Assisting Reproduction, Choosing Genes, and the Scope of Reproductive Freedom

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The reproductive battles of the last forty years have been largely about contraception and abortion. In the twenty-first century reproductive battles will also pull in assisted reproduction, genetic selection, and genetic enhancement. The conceptual framework developed for abortion and contraception set the backdrop for those conflicts, but they take us only a short way into this new territory.

Issues arising with assisted reproduction and genetic selection focus more directly on efforts to reproduce than on avoiding reproduction—the core interest in past struggles over contraception and abortion. Those struggles were also centrally about respecting the equal status of women as citizens through control over their reproductive lives.[1] The new territory, by contrast, involves the ability to bear and rear children when women and men want to reproduce.

This places a new set of issues on the table—the importance of reproduction to individuals as such. Fashioning a social and legal consensus about reproductive rights will push all involved—individuals, families, doctors, professional organizations, courts, and legislators—to confront the meanings and interests at stake in the reproductive decisions under scrutiny. To do that, we have to ask why reproduction is important and valued, and then whether the logic of respecting it entails the same robust protection for assisted reproduction and genetic selection that contraception and abortion warrant.

Issues of the meaning and scope of reproduction are directly implicated in most current and anticipated controversies over both assisted reproduction and genetic selection.[2] The main controversies in

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1 *See* Gonzales v. Carhart, 127 S. Ct. 1610 (2007) (Ginsburg, J., dissenting); Reva Siegel, *Reasoning from the Body: A Historical Perspective on Abortion Regulation and Questions of Equal Protection*, 44 STAN. L. REV. 261 (1992). I focus on a liberty approach to reproductive issues in this Article, but equality issues are always relevant when women play a central role in an activity, as in the case of reproductive technology. Equality issues, however, appear to be less directly salient in the assisted reproduction and genetic screening and selection areas. Still, education, employment, and childcare might affect a woman's willingness to use or contribute to egg donation and surrogacy.

2 Excluded here are the use of reproductive materials—gametes and embryos—for research. Although an important frontier of scientific research and future medical practice, they are not directly reproductive.

assisted reproduction arise from methods for having offspring and forming families when there are medical or social impediments to coital conception, with parents sometimes having only a genetic or gestational tie to children. The law erects few direct prohibitions, but the legal framework for assigning rearing rights and duties can effectively prevent or dampen access to new techniques.

Genetic selection and shaping also involve the freedom to reproduce. The use of those techniques entails steps that could reveal or change the genetic makeup of prospective children and thereby affect a person's willingness to procreate. While most selection is now done negatively, that is, by screening out gametes and embryos with particular genes, the technical ability to delete or add genetic material will soon be in our hands. Here we need to examine whether choice of offspring traits is an essential part of reproductive freedom, and what moral or policy difference negative selection versus positive alteration makes.

I. The Reproductive Liberty Argument for Access to and Use of ARTs

Reproductive liberty has been hard-fought territory in the late twentieth century, with legislative battles occurring against a backdrop of influential and highly contested constitutional legal decisions. The pivotal case for contemporary purposes was the 1965 decision in *Griswold v. Connecticut*[3] which recognized a married couple's right as against state prohibition to use birth control. *Eisenstadt v. Baird*[4] extended that right to unmarried persons in 1972. *Roe v. Wade*[5] then expanded it to include the freedom to end a pregnancy that had already started. We continue to fight over the implications of that case—both in our constitutional jurisprudence and national and state elections.

Our current but still inchoate thinking about reproductive autonomy is the soil from which future policy for assisted reproduction and genetic selection will grow. That thinking recognizes strong presumptive protection for procreative liberty understood as the freedom from state interference to decide whether to have children.[6] Such a view

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3 Griswold v. Connecticut, 381 U.S. 479, 485–86 (1965).

4 Eisenstadt v. Baird, 405 U.S. 438, 443 (1972).

5 Roe v. Wade, 410 U.S. 113, 153 (1973); *see also* Planned Parenthood of Se. Pa. v. Casey, 505 U.S. 833, 844–46 (1992).

6 There is a vibrant critique of the limitations of a negative rights approach to constitutional issues because it overlooks the extent to which even negative rights require some degree of government assistance or resources in enforcement. *See, e.g.*, Martha Nussbaum, *Forward:*

should lead to a great deal of discretion over what methods one uses to accomplish that end and whether one uses genetic screening, selection, and alteration techniques in doing so. In fact, such a robust conception of reproductive freedom may protect less in practice than initially feared. But that is plenty already.

But to see that, one must first start with how society is accustomed to think of reproductive autonomy in constitutional terms as primarily a right not to reproduce, with a focus primarily on the issues of abortion, contraception, and public funding which it raises.[7] Since the mid-1960s reproductive liberty cases have focused almost solely on avoiding reproduction, and rarely on efforts to reproduce, much less on the technologies that enable persons to do so. Although conflict over contraception and abortion will continue, they are no longer the only game in town. As assisted reproduction has entered the mainstream and some form of genetic screening has become routine in most pregnancies, there has been renewed focus on liberty interests or rights in reproduction, and the many issues which they spawn. There are advantages to a liberty approach, even if many of the issues can be cast in terms of equality as well. To move forward and meet new challenges, public policy will have to keep up with the science as well as disentangle the interlacing threads of the debate, including protection of women, respect for human life, the role of unenumerated rights in the Fifth and Fourteenth Amendments, the meaning of family, and the like.

Interestingly, the first Supreme Court forays into procreative liberty did involve limitations on reproduction, rather than contraception and abortion. In 1927, *Buck v. Bell*[8] upheld mandatory sterilization of mental defectives, finding that it did not infringe on valid reproductive rights (since the retarded did not have a protectable conception of what reproduction was about) and there were sound reasons for overriding the bodily integrity interests that were at stake.[9] *Buck* has

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Constitutions and Capabilities: "Perception" Against Lofty Formalism, 121 HARV. L. REV. 5, 21–22 (2007).

7 Other articles in this symposium show awareness of this emphasis and the need to broaden the discourse about reproductive rights. *See, e.g.*, Radhika Rao, *Equal Liberty: Assisted Reproductive Technology and Reproductive Equality*, 76 GEO. WASH. L. REV. 1457, 1457 (2008); Sonia Suter, *The "Repugnance" Lens of* Gonzales v. Carhart *and Other Theories of Reproductive Rights: Evaluating Advanced Reproductive Technologies*, 76 GEO. WASH. L. REV. 1514, 1517 (2008).

8 Buck v. Bell, 274 U.S. 200 (1927).

9 The Court stated that:

> We have seen more than once that the public welfare may call upon the best citizens for their lives. It would be strange if it could not call upon those who already

never been overruled, though one suspects it would come out differently if it arose today.

Skinner v. Oklahoma[10] in 1942 also dealt with the right to reproduce.[11] The Court took a more protective view in considering the sterilization of non-retarded recidivist criminals. Although it couched its decision in the language of equality (why were chicken thieves sterilized but not embezzlers and other criminals?), the rhetoric of a liberty right to reproduce—treated as a basic civil right—explains the frequency with which the case is now cited.[12] *Skinner* is a sentinel case in the march toward unenumerated rights recognized in *Griswold* and *Roe*. Although it protects reproductive liberty by prohibiting the state from forcibly interfering with fertility, the underlying liberty interest should be recognized in other contexts as well.

Society thus has the basic tools for talking about reproductive liberty in the age of assisted reproduction and genetic selection, even if doctrinal starting points for practices beyond abortion and contraception rest on dicta or inferences from *Buck* and *Skinner*. Conservatives and liberals together decry attempts to force contraception or abortion, even in overpopulated societies.[13] They also reject reproduction-limiting conditions on probation or welfare, even when the parties being sanctioned have been quite irresponsible in their reproductive behavior.[14] But a fully theorized approach to reproductive liberty—

> sap the strength of the State for these lesser sacrifices, *often not felt to be such by those concerned*, in order to prevent our being swamped with incompetence. It is better for all the world, if instead of waiting to execute degenerate offspring for crime, or to let them starve for their imbecility, society can prevent those who are manifestly unfit from continuing their kind . . . . Three generations of imbeciles are enough.

Id. at 207 (emphasis added). Given current thinking, it is highly unlikely that the decision would come out similarly today.

10 Skinner v. Oklahoma, 316 U.S. 535 (1942).

11 *Id.* at 536.

12 The Court stated:

> We are dealing here with legislation which involves one of the basic civil rights of man. Marriage and procreation are fundamental to the very existence and survival of the race. . . . [There] is no redemption for the individual whom the law touches. . . . He is forever deprived of a basic liberty.

Id. at 541.

13 *See, e.g.*, 8 U.S.C. § 1101 (1942) (stating that a person "who has been forced to abort a pregnancy or to undergo involuntary sterilization, or who has been persecuted for failure or refusal to undergo such a procedure or for other resistance to a coercive population control program, shall be deemed to have been persecuted on account of political opinion," thus qualifying for refugee status).

14 Trammel v. State, 751 N.E.2d 283, 286 (Ind. 2001); State v. Talty, 814 N.E.2d 1201, 1207 (Ohio 2004); State v. Oakley, 629 N.W.2d 200, 201–02 (Wis. 2001).

particularly when one actively seeks to reproduce—still wants legal elaboration. As technologies proliferate, further development of the meaning of reproductive autonomy should also occur. Most of the development is likely to happen outside of the courts, either in bioethical debates and commissions, professional guidelines, or legislatures, with constitutional principles and bioethical debates setting the background.[15]

A. Competing Interests

Any talk about reproductive liberty must confront not merely the importance of the liberty interest at stake, but also whether competing interests are sufficient to outweigh or override those interests. We know this, but our rights discourse is often quite loose, lumping the two together without clear distinction between them. It customarily does not distinguish between infringements of presumptive liberties that turn out not to be justified, and hence non-violations of those rights, and those which do. That is, most liberties are presumptive rights. They are protected unless there are sufficiently weighty interests on the other side. The shorthand phrase "procreative liberty" could thus refer to the presumptive right without a close examination of competing interests or to situations in which those interests have been found wanting. A full-throated account of procreative liberty must also attend to the competing interests and consider in what circumstances they might override that presumptive liberty, e.g., to justify the infringement of the presumptive right. In addition, much room remains for non-infringing regulation to ensure informed consent and autonomy.

Because this Article is broad and presents the theory in all its aspects, it mentions only briefly some of the competing interests, and focuses more on respect for prenatal life as a ground for limiting reproductive autonomy. There are many objections, both deontological and consequentialist, to the use of technological assistance in reproduction and to genetic screening and selection. The standard menu of competing interests includes the dignity of human reproduction, the interests of women and children, and ideals about the family.[16] Ge-

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15 Cases like *Gonzales v. Carhart* are good barometers of changes in the Court due to single vote shifts (Alito for O'Connor), but turn out to have little relevance to the issues under scrutiny in this Article. Gonzales v. Carhart, 127 S. Ct. 1610 (2007).

16 Several prominent thinkers argue from a conception of what humans are and what they do, as well as traditional notions of family and community versus individualistic conceptions of liberty. *See, e.g.*, Daniel Callahan, *Bioethics and Fatherhood*, 1992 UTAH L. REV. 735; Leon R. Kass, *The Wisdom of Repugnance: Why We Should Ban the Cloning of Humans*, 32 VAL. U. L.

netic selection and alteration add concerns about commodification, tilting the natural playing field of competition, increasing inequality, and changing the nature of the family. This Article discusses these concerns only to suggest that none of them appear to be sufficient in themselves or together to justify banning assisted reproduction or most forms of genetic screening and alteration.

An important consideration that does deserve more discussion is respect for, or protection of, prenatal life. Protecting fetuses against destruction has been the main cause of opposition to abortion, and is the source of the most powerful resistance to Supreme Court decisions upholding abortion rights. Many forms of assisted reproduction and genetic selection directly implicate issues of prenatal life because they involve creating, sampling, discarding, or otherwise impinging upon embryos. To understand fully the protected status of reproductive liberty we must therefore have a good handle on the constitutional status of governmental efforts to protect embryos.

The question is whether a desire to protect embryos by minimizing the number created, discarded, and used in research or therapy is sufficiently weighty to justify the infringement of an infertile couple's interest in procreating. This is the perennial problem of embryo status. It has long been apparent that this problem is not resolvable by rational argument.[17] This Article does not rehearse the arguments for each side here, but notes the current uncertain or unresolved constitutional status of governmental efforts to protect embryos when no fetus or pregnancy is involved.[18] This uncertainty arises from the focus in past cases on pregnancy and fetuses and the lack of constitutional disputes to date over newer technologies that involve the creation of embryos outside of the body.

REV. 679 (1998); Michael Sandel, *Moral Argument and Liberal Toleration: Abortion and Homosexuality*, 77 CAL. L. REV. 521 (1989).

17 Scott Altran, Robert Axelrod & Richard Davis, *Sacred Barriers to Conflict Resolution*, 317 SCI. 1039 (2007). Using the Arab-Israeli conflict as an example, the authors stress the importance of symbolic over rational behavior. *See id.* They mention each side making symbolic concessions as a way to help resolve harder issues. *Id.* "Special respect" for embryos—requiring a strong reason for destroying or manipulating embryos, and limiting such things as creating embryos solely for research, may be seen as a way to make symbolic trade-offs. *Id.* It does not appear to have been successful in quieting deeper conflicts. *See* John A. Robertson, *Symbolic Issues in Embryo Research*, HASTINGS CENTER REP., Jan.–Feb. 1995, at 37, 37–38 (vol. 25, no. 1).

18 For an update of those arguments, see John A. Robertson, *Embryo Culture and the "Culture of Life": Constitutional Issues in the Embryonic Stem Cell Debate*, 2006 UNIV. OF CHI. LEGAL F. 1, 19–26.

It is constitutionally uncontested that embryos and fetuses do not have Fifth and Fourteenth Amendment rights as such.[19] Rather, the constitutional dispute centers on whether government may nevertheless treat them as if they did or otherwise protect them. This is the issue at the heart of *Roe* and abortion rights. *Roe* and *Casey* reaffirm that the state may not value fetuses prior to viability so highly that it unduly burdens a woman's right to terminate a pregnancy. Of course, if *Roe* were reversed, a state could—and some likely would—ban most previability abortions, though the number that do so will depend on details of the reversing opinion and on political factors in the legislative process.[20]

Two things are directly relevant to the embryo status debate. One is that even with *Roe* and *Casey* intact, the rights they recognize do not directly apply to embryos outside of the body and what can be done with them. Abortion is not at issue until implantation and pregnancy have started, so rights to abortion, strictly speaking, do not cover what may be done with embryos that involve no pregnancy.[21] But abortion does not define the universe of reproductive rights. Although not directly controlled by *Roe* and *Casey*, constitutional limits would still apply to laws limiting actions with preimplantation embryos if those laws violated reproductive or other rights beyond abortion. Restrictions on testing and selecting embryos, or on the discard or creation of embryos, might well violate liberty interests and rights in having children.

A second point, emphasized in Justice Kennedy's opinion in *Gonzalez v. Carhart*, is that the state is free to demonstrate respect for nascent human life even prior to viability, as long as doing so does not violate the right to abortion (or, by implication, other reproductive rights).[22] So even if *Roe* remains intact, *Carhart* reaffirms *Casey*'s

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19 Roe v. Wade, 410 U.S. 113, 159 (1973). The two dissents in *Roe* did not contest this point, nor did any dissenters in *Casey* or other cases involving abortion. *See* Planned Parenthood of Se. Pa. v. Casey, 505 U.S. 833 (1992).

20 A 2006 South Dakota law that recognized no exceptions for rape or incest did not withstand a statewide referendum, suggesting that such extreme restrictions are unlikely even with the demise of *Roe*. *See* H.B. 1215, 81st Sess. (S.D. 2006) (the ban as passed by the South Dakota legislature); *see also* Monica Davey, *South Dakotans Reject Sweeping Abortion Ban*, N.Y. TIMES, Nov. 8, 2006, at P8.

21 I first addressed this issue in 1986 in John A. Robertson, *Embryos, Families, and Procreative Liberty: The Legal Structure of the New Reproduction*, 59 S. CAL. L. REV. 939, 977–81 (1986).

22 *See* Gonzales v. Carhart, 127 S. Ct. 1610, 1615 (2007). Justice Kennedy makes this point by quoting *Casey*'s restatement of "*Roe*'s . . . 'essential holding' . . . [that] the State has legitimate interests from the pregnancy's outset in protecting the . . . life of the fetus that may become a

gloss on *Roe* that the state's interest in prenatal life exists throughout pregnancy. Although both cases talk about "fetal protection," it is not a stretch to think that a future Supreme Court majority would allow states to protect human life from fertilization onward, whether the entity at stake is inside or outside the body.[23] But that could be only if the Court found no other reproductive or liberty rights violated.

A reversal of *Roe* would thus not directly affect what could be done with embryos outside of the body, but it would energize state efforts for more vigorous protection of embryos and interventions into Assisted Reproductive Technology ("ART") practices. Regardless of the ultimate viability of *Roe*, the issue will turn on whether a state's moralistic interest in protecting embryos as such would be sufficient to outweigh the liberty interests at stake in doing things with embryos. With selection and alteration, the issue would be whether the choices or uses made there are such a central part of reproductive liberty that moral concerns, such as demonstrating respect for human life at the embryo stage, are sufficient to outweigh those interests.

Of course any role for individual autonomy in genetic selection will assume that the embryo does not have inherent ethical and legal status, which would otherwise operate as a powerful limit. This is because selection and manipulation of embryos for genetic engineering of offspring will often, though not always, affect embryos. It may lead to their creation for manipulation, and then their testing and discard. Of course, if the manipulation occurs at the gamete level, then embryo status issues will not enter because embryos do not exist until haploid gametes merge to form a new diploid entity.

Embryo status issues also arise with the creation or use of leftover embryos for embryonic stem cell research and therapy, a recent site of much controversy. Such uses do not directly implicate reproductive rights because reproduction as such is not directly involved. This demonstrates that not everything involving the reproductive apparatus implicates reproductive liberty.[24]

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child." *Id.* (quoting Planned Parenthood of Se. Pa. v. Casey, 505 U.S. 833, 846 (1992)). He goes on to note that the question in *Carhart* is "whether the Act furthers the Government's legitimate interest in protecting fetal life" that may become a child. *Id.* Unless Justice Kennedy is not paying close attention to his words, the use of "fetus" suggests that cells in pre-fetal stages, such as preimplantation embryos in the fetus or laboratory, are not covered.

23 This would assume the retirement of Justice Stevens or Ginsburg, the election of a pro-life Republican President in 2008, and the appointment of strictly pro-life Justices.

24 *See* Robertson, *supra* note 18.

B. Issues in Assisted Reproduction

Before turning to how the idea of procreative liberty will work itself out in the area of genetic screening and selection, this Article mentions several pressure points for regulation of the ARTs now used by infertile couples—and increasingly by gays and lesbians—in their efforts to reproduce.[25] These arise mainly with in vitro fertilization ("IVF") and its donor and surrogate analogues. There are two kinds of normative issues at play here. One is the meaning, and therefore the scope, of reproductive autonomy. Scope problems arise because of the uncertain and contested meaning of "reproductive" when we move from coital reproduction—the implicit norm—and use gamete donors and surrogates. The second is the type and degree of burden that justifies infringing reproductive autonomy. Candidates range from protecting prenatal life and offspring to preserving family dignity and protecting women and embryos. This Section surveys the current major controversies in assisted reproduction before addressing the scope of reproductive liberty in genetic screening, selection, and alteration. Discussion of hypothetical possibilities such as artificial wombs and use of gametes derived from skin cells are too far removed from clinical practice to be addressed here.[26]

1. Number of Eggs Fertilized

Standard IVF works by hormonally stimulating the ovaries and retrieving multiple eggs.[27] Intracytoplasmic sperm injection or fertilization then occurs, usually yielding multiple embryos.[28] One or more embryos may be placed in the uterus in a single cycle, and there is a

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25 On the question of regulation of assisted reproduction generally, see Marsha Garrison, *Regulating Reproduction*, 76 GEO. WASH. L. REV. 1623 (2008). For a brief synopsis of the anti-regulatory position, see John A. Robertson, *The Virtues of Muddling Through*, HASTINGS CENTER REP., Sept.–Oct. 2008, at 26, 26 (vol. 38, no. 5).

26 To commemorate the thirtieth birthday of the first child born from IVF, *Nature* published a report containing the views of several reproductive experts on likely developments in the next thirty years of ART. Three experts mentioned the likelihood of obtaining gametes from skin or other cells of anyone, thus creating an unlimited supply of eggs for research and reproduction. The ability to do so would derive from developing techniques to induce the production of pluripotent stem cells from ordinary somatic cells and growing knowledge of how germ cells derive from embryonic stem cells. None of the commentators thought it would soon be available. Helen Pearson, *Special Report: Making Babies: The Next 30 Years*, 454 NATURE 260–62 (2008) (comments of Davor Solter, Alan Trounson, and Miodrag Stojkovic).

27 *See* U.S. National Library of Medicine & National Institutes of Health, Medline Plus Medical Encyclopedia: In Vitro Fertilization (IVF), http://www.nlm.nih.gov/medlineplus/ency/article/007279.htm (last visited July 21, 2008).

28 *See id.* ("The sperm usually enters (fertilizes) an egg . . . after insemination." If, however, the doctor believes there is a low probability of fertilization, she "may directly inject the

possibility that any remaining embryos could be cryopreserved for later use.[29] Many of them, however, may eventually be removed from storage and discarded.[30] If fewer eggs were obtained or fertilized, there would be fewer embryos to store and discard.[31]

Persons protective of embryos are naturally concerned about the large number of embryos that face discard in standard IVF and would ban IVF on that ground alone.[32] Others recognize the importance of IVF for infertile couples and urge that fewer embryos be created in the first place.[33] Because there are limits on the number of embryos that can be safely transferred in one cycle, this means limiting the number of eggs fertilized to two or three.[34] Italy took a highly restrictive, prohibitory approach in 2004.[35] Despite its low birth rate and resulting population and social welfare problems, it enacted an ART law that prohibits fertilizing more than three embryos and requires that all be placed in the uterus.[36]

While right-to-life groups in the U.S. share the premises of the Vatican-backed Italian law, there have been relatively few efforts to regulate the workings of IVF clinics. There are, however, signs that their ceding of the field to the infertile and their doctors may change. A right-to-life group in Colorado has succeeded in putting an initia-

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sperm into the egg. This is called intracytoplasmic sperm injection (ICSI)." Additionally, "[m]any fertility programs routinely do ICSI on some of the eggs even if everything is normal.").

29 *See* AM. SOC'Y FOR REPROD. MED., ASSISTED REPRODUCTIVE TECHNOLOGIES: A GUIDE FOR PATIENTS 9–10 (2007), *available at* http://www.asrm.org/Patients/patientbooklets/ART.pdf ("Extra embryos remaining after the embryo transfer may be cryopreserved (frozen) for future transfer . . . . However, not all embryos survive the freezing and thawing process, and the live birth rate is lower with cryopreserved embryo transfer. Couples should decide [whether] to cryopreserve extra embryos before undergoing IVF.").

30 *See* Andrea D. Gurmankin et al., *Embryo Disposal Practices in IVF Clinics in the United States*, POL. & LIFE SCI., Sept. 2003, at 4, 6 (vol. 22, no. 2) *available at* http://repository.upenn.edu/cgi/viewcontent.cgi?article=1006&context=bioethics_papers (surveying IVF clinics and discovering that seventy-eight percent dispose of embryos in some way, some only after contacting the couple).

31 Freezing eggs prior to fertilization could obviate this problem, but egg freezing has not yet been established as safe and effective. *See* Practice Comm. of the Soc'y for Assisted Reprod. Tech. & the Practice Comm. of the Am. Soc'y for Reprod. Med., *Essential Elements of Informed Consent for Elective Oocyte Cryopreservation: A Practice Committee Opinion*, 88 FERTILITY & STERILITY 1495 (2007) [hereinafter *Elements of Informed Consent*].

32 *See* Pam Belluck, *It's Not So Easy to Adopt an Embryo*, N.Y. TIMES, June 12, 2005, at D5 (discussing the concerns regarding extra embryos and possible solutions).

33 *See* Laurie Tarkan, *Lowering Odds of Multiple Births*, N.Y. TIMES, Feb. 19, 2008, *available at* http://www.nytimes.com/2008/02/19/health/19mult.html.

34 *See id.*

35 John A. Robertson, *Protecting Embryos and Burdening Women: Assisted Reproduction in Italy*, 19 HUM. REPROD. 1693, 1693 (2004).

36 *Id.*

tive on the fall 2008 ballot that would define "person" in the state constitution to "include any human being from the moment of fertilization," thereby protecting embryos.[37] If successful, it would make embryo discard criminal, thus limiting what can be done in IVF. Conservatives who control the legislative process in Georgia are also considering legislation to limit embryo creation and discard.[38] The power of right-to-life forces has waned since their apogee in the Bush Administration, but they can never be counted completely out. The fights in Georgia and Colorado could inspire embryo protectionists in other states to try to impose limits on ART clinic practices. It might also lead practitioners to reconsider their stimulation and fertilization protocols, perhaps moving them toward less embryo-intensive practices. The development of egg freezing would finesse the issue by making it unnecessary to go through another IVF cycle to create embryos.[39]

In the absence of viable egg freezing techniques, laws that would restrict the number of eggs that could be fertilized or that would prohibit embryo discard would appear to violate the reproductive rights of infertile persons who need to use IVF to procreate. Because there is no way to know in advance how many eggs will successfully fertilize and then how many of them will implant and come to term, limiting the number fertilized to two or three (with or without requirements to transfer all) could mean that women have to undergo additional stimulation cycles and surgical retrieval to produce a child. Avoiding excess embryos for storage would not seem to be a sufficiently weighty interest to justify this intrusion.[40]

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37 *See* Ashley Surdin, *Colorado Voters Will Be Asked When 'Personhood' Begins*, WASH. POST, July 13, 2008, at A04.

38 The Georgia proposal, not yet reduced to a bill, would follow the Italian example. *See* H.B. 1358, 149th Gen. Assem., Reg. Sess. (Ga. 2008).

39 Despite its experimental status, enough programs are offering egg freezing that the American Society for Reproductive Medicine ("ASRM") and the Society for Assisted Reproductive Technology have issued guidelines for informed consent "elective" egg freezing. *See Elements of Informed Consent*, *supra* note 31, at 1495.

40 See *infra* Section I.B.2 for a discussion. *Carhart* suggests, however, that protecting a woman's health is not a constitutionally required exception for abortion; thus, health burdens may not be sufficient to infringe rights in other circumstances. *See* Gonzales v. Carhart, 127 S. Ct. 1610, 1617–18 (2007) (holding that the law's "failure to allow the banned procedure's use where necessary . . . for preservation of the [mother's] health does not . . . impos[e] an unconstitutional burden").

2. Number of Embryos Transferred

The most important medical and social problem now in IVF is the high rate of multiple births.[41] While the number of triplets and higher order multiples from IVF has greatly diminished, about a third of IVF births in the United States now involve twins.[42] Although many couples view twins as desirable, twins are less healthy, more premature, and raise a variety of other problems.[43] Wise social policy and practice here would take steps to minimize the birth of twins, but doing so raises many issues about the meaning and limits of procreative autonomy, e.g., the right to have twins despite the costs that it imposes on others.

The scope issue is whether reproductive freedom extends to the number of children one has at a particular time, and the importance of individual choice in deciding. The burdens concern the medical and social costs of twins, costs which will typically be placed on others. The issues are much more blurred here than elsewhere. Also, the workability of professional practice guidelines as guided by patient preferences are more robust than in other areas, at least as demonstrated with higher order multiples.[44] Interestingly, the availability of insurance coverage for IVF has a major effect on the number of embryos transferred in a single cycle. Wider insurance coverage for IVF may thus be the best way to move toward a single embryo transfer policy in the United States.[45]

3. Limits on Payments to Donors and Surrogates

Paying egg donors and gestational surrogates is arguably essential to get the eggs or gestation that infertile women and men need to reproduce or form families with some biologic connection between rearing parent and child. Though only one state prohibits the sale of

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41 *See* John A. Robertson, *Procreative Liberty and Harm to Offspring in Assisted Reproduction*, 30 AMER. J.L. & MED. 7, 10 (2004).

42 Society for Assisted Reproductive Technology: IVF Success Rates, http://www.sart.org (last visited July 21, 2008).

43 *See* Tarkan, *supra* note 33 ("It is not that twins or triplets are undesirable, doctors say. But multiple pregnancies often lead to risky preterm births and other complications.").

44 ASRM guidelines have been credited with bringing down the rate of triplets or more, but the patient-centered arguments for doing so are also strong. *See, e.g.*, Katherine T. Pratt, *Inconceivable? Deducting the Costs of Fertility Treatment*, 89 CORNELL L. REV. 1121, 1188 (2004) ("Recent data also indicate that multiple birth rates attributable to IVF have declined significantly since the adoption of the new treatment protocols.").

45 For a discussion of other options in Europe, see Robertson, *supra* note 35, at 1695.

eggs for fertility purposes,[46] several states ban payments for research-bound eggs,[47] and others ban payment for gestational surrogacy services.[48] In Canada and Europe (with Spain and the Scandinavian world an exception), and many other parts of the world, it is illegal to pay for gametes or surrogacy.[49] Practice guidelines by professionals, as one would expect, are more liberal; for example, the American College of Obstetricians and Gynecologists has joined the American Society of Reproductive Medicine in backing payment to egg donors for research as well as for infertility.[50] A thriving practice in outsourcing gestation to India and procuring eggs from eastern European women shows that globalization affects reproduction as well.[51]

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46 LA. REV. STAT. ANN. § 9:122 (1986); Radhika Rao, *Coercion, Commercialization, and Commodification: The Ethics of Compensation for Egg Donors in Stem Cell Research*, 21 BERKELEY TECH. L.J. 1055, 1057 (2006). *But see*, *e.g.*, VA. CODE ANN. § 32.1-291.16 (2007) ("With the exception of hair, ova, blood, and other self-replicating body fluids, it shall be unlawful for any person to sell, to offer to sell, to buy, to offer to buy, or to procure through purchase any natural body part for any reason.").

47 *See, e.g.*, CAL. HEALTH & SAFETY CODE § 125350 (2007); CONN. GEN. STAT. § 19a-32d (2005); MASS. GEN. LAWS ch. 111L, § 8(c) (2005).

48 *See, e.g.*, FLA. STAT. ANN. § 63.213(2)(f) (2003). It states:

> [T]he intended father and intended mother may agree to pay all reasonable legal, medical, psychological, or psychiatric expenses for the volunteer mother related to the preplanned adoption arrangement and may agree to pay the reasonable living expenses and wages lost due to the pregnancy and birth of the volunteer mother and reasonable compensation for inconvenience, discomfort, and medical risk. No other compensation, whether in cash or in kind, shall be made pursuant to a preplanned adoption arrangement.

Id.; *see also* NEV. REV. STAT. ANN. § 126.045(3) (1995) ("It is unlawful to pay or offer to pay money or anything of value to the surrogate except for the medical and necessary living expenses related to the birth of the child as specified in the contract."); WASH. REV. CODE § 26.26.210-250 ("No person, organization, or agency shall enter into, induce, arrange, procure, or otherwise assist in the formation of a surrogate parentage contract, written or unwritten, for compensation."). For an overview of these laws, see Center for American Progress, Guide to State Surrogacy Laws, www.americanprogress.org/issues/2007/12/surrogacy_laws.html (last visited July 21, 2008).

49 John A. Robertson, *Reproductive Technology in Germany and the United States: An Essay in Comparative Law and Bioethics*, 43 COLUM. J. TRANSNAT'L L. 189, 209–10 (2004); *see also, e.g.*, Assisted Human Reproduction Act, 2004 S.C., ch.2, § 5 (Can.), *available at* http://laws.justice.gc.ca/en/ShowFullDoc/cs/A-13.4///en; Diana Brahams, *The Hasty British Ban on Commercial Surrogacy*, HASTINGS CTR. REP., Feb. 1987, at 16, 16–19 (vol. 17, no. 1) (discussing the British ban).

50 *Using Preimplantation Embryos for Research*, COMMITTEE OPINION (Am. Coll. of Obstetrics & Gynecology Comm. on Ethics, Washington, D.C.), Nov. 2006, at 1, 12; INT'L SOC'Y FOR STEM CELL RESEARCH, GUIDELINES FOR THE CONDUCT OF HUMAN EMBRYONIC STEM CELL RESEARCH (2006), www.isscr.org/guidelines/ISSCRhESCguidelines2006.pdf.

51 *See, e.g.*, Anuj Chopra, *Childless Couples Look to India for Surrogate Mothers*, CHRISTIAN SCI. MONITOR, Apr. 3, 2006, *available at* http://www.csmonitor.com/2006/0403/p01s04-wosc.html.

Focusing on egg donation only, a ban on paying women for their time and effort in providing eggs would violate the reproductive autonomy of infertile couples who need to pay egg donors to get the eggs needed to have a child. Although this Article will not consider the complexities of this issue in detail here, the discussion is complicated on two grounds. One is that it forces us to analyze the meaning of reproductive rights when we move beyond the genetic connection *tout court*. Egg donation enables a woman who lacks eggs to gestate and then rear a child with whom she has a gestational connection only. If the scope of reproductive liberty is confined to genetic transmission (a scope question), then her procreative liberty would not be at issue. On the other hand, if procreative liberty is conceived of more broadly to include gestational connections as well, then obtaining eggs to treat infertility would fall within its scope and the more vigorous protection that that label brings.[52]

The second complication (a competing interest issue) is the fear that money and payment for eggs will exploit or commodify women. The competing arguments here are frequently iterated, as new instances bring forth old arguments. While the organ transplant context has never allowed direct payment or compensation to donors, whether live or cadaveric, a different legal and practice regime has emerged with egg donation and paid surrogacy, often involving brokers who publicize and market their services. At the moment there are no legal prohibitions in the United States on paying egg donors as such.[53] Indeed, there is a widely entrenched practice of paying research subjects and egg donors for infertility.

Although not directly involving reproduction, it is worth mentioning the inconsistencies that arise when states that allow payment to research subjects and fertility donors prohibit paying women for eggs for research. California and Massachusetts, two bellwether states of assisted reproduction and stem cell science, prohibit paying for eggs used in stem cell research despite the legality of paying other research subjects and infertility egg donors.[54] The inability to pay egg donors for research in these states has led to a dearth of eggs, thus making it

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52 I put aside the question of her partner's right to reproduce through provision of gametes that are used for fertilization and the right of the egg donor to reproduce *tout court*.

53 There are, however, some untested bans on paying surrogates. *See* Lawrence Gostin, *Surrogacy from the Perspectives of Economics and Civil Liberties*, 17 J. CONTEMP. HEALTH L. & POL'Y 429, 430 (2001) ("The District of Columbia and Arizona ban surrogacy contracts. Florida, Michigan, Nevada, New Hampshire, New York, Virginia, Washington and West Virginia ban payments to surrogates, but have broad exceptions to allow the payment of expenses.").

54 *See* Ronald M. Green, *Five Ethical Questions for SCNT Stem Cell Research*, 9 MINN. J.

difficult to go forward with many forms of stem cell research. [55] Donors and research subjects deserve protection, but that could be achieved by greater attention to informed consent, clinical practice, and coverage of medical care in the case of injury. An autonomy approach would allow such contracts as long as they are fully informed and some minimal protections are in place. Opponents argue that in practice the protections will never be adequate and that it is unseemly or exploitive to take advantage of the need of women for money.[56] These issues would arise anew within a reproductive liberty framework if states moved to restrict paying egg donors for infertility or surrogacy.[57]

4. Contracting to Create Families

A fourth site for clarification of reproductive rights is whether rearing rights and duties in children follow genes, gestation, or contractual arrangements concerning their interchange. Scope problems here raise basic questions about the meaning of family as construed in social practice and then family law. There is no uniformity among states or perfect logic within them.

Family law rules for parentage attending the use of gamete donors and surrogates split over whether the prior agreement among the parties will control the allocation of post-birth rearing rights and duties or some preexisting model that assumes coital conception will control. There is much variation among states here. One would like to say that the general movement of the law follows Sir Henry Maine and moves from status to contract,[58] but there are many places in which states do not follow a contractual approach, and many arguments why they should not.

L. SCI. & TECH. 131, 139 (2008) ("[S]everal states, including California and Massachusetts, passed laws prohibiting payment for eggs for research.").

55 Brendan Maher, *Egg Shortage Hits Race to Clone Human Stem Cells*, 453 NATURE 828–29 (2008). It has also led to the use of animal eggs or cybrids as an alternative, which creates in turn the need for additional policy statements and guidelines from ethics and regulatory bodies. *See* Stephen R. Munzer, *Human-Nonhuman Chimeras in Embryonic Stem Cell Research*, 21 HARV. J.L. & TECH. 123 (2007).

56 It may be that women are especially at risk here because of their limited access to education and job opportunities, especially in less developed countries. For some of the problems with paying research subjects under a market approach, see Carl Elliott, *Guinea-Pigging*, NEW YORKER, Jan. 7, 2008, at 36.

57 *See supra* Part I.B. Opposition to gay reproduction might spur such efforts, since gay males will usually need to pay egg donors and surrogates to have offspring.

58 HENRY SUMNER MAINE, ANCIENT LAW 170 (1861) ("The movement of the progressive societies has hitherto been a movement from Status to Contract.").

The Supreme Court first considered these issues in 2000 in *Troxel v. Granville*,[59] a case involving grandparent visitation rights. Four Justices there agreed that Fourteenth Amendment due process "protects the fundamental right of parents to make decisions concerning the care, custody, and control of their children," going on to say that:

> so long as a parent adequately cares for his or her children (*i.e.*, is fit), there will normally be no reason for the State to inject itself into the private realm of the family to further question the ability of the parent to make the best decisions concerning the rearing of that parent's children.[60]

This is fine in the case of coitally conceived children, though even here there is controversy about when long-time caregivers should have rearing rights. The issue becomes more complicated with ART procedures using donors and surrogates. *Troxel* does not address what constitutes a parent in non-coital settings, or whether contractual undertakings can control a parent's right or duty to rear even if state law holds to the contrary. Working out the meaning of procreative liberty in the context of family creation through the use of donors and surrogates is a major challenge for the states, with occasional Supreme Court pronouncements lighting the background.

5. Gay and Lesbian Reproduction

A final area of emerging elaboration about the scope of reproductive liberty is the reproductive interests of gays and lesbians. Artificial insemination has long been used by lesbian couples to form families.[61] IVF now allows one partner to provide the egg and the other the gestation. IVF using a donor egg and gestational surrogacy also allows males to have a child either alone or with a male partner.

Our developing conceptions of procreative liberty should extend protection to gay and lesbian individuals and couples. Gays and lesbians have the same interests in having children that heterosexuals do, and can use ARTs to achieve that goal. Most of the societal conflict about recognizing gay and lesbian families has centered on same-sex marriage, not on direct prohibition of gay and lesbian reproduction itself.[62] Indeed, gay and lesbian reproduction, either coital or assisted, will continue to occur, whatever the status of same-sex marriage and

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59 Troxel v. Granville, 530 U.S. 57, 60 (2000).

60 *Id*. at 66, 68–69.

61 *See* John A. Robertson, *Gay and Lesbian Access to Assisted Reproductive Technology*, 55 CASE W. RES. L. REV. 323 (2004).

62 *See id.* at 324.

civil unions. As more children are born to gays and lesbians, the need to treat their children equally with other children will fuel equal protection arguments for recognition of same-sex marriage or civil union protections for their children.[63]

If the freedom to reproduce is taken seriously, laws that would directly prohibit gay or lesbian reproduction would run into major constitutional problems.[64] At the moment there are no direct prohibitions on gay and lesbian reproduction, though many indirect restrictions arise from limits on paying donors and surrogates, limits on prior agreements for assigning rearing rights and duties, and the lack of a nondiscriminatory ethic among ART practitioners.[65] Especially challenging here are the special twists that recognition of the rights of single and gay males to reproduce through egg donors and surrogates poses.[66] Again, direct prohibitions are few but indirect restrictions many. If barriers exist in one state, easy interstate mobility simply channels efforts to more favorable climates, leaving the courts to clean up the filiation and rearing issues that ensue.

II. Genetic Challenges: The Right to Screen and Alter Offspring Genes

Building on that background, this Section considers the issues that greater knowledge and technical control of the genome may present. For the immediate and mid-distance future most of the activity in this area will likely involve negative selection, via screening and choosing not to use gametes or embryos. Most pregnancies in the United States are now screened through ultrasound or maternal serum sampling for neural-tube defects and chromosomal anomalies. Fetal DNA is not directly accessed unless there are more specific factors that justify the greater risk of piercing the amniotic sac.[67] With IVF making external access to embryos possible, it is much easier—though not cost free—to obtain embryonic DNA prior to a decision to

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63 *Goodridge v. Department of Public Health*, 789 N.E.2d 941, 943 (Mass. 2003), takes an equal protection approach based on equal treatment of offspring born to same-sex couples. The court cited approvingly earlier state cases on the legality of ARTs.

64 Robertson, *supra* note 61, at 325.

65 *See* N. Coast Women's Med. Group, Inc. v. Superior Court, 40 Cal. Rptr. 3d 636 (Cal. Ct. App. 2006).

66 Interestingly, repeat surrogates say that they prefer to work with gay male couples because such couples are less complicated. Ginia Bellafante, *Surrogate Mothers' New Niche: Bearing Babies for Gay Couples*, N.Y. TIMES, May 27, 2005, at A1.

67 *See, e.g.*, Carolyn J. Chachkin, *What Potent Blood: Non-Invasive Prenatal Genetic Diagnosis and the Transformation of Modern Prenatal Care*, 33 Am. J.L. & Med. 9, 10–11 (2007).

discard or transfer that embryo. In theory, DNA microarray technology and single-nucleotide polymorphism maps[68] will allow ever-broader genome-wide screening of embryos to take place prior to transfer. The confluence of families at known risk for genetic disease and those interested in minimizing predisposition of their children to adult chronic disease will likely drive the demand for embryo screening and negative selection.[69]

Many persons are quick to assume that genetic alteration will follow in the wake of widespread embryo screening. The technology for knocking out, inserting, and then turning on particular genes is now well developed in mice and in principle extendable to humans.[70] The discoverers of this technique—Mario Capecchi, Martin Evans, and Oliver Smithies—received the 2007 Nobel Prize in Physiology or Medicine. They developed homologous recombination techniques that allowed the creation of "knock-out" mice and the development of precise functional models for what genes do. Their studies also suggest that DNA could be inserted and turned on at will.[71] In the short run, gene targeting will be used primarily to identify gene function and to provide models for studying and treating disease.[72] Eventually, however, the same techniques could be applied to turn off, add, or turn on human DNA.[73]

Possibility, however, is not probability. In fact, human gene targeting and alteration is quite far off, and relatively little demand for it is likely even if it were generally safe and effective in humans. The prospect is dizzying, however, and makes morally fraught even the slightest step in that direction. A steady drip of incremental change will bring many issues into public view and create pressure for regulation. Deciding among valid uses, such as when to screen and discard embryos for probabilistic medical indications, may often be ethically

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68 *See* Human Genome Project: SNP Fact Sheet, http://www.ornl.gov/sci/techresources/Human_Genome/faq/snps.shtml (last visited July 21, 2008).

69 These are not cost-free decisions and there are many reasons why most parents will not seek non-specific genetic screening. *See infra* Part II.

70 The winners of the 2007 Nobel Prize in Biology recognized the scientific basis of genetic engineering; they used the principle of homologous recombination, building from studies in which scientists had previously "found that artificial DNA of known sequence could engage in homologous recombination with mouse DNA, and exploited this to target specific mouse genes." Alison Abbott, *Biologists Claim Nobel Prize with a Knock-Out*, 499 NATURE 642 (2007).

71 *Id*.

72 *Id*. More than 500 different types of knock-out mice now exist, and a worldwide effort has been launched to knock out every single gene in the mouse genome.

73 Cre-lox gene provides a switch that enables this to be done in mice, but it has not yet been done in humans. *Id*.

contested. In the United States, however, those contests will usually be resolved at the level of professional practice and guidelines. New policy mechanisms may have to evolve to deal with these questions.[74]

I have argued elsewhere that our conceptions of reproductive liberty (liberty to engage in or avoid reproduction) extend logically to a wide swath of genetic control in reproductive decisions.[75] Most of this control will be negative, through screening and non-use or transfer of gametes and embryos carrying particular genes. That standard, however, protects less than one might initially think. A sound conception of reproductive liberty requires that an "important" or at least "core" aspect of reproductive liberty be at stake, not simply that reproductive components or machinery is used. In practice sex will generally trump technology—when coital conception will work people will prefer intercourse over laboratory reproduction.

The argument for rights to control genetic makeup of offspring has several components. Assuming robust protection for decisions to have or not have offspring (treatment as a fundamental right requiring a compelling interest or the equivalent to justify state infringement), some right to test, choose, and possibly alter genes should follow as well.[76] The right to avoid or engage in reproduction is protected because of the experiences of rearing and reproduction it makes possible. More information about the packet of those experiences portended might often be directly relevant to whether one goes forward with reproduction. Bans on obtaining or acting on such information would thus infringe the right to reproduce and require compelling justification.[77]

The argument here is strongest and most accessible with regard to screening and negative selection. As knowledge of the genome grows and whole genome sequencing of individuals becomes routine, people will seek knowledge of their genes for health and prevention purposes.[78] Naturally, they will also be interested in the genes of off-

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74 Some thinkers advocate for a new agency to regulate reproductive technology. *See* Garrison, *supra* note 25, at 1648–51; Franco Furger & Francis Fukuyama, *A Proposal for Modernizing the Regulation of Human Biotechnologies*, HASTINGS CENTER REP., July–Aug. 2007, at 16–20 (vol. 30, no. 4).

75 John A. Robertson, *Procreative Liberty in the Era of Genomics*, 29 AM. J.L. & MED. 439, 446–47 (2002).

76 This is under the standard liberal rights argument of autonomy.

77 Robertson, *supra* note 75, at 484.

78 *But see* David Hunter et al., *Letting the Genome Out of the Bottle—Will We Get Our Wish?*, 358 N. ENGL. J. MED. 105, 106 (2008) (questioning the accuracy and clinical utility of genome analysis).

spring. This may affect whom they choose as mates or gamete donors and the screening that embryos and fetuses undergo. As genomic findings become more powerful, there will be increased incentives to get embryonic DNA for such purposes.

Reproductive liberty questions arise when individual desires to learn, select, or shape the genes of offspring run up against governmental restrictions on doing so. Although there are at present few direct legal barriers, some are likely to arise as the technology develops, demand grows, and people become aware of the wide range of screening and diagnostic testing which are possible. With homologous recombination and gene knockout and insertion techniques, demand to alter genes may also grow. There are, however, many steps to be climbed in the winding staircase that could move this technology from the laboratory into the clinic. Common ethical perceptions may also change as society becomes more comfortable with new technologies, and as other social and technological change occurs.

Vanquishing scientific barriers will not automatically entrench routine use of genetic screening and selection, much less alteration. Although embryos are now available for external analysis, they are still relatively inaccessible except for couples otherwise going through IVF for infertility or for severe genetic disease. Those couples might conceivably add on a genome-wide screen for other traits or associations, but even this assumes that embryos can be sampled without harming them and that the reliability and predictive values of those screens makes it worth doing. In some cases there may not be enough embryos unaffected by the sentinel condition that meaningful selection among embryos, even if it could be done efficiently, would be worth doing. In others the additional costs might deter couples whose main concern is getting pregnant.[79]

Even more unlikely is the chance that fertile couples will pass up coital conception to do embryo screening. This will require the woman to submit to ovarian stimulation, egg retrieval, and then genetic sampling of embryos merely to select embryos with a particular stretch of DNA.[80] The risk of serious genetic disease in offspring will

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[79] Despite being touted for these purposes, preimplantation screening of embryos has not yet been shown to improve live-birth rates in patients with advanced maternal age, previous implantation failure, or recurrent pregnancy loss due to aneuploidy. Practice Comm. of the Soc'y of Assisted Reprod. and the Practice Comm. of the Am. Soc'y of Reprod. Med., *Preimplantation Genetic Testing: A Practice Committee Opinion*, 88 FERTILITY & STERILITY 1497, 1501–02 (2007).

[80] The same is true for creating embryonic stem cells without destroying embryos, as Robert Lanza and a team at Advanced Cell Technology claimed to have done. Rick Weiss, *Lab Cites*

be a sufficient motivator for doing so, but the chance to do a whole genome scan and learn that all embryos are at risk for some condition, many of which cannot easily be prevented, will probably not be enough of an incentive to submit to the costs and rigors of IVF. With the exception of gender, there will likely be few non-medical traits that are simple enough for embryo testing. As the technology improves and the specificity of genetic snapshots increases, however, this weighing of the issues may change.

Positive alteration is even less likely to occur unless knockouts of deleterious genes are easily done—a form of preimplantation surgery that in clear cases should be permitted (or even required).[81] One can imagine scenarios of gene therapy on embryos with deleterious genes, such as cystic fibrosis, sickle cell, and Tay-Sachs. That is, the harmful genetic mutations have been identified and can be targeted for deletion or DNA knockouts or the insertion of helpful genetic sequences, i.e., copy number repeats to add or subtract the enzymes whose absence or presence causes disease. The question is why, except in a very narrow range of cases, anyone would want to do it. One would have to first obtain and test embryos for the defective gene. In most cases there may be enough otherwise unaffected embryos to transfer to achieve pregnancy and birth, so there would be little need to do genetic alteration.[82] Only in those cases where there are insufficient embryos to transfer would gene alteration make sense, and they will be few indeed.

More fanciful scenarios of enhancement and empowerment figure in many of these discussions. The possibility of genetic alteration conjures up the idea of parents using those techniques to empower their children before birth with super-qualities, thus creating unrealistic expectations for them, entrenching privilege, and deepening inequality.[83] If there were easy fixes, the well-off would no doubt avail themselves of them. Society should, of course, proceed slowly here but there is no need to erect barriers that impinge on many kinds of

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Stem Cell Advance; Method of Harvest Could Leave Embryos Undamaged, WASH. POST, Jan. 11, 2008, at A4.

81 Would there, or should there, then, be a duty for parents to have it to protect their unborn children?

82 Of course, genome-wide scans of embryos might change matters. Few people argue against discard of affected embryos, and even fewer would argue that there is a duty to treat rather than discard.

83 On genetic enhancement generally, see ALLEN BUCHANAN, DAN W. BROCK, NORMAN DANIELS & DANIEL WIKLER, FROM CHANCE TO CHOICE: GENETICS AND JUSTICE 104–202 (2000).

science just because of hypothetical fears. Fortunately the undeveloped state of the technology leaves ample time for pause and reflection. With a few exceptions, there are a small number of non-medical traits that are controlled by single genes and thus subject to easy genetic selection. While the proof of principle is there with gene targeting of mice, the practical obstacles to showing safety and efficacy and then actually finding it practical suggest that it will not be widely used for human reproduction, if used at all, for many years to come.

As discussion and debate unfold, it is important to remember how genetic screening, selection, and alteration practices implicate our understandings of procreative liberty. As this Article has shown, the freedom to screen, identify, and perhaps even alter genes should follow from the standard accounts of reproductive autonomy discussed above. In elaborating those connections, however, one should not forget that technological capability does not imply a right to use. The question of scope must still be addressed. The choices must be plausibly related to societal understandings of reproduction and why it is important, not simply a desire to use reproductive components in particular ways.[84] The fact that a genetic toolkit is available for fun and games does not mean that it's perfectly fine to use it in any manner, particularly if the toolbox extends to human characteristics and children, which indeed, is a big assumption.[85]

Given the uncertainties here, one can understand the reluctance of many persons, liberal and conservative alike, to proceed full throttle ahead, thus setting up conflict with those who are more libertarian or market-oriented in their approach. There is much room for a middle ground behind the libertarians and the prohibitionists, but agreeing on where the line is drawn will often be contentious. Nor should perfect symmetry be expected, as we have seen in inconsistencies in paying for eggs for infertility and for research. As long as basic and clinical research may proceed, a wait-and-see policy is reasonable.

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84 The standard accounts of why reproductive autonomy and choice are valued do not argue for as broad a canopy of protection as "anything goes." Thus cloning when not infertile or genetic alteration on a lark would not fall within coherent conceptions of reproductive autonomy. *See* Robertson, *supra* note 75, at 460–80.

85 In the end, genetic alteration approaches to offspring may be so highly reductionist and mechanistic that they will prove unappealing except in the clearest cases. They assume that one nucleotide substitution will change everything, when in fact the world of organisms, not to mention social life, is much more complex. Yes, there may be a Darwinian desire to search for a reproductive advantage, as people do with post-birth rearing practices to give their children a step up. In the end, however, such manipulations may be so far removed from core understandings of why reproductive autonomy is valued as to not qualify for the protection accorded core reproductive interests.

Conclusion

If the twentieth century was the century of physics, it is predicted that the twenty-first century will be the century of biology and the life sciences.[86] The scientific challenges are formidable, but close behind (or better yet, anticipated in advance) will be the normative work in ethics, law, and policy needed to frame advances in the life sciences. Many issues will concern the natural biosphere—protecting, altering, and consuming it. But some issues will concern changing and controlling human traits, either to treat illness or enhance the capacities of offspring. Sequencing the human genome has energized this quest and fueled the controversies that surround it.

Many futuristic scenarios overlook the importance of human genetic engineering. Freeman Dyson's stimulating 2007 article[87] focuses on the biosphere and vegetative part of the coming biotech century. He has much of importance to say, for example, about how kids will have genetic tool kits and will be able to create new breeds of orchids and snakes, and will find it common and acceptable to do so. One could thus imagine a future where genetic engineering will be widely practiced, just as texting and cellular communication now are. The computer revolution may become a genetic engineering revolution, with synthetic biology and engineered organisms within easy reach of all.[88]

Yet one searches his provocative analysis in vain for anything concerning human genetic applications. If genetic engineering is so easy and accepted, then it should be for humans as well, or so one would think. That prospect excites some but daunts others. Increasingly there is a sense that some degree of control and manipulation of

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86 *See* Nigel Goldenfeld & Carl Woese, *Biology's Next Revolution*, 445 NATURE 369 (2007), *available at* http://arxiv.org/abs/q-bio/0702015v1 (online version slightly expanded); Carl Woese, *A New Biology for a New Century*, 68 MICROBIOLOGY & MOLECULAR BIOLOGY REV. 173 (2004), *available at* http://dx.doi.org/10.1128/MMBR.68.2.173-186.2004.

87 Freeman Dyson, *Our Biotech Future*, N.Y. REV. BOOKS, July 19, 2007, at 4, 6, 8 (vol. 54, no. 12).

88 As an interesting sidelight, Freeman Dyson's daughter Esther, a well-known Internet entrepreneur and the first chair of the Internet Corporation for Assigned Names and Numbers, the organization that assigns Internet domain names, has publicly described her willingness to become part of George Church's Personal Genome Project, in which 10 persons at this stage and eventually 100,000 will post their genome sequence and medical records on the Internet in a public database available for researchers or others to use. If this project is an example of how amenable younger generations will be to revealing genomic information about themselves, then it is all the more likely that they will be interested in learning about prospective children's genomes and medical prospects, with alteration not far behind. Esther Dyson, *Full Disclosure*, WALL ST. J., July 25, 2007, at A15.

the genome is inevitable, including germline changes, the previous unacceptable boundary.[89] But this is a highly contested area, and is likely to become more so as techniques of control and manipulation mature.

Because this will be a contentious issue for some time to come, it is useful to explore current thinking about reproductive autonomy. If the ability to tinker with the human will be as routine as Dyson thinks it will be with plants and other species, then our current modes and norms for dealing with genetic and reproductive issues will have to evolve to tackle them. As this Article has shown, the analysis is complex. It involves both the nature of reproductive autonomy and the kinds of concerns (dignitarian and consequentialist) that might validly limit recognized aspects of reproductive autonomy. Determining the trade-off between interested parties will be value-laden and highly contested and politicized. The scope and justifiable reasons for limiting procreative liberty should play a central part in that dialogue.

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89 "Germline therapy involves the modification of all cells in the body, including those cells that produce gametes. Germline therapy affects those cells involved in reproduction, therefore scientists can alter heritable traits." Kristie Sosnowski, *Genetic Research: Are More Limitations Needed in the Field?*, 15 J.L. & HEALTH 121, 130 (2001).