[265] EXEC. OFF. OF THE PRESIDENT OF THE U.S., ELEVEN FACTS ABOUT AMERICAN FAMILIES AND WORK 4 (2014), https://obamawhitehouse.archives.gov/sites/default/files/docs/eleven_facts_about_family_and_work_final.pdf.

[266] Shelley J. Correll, et al., *Getting a Job: Is There a Motherhood Penalty?,* 112 AM. J. SOCIO. 1297, 1297 (2007) (citing ANN CRITTENDEN, THE PRICE OF MOTHERHOOD: WHY THE MOST IMPORTANT JOB IN THE WORLD IS STILL THE LEAST VALUED (2001)).

[267] *See* Michelle J. Budig & Paula England, 66 AM. SOCIO. REV. 204, 219 (2001).

[268] *See* Margaret Nowak, et al., *Sustaining Career Through Maternity Leave*, 15 AUSTL. J. LAB. ECON. 201, 204 (2012).

[269] Correll, *supra* note 266, at 1298.

[270] *Supra* text accompanying notes 212–20.

gestation, a prohibition on ectogenesis would constitute an undue burden.

Accordingly, a prohibition on ectogenesis will place a substantial obstacle in the path to procreation for many American women. Accordingly, the Court should apply strict scrutiny on any prohibition, pursuant to the undue burden test set forth in *Casey*.

VII. STATE INTERESTS

Assuming the Court were to find the right to elective ectogenesis within the protective ambit of the Fourteenth Amendment's Due Process Clause, the state would bear the burden of establishing that its law burdening the exercise of procreational choice was narrowly tailored to satisfy a compelling government interest.[271] Should the Court determine that the use of ectogenesis is a privacy right protected by the Due Process Clause of the Fourteenth Amendment, the state would be unable to place an undue burden on the exercise of that right absent proof that the restriction is narrowly tailored to satisfy a compelling government interest.[272] In this section, this paper will identify and evaluate several state interests that might be raised in support of the regulation or prohibition of ectogenesis. Whether these interests would likely rise to the level of compelling or legitimate, as necessary to meet the State's burden under a strict scrutiny or rational basis analysis, respectively, will also be discussed.

A. Health and Safety

The state's interest in health and safety, in the context of ectogenesis, would likely manifest itself in the following categories: protection of maternal health; prevention of harm to children born from ectogenesis; and regulation of the practice of medicine. The safety of ectogenetic technology will be a primary state interest, and almost certain to be considered compelling by a reviewing Court.

1. Preservation of Maternal Health and Life

The government might assert that its interest in protecting maternal health and safety is a compelling interest justifying restricting access to ectogenesis. While I do not dispute that protecting maternal

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[271] CHEMERINSKY, *supra* note 69.

[272] CHEMERINSKY, *supra* note 69.

health and safety is a compelling interest, that goal is not even rationally related to the prohibition of ectogenesis.

First, certain medical ailments increase the risk of injury or death to the gestating mother, such as preeclampsia. Preeclampsia is a medical condition occurring in 6-8 percent of pregnancies in the United States and whose risks range from high blood pressure to seizures, kidney failure, and death.[273] Since the only cure for preeclampsia is delivery of the fetus, although mild symptoms can be mitigated with various medical interventions, preterm induced delivery may be required in severe cases to prevent maternal and loss of fetal life.[274] Ectogenesis would enable a mother with preeclampsia to transfer the baby from her uterus to an extracorporeal gestation chamber, which could then support the infant until term.[275] Without ectogenesis, particularly when the symptoms are severe or the fetus is periviable, women must choose between their physical health and the life of their fetus.[276]

Second, pregnancy involves countless risks to the health of the mother, which vary in seriousness depending on her age and health status.[277] Even "normal" pregnancies involve physical symptoms, imposing on maternal bodily security.[278] These gestational symptoms often include "morning sickness, dizziness, headaches, bone and muscle aches, loss of visual acuity, bleeding gums, breathlessness, heartburn, varicose veins and hemorrhoids."[279] During delivery, many women experience "vaginal tearing and psychological trauma resulting from childbirth itself."[280] While maternal morbidity and mortality vary geographically and by socio-economic status, "the World Health Organisation estimates that approximately [fifteen] percent of all pregnant women will develop a 'potentially life-threatening complication' as a

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[273] OFF. OF COMMC'N, NAT'L INST. OF CHILD HEALTH AND HUMAN DEV., *Preeclampsia and Eclampsia*, https://www.nichd.nih.gov/health/topics/preeclampsia (last reviewed Jan. 31, 2017); OFF. OF COMMC'N, NAT'L INST. OF CHILD HEALTH AND HUMAN DEV., *What are the Risks of Preeclampsia & Eclampsia to the Mother*?, https://www.nichd.nih.gov/health/topics/preeclampsia/conditioninfo/risk-mother (last reviewed Nov. 19, 2018).

[274] OFF. OF COMMC'N, NAT'L INST. OF CHILD HEALTH AND HUMAN DEV., *What are the Treatments for Preclampsia, Eclampsia, & HELLP Sundrome*?, https://www.nichd.nih.gov/health/topics/preeclampsia/conditioninfo/treatments#top (last reviewed Nov. 19, 2018).

[275] *See* Bulletti et al., *supra* note 27, at 127.

[276] *See* Ben Reininga, *3 Real Women Tell Their Abortion Stories*, REFINERY 29 (Sept. 21, 2015, 5:00 PM), https://www.refinery29.com/en-us/untold-stories-abortion-stories.

[277] KENDAL, *supra* note 33, at 3.

[278] KENDAL, *supra* note 33, at 3.

[279] KENDAL, *supra* note 33, at 3.

[280] KENDAL, *supra* note 33, at 3.

direct result of their reproductive enterprise."[281] In light of the countless physical risks to maternal health imposed by in vivo gestation, an attempt by the state to abridge access to ectogenesis could not be rationally related to the state interest of preserving maternal health. Limiting access to ectogenetic technologies would, at best, be neutral to maternal health and, at worst, impose a serious risk of physical harm to the mother.

2. Preventing Harm to Children born from Ectogenesis

Even if procreation via ectogenesis is found to be a fundamental right under the Due Process Clause, the state will be able to regulate its use if the state can establish that children born from ectogenesis are likely to be harmed by the technology. It is indisputable that the safety of babies and children is a compelling government interest.[282] If ectogenetic technology were shown to cause birth defects, psychological problems, or other harms to those born from the technology, the state would likely prevail in a challenge to a law banning its use. However, where no harm has been demonstrated, speculation about the harms to babies cannot overcome strict scrutiny.[283] Speculation cannot withstand strict scrutiny, but the Court will defer to Congressional scientific findings where medical uncertainty exists.[284]

The state may argue that a ban on ectogenesis satisfies a compelling state interest because the human experimentation required to develop the technology is harmful to the life of children born from the unperfected technology. In their 1985 book *Making Babies: The New Science and Ethics of Conception*, Peter Singer and Deane Wells state that legal and ethical limitations on human experimentation pose a barrier to the testing and development of ectogenetic technologies.[285] They argue that studies on non-human animals will be less applicable to humans (compared to in vitro fertilization experiments) because data about the "mental and psychological" aspects of human development,

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[281] KENDAL, *supra* note 33, at 3 (citing WHO DEP'T OF REPROD. HEALTH AND RSCH., MANAGING COMPLICATIONS IN PREGNANCY AND CHILDBIRTH: A GUIDE FOR MIDWIVES AND DOCTORS 5 (2007)).

[282] The abortion cases (*see e.g.* Planned Parenthood of Se. Pa. v. Casey, 505 U.S. 833 (1992); Roe v. Wade, 410 U.S. 113 (1973)) make clear that the government does not have a compelling interest in preserving fetal life prior to viability.

[283] Consol. Edison Co. of N.Y., Inc. v. N.Y. Pub. Serv. Comm'n, 447 U.S. 530, 543 (1980) ("Mere speculation of harm does not constitute a compelling state interest.").

[284] Gonzales v. Carhart, 550 U.S. 124, 165 (2007).

[285] PETER SINGER & DEANE WELLS, MAKING BABIES: THE NEW SCIENCE AND ETHICS OF CONCEPTION 130 (1985).

essential facets of a normal human existence, cannot be understood from such studies.[286] Commenting that "[w]ork on ectogenesis will forever remain unjustifiable," given the unethical nature of attempting to gestate babies ex vivo who might be "brought into existence…destined for a deprived human life," Singer and Wells identify one ethically-sound avenue for developing ectogenesis.[287] As discussed in an earlier section, medical advances in the treatment of premature infants have led to steady progress towards the survival of pre-term infants born at increasingly earlier weeks of development.[288] With this gradual development of life-saving measures for premature infants, we may eventually "reach the point at which the human embryo produced through IVF can be kept alive without ever putting it inside a human body."[289] Recognizing that premature infants have higher rates of abnormalities "because a defective fetus is more likely to abort spontaneously or be born prematurely than a normal [healthy] fetus," the authors suggest attempting to isolate the effects of prematurity from the effects of ectogenesis.[290] By gathering data about the outcomes for these children, we could determine whether ectogenesis is a safe technology without ever engaging in human experimentation for purely scientific purposes.[291] I agree with their proposal for an ethical pathway toward ectogenesis. Should full ectogenesis emerge as a safe by-product of advances in neonatal intensive care, the state's restriction of access to it could not be justified as being rationally related to the interest of preserving fetal life.

Another possible scenario that might emerge is the prohibition on full ectogenesis prior to the clear establishment of its safety to children born from the technology. If ectogenesis were to become available as reproductive biotechnology, but there existed a lack of medical consensus regarding the outcomes for children born of the technology, the state might seek to ban its use entirely. Pursuant to the 2007 holding from *Gonzales v. Carhart*, a high level of deference would be granted to any scientific findings accepted by the legislature.[292]

In the case of *Gonzales v. Carhart*, the Supreme Court upheld the Partial Birth Abortion Act of 2003, which criminalized the intentional performance of intact dilation and evacuation abortions (D&X), also known as "partial birth abortions."[293] The law provided no

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[286] *Id.*
[287] *Id.* at 124, 130.
[288] *Supra* text accompanying notes 39–42.
[289] SINGER & WELLS, *supra* note 284, at 130–31.
[290] SINGER & WELLS, *supra* note 284, at 131.
[291] SINGER & WELLS, *supra* note 284, at 131.
[292] Gonzales v. Carhart, 550 U.S. 124, 132 (2007).
[293] *Id.*

exception for preservation of maternal health.[294] Congress relied on "[a] select panel of physicians" who "testified about the inherent health dangers and drawbacks of D&X procedures," despite the fact that ninety-one percent of "doctors with relevant experience in performing abortions actually oppose[d] the ban."[295] Stating that the Court "has given state and federal legislatures wide discretion to pass legislation in areas where there is medical and scientific uncertainty," the majority articulated a high standard of deference to Congressional scientific findings.[296] The Court thus deferred to the Congressional findings that intact dilation and evacuation (D&X) was "never medically necessary" and upheld the Act.[297]

One critic of the deferential standard set forth in *Gonzales* stated that the Court's "lower bar…for the scrutiny of scientific and medical" findings by Congress "invites collateral attacks" on rights "otherwise entitled to constitutional protection."[298] While "[j]ustice recognizes no congressional right to legislate away reality or the Constitution," by granting broad deference to Congress-accepted science, the holding in *Gonzales* suggests that absent medical consensus, the legislature's scientific findings need not be vigorously tested.[299] Regarding ectogenesis, this may manifest as a denial of access based on loosely supported legislature-accepted science.

3. Regulation of the Practice of Medicine

The state may assert an interest in regulating ectogenesis based on its interest in regulating the practice of medicine. The regulation of medicine has been described as "a particular creature of state regulation because it is the nexus of…traditional areas of police power regulation" including regulating the professions and preserving public health and safety.[300] In *Gonzalez v. Carhart*, a portion of Congressional support for the act at issue was based in the desire to mitigate the "effects on the medical community and on its reputation caused by the practice of

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[294] *Id.* at 143.

[295] Ames Grawert, *The Fundamental Meaning of "Medical Uncertainty": Judicial Deference to Selective Science in Gonzales v. Carhart,* 12 N.Y.U. J. LEGIS. & PUB. POL'Y 379, 384 (2009).

[296] *Gonzales*, 550 U.S. at 163.

[297] *Id.* at 165–66.

[298] Grawert, *supra* note 295, at 381.

[299] Grawert, *supra* note 295, at 386.

[300] Edward P. Richards, *The Police Power and the Regulation of Medical Practice: A Historical Review and Guide for Medical Licensing Board Regulation of Physicians in ERISA-Qualified Managed Care Organizations,* 8 ANNALS HEALTH L. 201, 202 (1999).

partial-birth abortion."[301] Citing *Glucksberg*, the Court held that "[t]here can be no doubt the government 'has an interest in protecting the integrity and ethics of the medical profession.'"[302] The legislative history of the 2003 Act suggested concern from Congress that failing to prohibit the use of intact dilation and extraction methods would "further coarsen society to the humanity of not only newborns, but all vulnerable and innocent human life."[303]

Ectogenesis will necessarily occur in a medically supervised context. The sensitive balance of nutrients, hormones, and waste removal will require sophisticated medical technology and expertise to operate and maintain.[304] The involvement of medical professionals will invite some state involvement, due to the police power to regulate the medical profession. In *Gonzales*, the Court considered seriously the state's legitimate interest in regulating medical practices so as to promote "respect for the dignity of human life."[305] The state may introduce rationale for the prohibition or regulation of ectogenesis on the grounds that the symbolic severance of the gestational bond between mother and child could undermine the stability of the family unit or the value of a human life. It might argue that allowing physicians to engage in this "disaggregate[ion] or alter[ation of] ordinary reproductive practices," undermines public confidence in the medical profession.[306] These, and other arguments based on the symbolic impact of ectogenesis, could be held to be legitimate state interests. Should the Court find ectogenetic reproduction outside the scope of procreative liberty, and thus subject to rational basis review, the state's legitimate interest in regulating the medical profession could be sufficient to justify a regulation or ban on ectogenesis.

B. Illegitimate Government Interests

Interests that would be deemed illegitimate include arguments based on moral or religious dogma and, under strict scrutiny, arguments that are speculative in nature.

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[301] *Gonzales*, 550 U.S. at 157.
[302] *Id.*
[303] *Id.*
[304] Jessica H. Schultz, *Development of Ectogenesis: How Will Artificial Wombs Affect the Legal Status of a Fetus or Embryo?*, 84 CHI.-KENT L. REV. 877, 878 (2009).
[305] *Id.*
[306] ROBERTSON, *supra* note 32, at 39.

The *Lawrence* Court held that arguments based on purely moral assertions are not even legitimate state interests.[307] Moral or religious arguments against the use of ectogenesis could include that the technology is an offense against G-d or against nature and that a woman utilizing ectogenesis "would be shirking her obligations as a mother and denying her essential identity as a woman."[308] Whether the Court characterizes ectogenesis as a fundamental procreative liberty or not, such moral arguments are not even legitimate state interests and cannot be used to justify a ban under any standard of review.

If reproduction via ectogenesis is protected as a fundamental procreative liberty or privacy interest under the Due Process Clause, many of the arguments made in opposition to it must fail as too speculative. As previously discussed, strict scrutiny requires the state to prove that the law is narrowly tailored to fulfill a compelling government interest.[309] Speculative harms are insufficient.[310] Some of the many highly-speculative arguments against ectogenesis include that ectogenesis will lead to the mass extermination of women, that it will be used to farm human organs or to grow slaves, that it will destroy traditional family structures, and that children born from ectogenesis will be "nothing more than psychological monsters."[311] Each of these concerns evokes a salient image of dystopia and each reflects the presumably widely-held intuition that the mother-child gestational bond serves an important societal function. However, since speculative harms cannot justify the denial of a fundamental liberty, under strict scrutiny, a prohibition of ectogenesis on these grounds would fail.[312] Under rational basis review, speculative harms can satisfy the requirement of a legitimate state interest rationally related to the law in question.[313] If reproduction via ectogenesis is not within the scope of fundamental procreative liberty or child-rearing, some or all of these hypothetical dystopian visions could be raised in support of its regulation.

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307 Lawrence v. Texas, 539 U.S. 558, 571 (2003).

308 *See* KERRY LYNN MACINTOSH, ILLEGAL BEINGS: HUMAN CLONES AND THE LAW 192 (2005); *see also* SINGER & WELLS, *supra* note 284, at 125.

309 CHEMERINSKY, *supra* note 69.

310 *See supra* text accompanying notes 283-4.

311 SINGER & WELLS, *supra* note 285, at 122, 124–25; *supra* text accompanying note 20.

312 *Supra* text accompanying notes 309-310.

313 Romer v. Evans, 517 U.S. 620, 632 (1996).

VIII. CONCLUSION

Ectogenesis exists on the reproductive frontier. As technological advances in neonatal intensive care occur, the emergence of new methods of reproduction will present novel legal challenges for lawmakers and the Supreme Court. As argued above, the right to use ectogenesis to reproduce involves the rights to procreate,[314] not to gestate,[315] and to make child-rearing decisions autonomously without state interference.[316] If the right to utilize this technology is found to be fundamental, which would be logical given the existing reproductive privacy jurisprudence, the Court will approach from a baseline of strict scrutiny, prohibiting the state from unduly burdening access absent a compelling state interest. Whereas if the use of ectogenesis does not fall within the scope of the Due Process Clause, any restriction that is rationally related to a legitimate state interest will suffice.

The state of substantive due process jurisprudence regarding procreative liberty and reproductive biotechnologies leaves enough uncharted territory to make predictions futile. In any case, we must refrain from proclaiming ectogenesis "indecent and unnatural,"[317] given the potential gains to humanity, especially for us gestating humans, from its liberating reproductive applications.

[314] *See supra* Parts III and IV.
[315] *See supra* Parts III, IV, and VI.
[316] *See supra* Part V.
[317] HALDANE, *supra* note 3, at 44.