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GENES, CLONES, AND GENDER EQUALITY

*Mary B. Mahowald**

INTRODUCTION

The concept of gender neutrality has long had wide appeal to liberal thinkers. In many areas, gender neutral language attests to this appeal and suggests that men and women are, and should be treated as, equals.¹ Often, gender neutral language is appropriate and desirable on moral grounds—just as racial or ethnic neutrality is appropriate and desirable—because such factors are irrelevant in evaluating individuals as such. In some cases, however, such neutrality is conceptually misleading and morally inexcusable because it masks inequities that

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¹See ROSEMARIE TONG, *FEMINIST THOUGHT* 11-38 (1989) (discussing liberal feminism). Rosemarie Tong states:

If [Betty] Friedan is right, then liberalism is wrong to deny the differences between men and women, to press for gender-neutral laws and/or gender-blind policies. Thus, the task of the liberal feminist is to determine not what liberty and equality are for abstract rational persons, but what liberty and equality are for concrete men and women. This is a difficult and dangerous task, for, as Rosalind Rosenberg has stated, "If women as a group are allowed special benefits, you open up the group to charges that it is inferior. But, if we deny all differences, as the women's movement has so often done, you deflect attention from the disadvantages women labor under."

may then remain unaddressed.² Affirmative action policies are defensible on this basis.³

The field of reproductive endocrinology is one area in which gender neutral language is prevalently and misleadingly used. Infertility specialists, for example, refer to infertile *couples* as if both partners are infertile when usually only one of them is, and they discuss infertility treatment as if both partners were being treated when in fact, it is only the woman who undergoes invasive and painful treatment, even when, as happens half the time, it is her partner who is infertile.⁴ Gender neutral language is also used in referring to parental responsibility for children and caregiving of the sick, disabled or elderly. Single parents and caregivers are thus assumed to be men or women, as if either gender assignment is as likely as the other; in fact, however, single parents and caregivers are most often women.⁵ An interesting exception to the tendency to use gender-neutral language is the use of the feminine pronoun to refer to nurses when we don't know whether the individual nurse is male or female. Although the assumption is occasionally wrong, it is statistically much more probable that a nurse is female than that a single parent is male.⁶

²See *id.*

³See, e.g., Martha S. West, *The Historical Roots of Affirmative Action*, 10 LA RAZA L.J. 607, 607 (explaining that affirmative action has its roots in slavery.) Martha S. West states:

Affirmative action programs are a direct outgrowth of our nation's long and unhappy history of moving away from slavery and toward the goal of racial equality. I begin with slavery, not because I see affirmative action as a way to compensate for slavery and other past injustices, but because of the continuing impact of our unarticulated notion of the racial superiority of whites and the racial inferiority of persons with darker skin color.

Id.

⁴See MACHELLE M. SEIBEL, *INFERTILITY: A COMPREHENSIVE TEXT* 4-13 (2d ed. 1997).

⁵See, e.g., Katherine Morton Robinson, *Family Caregiving: Who Provides the Care, and at What Cost?*, 15 *Nursing Economics* 243, 243 (1997) (stating "[s]eventy-two percent of unpaid family caregivers are women...").

⁶See, e.g., Janette Y. Taylor, *Colonizing Images and Diagnostic Labels: Oppressive Mechanisms for African American Women's Health*, 21 *ADVANCES IN NURSING SCIENCE* 32, 32 (1999) (discussing the interaction of African American women with "the physician, who is usually White and male, or nurse, who is usually White and female"); The University of Arizona College of Nursing <<http://daps.arizona.edu/daps/sro/F99/CollegeEnrollment/Nursing>

Genetics is another field in which gender neutral language is prevalently and misleadingly used. In fact, however, some genetic diseases affect only males and are only transmitted by females; others are expressed differently in males and females, or more severely in one sex than in another.⁷ Prenatal testing for genetic diseases and fetal interventions undertaken after positive results can only be undertaken through women's bodies, even though men may be responsible for the genetic condition addressed.⁸ The great majority of genetic counselors are women, and statistically significant gender differences are evident in attitudes about ethical dilemmas in genetics.⁹ Gender differences are evident not only in the predominance of women in genetic counseling and other health care settings, but also in their predominance as informal caregivers of those children, the ill or disabled, and the

/nruMajor.html (listing the statistics for the 1999 college of nursing as 207 females and 21 males). Cf. *The Changing Pediatric Practice Environment*, 105 AMERICAN ACADEMY OF PEDIATRICS 173, 173 (discussing statistics of single-parent families).

The majority of children under 18 living below the poverty line are found in single-parent, female-headed families. In 1997, these families comprised 61 percent of the nearly 5.9 million families with children under 18 living in poverty. In contrast, married-couple families and those headed by single-male parents constituted about 32 percent and 7 percent, respectively, of the total number of these families. Children of color are disproportionately represented in poor, single-parent homes. In 1997, 55 percent of Africa American children and 63 percent of Latino children lived with single mothers whose incomes fell below the poverty level, compared with 37 percent of white, non-Latino children.

Id.

⁷For a delineation of types and examples of gender differences associated with genetic conditions, see Mary B. Mahowald, Dana Levinson, Christine Cassel, et al., *The New Genetics and Women*, 74 THE MILBANK QUARTERLY 239, 239-83 (1996). The issue of human cloning, however, is not included in this delineation because it was considered biologically impossible when the data for this article were generated.

⁸See *id.* at 241, 251.

⁹According to a survey of genetic counselors in the United States, ninety-five percent are women and 93 percent are Caucasian. See NATIONAL SOCIETY FOR GENETIC COUNSELORS, PROFESSIONAL STATUS SURVEY, PERSPECTIVES IN GENETIC COUNSELING 1-8 (Supp. 1996). From a broad survey of medical geneticists, Dorothy Wertz concluded that gender "was the single most important determinant of ethical decision making and ethical reasoning, over and above all other personal and professional variables, including nationality, age, number of years in genetics, type of degree, specialty, religion, religiosity, political inclination, marital status, number of children, and number of genetics patients seen per week." Wertz, *Provider Biases and Choices: The Role of Gender*, 36 CLINICAL OBSTETRICS & GYNECOLOGY 3, 524 (1993).

elderly.¹⁰ In both formal and informal settings, however, women seldom enjoy the level of prestige or remuneration for their caregiving that men enjoy.¹¹

Many people equate biological ties to children with genetic ties.¹² In fact, however, men can only be biologically related to children through genetics, but women have three separable types of biological relationship: genetics, gestation, and lactation.¹³ To some women, gestation, *i.e.*, the experience of pregnancy and childbirth is more important than the genetic tie.¹⁴ This particular gender difference is relevant to reproductive decisions by individuals who are carriers for autosomal diseases.¹⁵ If both partners are carriers for an autosomal recessive disease¹⁶ (*e.g.*, cystic fibrosis or sickle cell anemia), they can avoid the one in four chance of transmitting the disease to each of their children by using donor gametes from a noncarrier;¹⁷ in either case, the carrier woman will be biologically related to the child through gestation. *Both* partners may be biologically related if they use a donor egg rather than donor sperm. If one partner is a carrier for an

¹⁰See Mahowald, *supra* note 7, at 268.

¹¹Although the number of women in medicine has increased considerably, men still predominate in positions of leadership in the profession, and women continue to predominate in the allied health professions such as nursing and genetic counseling. See Thomas Koenig & Michael Rustad, *His And Her Tort Reform: Gender Injustice in Disguise*, 70 WASH. L. REV. 59, 61 (1995).

¹²See Mahowald, *supra* note 7, at 264.

¹³While challenging the term "surrogate motherhood" as applied to women who gestate and give birth, I identified gestation, genetics, and lactation as three separable types of biological ties to children in WOMEN AND CHILDREN IN HEALTH CARE: AN UNEQUAL MAJORITY 105 (1996).

¹⁴See J.G. Thornton, *Would You Rather Be a 'Birth' or a 'Genetic' Mother? If So, How Much?*, 20 J. MED. ETHICS 20, 87-92 (1994); Amy J. Ravin, Mary B. Mahowald & Carol B. Stocking, *Genes or Gestation? Attitudes of Women and Men about Biologic Ties to Children*, 6 J. WOMEN'S HEALTH 639, 639-47 (1997).

¹⁵See DONNA OLENDORF ET AL, THE GALE ENCYCLOPEDIA OF MEDICINE 1274 (1999) (describing autosomal disease as caused by a gene located on any of the first 22 chromosomes) [hereinafter GALE ENCYCLOPEDIA].

¹⁶See *id.* The risk of passing an autosomal disease to a child depends on whether the gene is dominant or recessive. See *id.* at 1276. A prospective parent carrying a dominant gene has a 50 percent chance of passing the gene to a child. See *id.* A child needs to receive only one copy of the mutated gene to be affected by the disease. See *id.* If the gene is recessive, a child needs to receive two copies of the mutated gene, one from each parent affected. See *id.*

¹⁷See *id.* (defining noncarrier as a person without a disease causing gene).

autosomal dominant disease¹⁸ (e.g., Huntington chorea¹⁹), they may avoid the one in two chance of transmitting the disease to each of their children by using donor sperm if the man is the carrier; if the woman is the carrier and her partner is not, egg donation allows both partners to have a biological tie to unaffected offspring.

Clearly, then, reproduction, genetics and caregiving are not gender neutral. But why is this important? Doesn't morality demand neutrality with regard to differences in gender, class, ability, and race? Aren't such differences desirable because they bring variety to our lives and our society? And if it is desirable to preserve differences between individuals or groups, aren't the differences themselves irrelevant to moral judgments or policy determinations? In what follows, I will explain why attention to differences is a moral imperative in applications of the burgeoning advances in genetics. Although human cloning is a means through which to reduce genetic differences between people, I will identify gender differences related to this new technology and explore their implications for conceptions of parenthood. Preliminarily, I will briefly consider the meaning of gender equality that underlies my account.

GENDER EQUALITY AS A SUBSET OF JUSTICE²⁰

Considerations of justice are generally viewed as indispensable to any adequate ethical analysis. But justice, as a moral principle, is open to different conflicting interpretations, and even when one meaning is agreed upon, to whom that meaning is to be applied may be a matter of dispute. Following Aristotle, the formal principle of justice is generally accepted as requiring equals to be treated equally and unequals

¹⁸See *id.*

¹⁹See TABER'S CYCLOPEDIA MEDICAL DICTIONARY 918 (17th ed. 1993) (defining Huntington chorea as an autosomal dominant disease of the central nervous system that usually begins to manifest symptoms between ages thirty and fifty. The patient experiences progressive dementia with bizarre involuntary movements characteristic of chorea. Many people have children prior to the disease's development; each of their children has a fifty percent chance of inheriting the disease.) [hereinafter TABER'S].

²⁰This section is taken from MARY BRUDY MAHOWALD, GENES, WOMEN, EQUALITY 69-76 (2000) (Chapter 4: *Gender Justice in Ethics*).

unequally, like things to be treated alike.²¹ There is broad disagreement, however, with regard to the material principle of justice, which involves the meaning of equality that underlies the formal principle.²² As Amartya Sen observes, most ethical theories concerning social arrangements appeal to some conception of equality, with the differences among them arising from the variables identified as deserving equal attention or distribution.²³ While scholars debate questions of who should be considered equal and what it means to treat them equally,²⁴ these questions are probably not debated enough by political leaders who champion equality as a fundamental social value.

The conception of equality that underlies my approach to ethical issues in genetics is consistent with Sen's focus on human capability as differently expressed and sometimes suppressed in different individuals and groups.²⁵ The suppression, rather than expression of different human capabilities, is to be eliminated or minimized in the egalitarian society that Sen and I both support.²⁶ Differences are welcome so long as they don't advantage one group or individual over another.²⁷ Equality between the sexes or races or classes does not mean that different groups are the same but that they have the same value despite their differences.²⁸ To put this in chromosomal terms, $XX^{29}=XY^{30}$, *i.e.*, women and men are not the same but they are equal in value, or to extend the equation to other chromosomal arrangements, $XX=XY=XXY^{31}=XO^{32}$, which means that people with chromosomal

²¹See generally ARISTOTLE, NICHOMACHEAN ETHICS V 3-5 (1998). Many authors cite this principle before delineating various material principles or arguing for their own.

²²See TOM L. BEAUCHAMP & JAMES F. CHILDRESS, PRINCIPLES OF BIOMEDICAL ETHICS 330 (1994) (listing six principles, each designating a different criterion for distribution to individuals: equal shares, need, effort, contribution, merit, and free-market exchange).

²³See AMARTYA SEN, INEQUALITY REEXAMINED 3 (1995).

²⁴See *id.* at 3.

²⁵See *id.* at 5.

²⁶See *id.* at 19-21.

²⁷See *id.*

²⁸See AMARTYA SEN, *supra* note 23, at 19-21.

²⁹See TABER'S, *supra* note 19, at 2170 (defining XX as the female chromosomal configuration).

³⁰See *id.* at 2173 (defining XY as the male chromosomal configuration).

³¹See *id.* at 1056 (defining XXY as Klinefelter Syndrome, a congenital endocrine condition of primary testicular failure).

arrangements other than XX and XY also have the same value despite their differences.

Gender equality thus refers to a situation in which differences between men and women are acknowledged and respected, while insuring that they themselves are valued in the same degree. Because of unchangeable biological differences, women experience burdens and risks that men do not experience in reproduction and genetics, and those burdens and risks tend to be greater for women than for men.³³ Both formally and informally, however, measures can be introduced to reduce the inequitable impact of their differences. If reasonable efforts are made in that direction, the requirements of gender equality may be met.³⁴

I am not arguing for the elimination or even for the reduction of capabilities on the part of some in order to equalize their capabilities with those of others. Rather, I am arguing the advantages that accrue to some because of their capabilities ought to be equally distributed, or less unequally distributed, to those who lack such advantages because of their lesser capabilities. Where equal distribution of advantages is not possible, there ought to be efforts to reduce the inequality. Morally, those who are advantaged through greater capabilities bear greater responsibilities towards those who are less advantaged. In other words, equitable distribution of advantages is a social ideal worth pursuing—despite its resonance with the Marxist maxim: from each according to ability, to each according to need.³⁵

Some differences *entail* inequalities; others are merely *associated* with them. For example, women who provide gametes for reproduction experience risk and discomfort that men who provide gametes do not experience (quite the contrary, in most instances);³⁶ this

³²See *id.* at 2058 (defining XO as Turner Syndrome, a congenital endocrine disorder in females caused by the failure of the ovaries to respond to pituitary hormone. Patients have only forty-five chromosomes; the second X chromosome is absent).

³³See *Roe v. Wade*, 410 U.S. 113, 153 (1973) (“Maternity, or additional offspring, may force upon the woman a distressful life and future. Psychological harm may be imminent. Mental and physical health may be taxed by child care”).

³⁴Admittedly, the criteria for determining “reasonable efforts” are problematic, as problematic as criteria for determining the “reasonable person” (or “reasonable man”) standard in law and bioethics.

³⁵See ROBERT C. TUCKER, *THE MARX-ENGELS READER* 388 (1972).

inequality is entailed or necessitated by one's being male or female. Once children are born, however, the unequal roles prevalently occupied by mothers or fathers are merely associated with their sex.³⁷ For example, the time spent with children by both parents could be the same, or the ratio could be reversed. The lesser prestige and income that typically attaches to caregiving,³⁸ in contrast with other occupations, is another disparity that mainly disadvantages women. This gap could surely be reduced through changes in social attitudes and practices.

What type of situation *should* prevail if differences result in inequality? If gender equality is desirable, efforts should be made to reduce inequalities occasioned by differences between the sexes. Where inequitable differences are unchangeable, as in the different reproductive roles of men and women, measures can still be introduced to reduce the inequity of their consequences. It may be argued, for example, that laws granting women alone the right to terminate a pregnancy are based on the realization that women's bodies and not men's are affected by those decisions.³⁹ Where inequitable differences are changeable, then such changes should be made, or at least attempted, on grounds of justice as a social goal. Alternatively, the advantages enjoyed by some may be balanced by those of others, so that the overall impact of changeable differences is equitable.

³⁶See *Davis v. Davis*, 842 S.W.2d 588, 601 (Tenn. 1992) ("We are not unmindful of the fact that the trauma (including both emotional stress and physical discomfort) to which women are subjected in the IVF process is more severe than is the impact of the procedure on men. In this sense, it is fair to say that women contribute more to the IVF process than men").

³⁷An exception to this point is the woman's capacity for lactation. While others, including fathers, are also able to feed infants, only women can nurse them.

³⁸See Robinson, *supra* 5, at 244 ("For many women, caring for an elderly female relative is an extension of her role as wife, mother, and homemaker. Colliere, in her 1986 feminist essay, hypothesizes that as 'cure' became a valued activity done by men, 'care' became the domain of women, thus undervalued and under compensated").

³⁹See *Roe v. Wade*, 410 U.S. 113, 153 (1973) ("The detriment that the State would impose upon the pregnant woman by denying this choice [abortion] altogether is apparent. Specific and direct harm medically diagnosable even in early pregnancy may be involved. Maternity, or additional offspring, may force upon the woman a distressful life and future. Psychological harm may be imminent. Mental and physical health may be taxed by child care. There is also the distress, for all concerned, associated with the unwanted child, and there is the problem of bringing a child into a family already unable, psychologically and otherwise, to care for it").

Just as differences between men and women need to be identified and examined to determine the extent, if any, to which they are associated with disadvantages for one group vis-à-vis others, the same is true for differences based on race or class or ability or sexual orientation. Some men, after all, are disadvantaged vis-à-vis some women, and some women are disadvantaged vis-à-vis other women.⁴⁰ In fact, the majority of us are neither wholly disadvantaged nor wholly advantaged.⁴¹ Accordingly, while I focus here on gender equality as a subset of justice, the conception of equality that underlies my analysis is necessarily applicable to other groups whose differences are associated with inequality. The issue I target is, ironically, one that illustrates the very conception of equality as sameness that I reject. Human cloning is a means of preserving, or at least maximizing, genetic sameness,⁴² and this may be construed by some as a strategy that promotes equality. Because of inequitable gender differences associated with cloning,⁴³ I disagree with that construal. To appreciate the contrast between these views, however, requires some understanding of what human cloning would entail for participants in the process. This understanding may at least partially be obtained by considering different meanings of cloning and the probability that techniques employed in nonhuman cloning will be applied to humans.

HUMAN EMBRYO CLONING⁴⁴

Human cloning has occurred in nature throughout human history, and in laboratory science for decades.⁴⁵ Nature's cloning occurs through

⁴⁰See, e.g., BELL HOOKS, *AIN'T I A WOMAN 2* (1981) (discussing black women's participation in not only the struggle for racial equality, but also the women's rights movement).

⁴¹See *id.*

⁴²See *Can We and Should We Clone Humans?* <<http://www.cwrl.utexas.edu/mchorost/e306/been/cloning.htm>> (explaining that cloning goes through the same process as *in vitro* fertilization; however cloning "destroys its originality through duplication").

⁴³See *infra* footnotes 44-88 and accompanying text.

⁴⁴This section is taken from MARY BRIDY MAHOWALD, *GENES, WOMEN, EQUALITY* 279-82 (2000) (*Chapter 16: Human Cloning, Women, and Parenthood*).

⁴⁵See Rebecca Voelker, *A Clone by Any Other Name Is Still an Ethical Concern*, 271 *JAMA* 331, 332 (1994). Jacques Cohen challenges the description of identical twins derived from embryos as clones, whether they occur naturally or through *in vitro* manipulation. He

identical twinning *in vivo* before implantation.⁴⁶ Scientific cloning occurs through the replication of genetically identical DNA, cells, bacteria, viruses, or whole organisms.⁴⁷ Replication of genes through recombinant DNA technology⁴⁸ has led to the development of treatments such as insulin for diabetes and erythropoietin for anemia.⁴⁹ Somatic cells⁵⁰ are replicated by retrieving them from people and growing them in culture in the laboratory; like DNA clones, these cell lines are used for experimental purposes that may lead to clinical applications.⁵¹

Recombinant DNA technology was controversial when first proposed, but it is now widely accepted on moral as well as scientific grounds.⁵² Although the other methods listed above are also non-controversial, two forms of human cloning continue to be debated: cloning from embryonic or fetal cells⁵³ and somatic cell nuclear

calls the latter a "cloning technique," and defines cloning more narrowly: "taking the nucleus of a cell from the body of an adult and transferring it to an unfertilized egg, destroying the genome of the oocyte of [sic] the egg, and letting it develop." *See id.*

⁴⁶*See id.*

⁴⁷*See id.*

⁴⁸*See* RICKI LEWIS, *HUMAN GENETICS: CONCEPTS AND APPLICATIONS* 316-17 (2d ed. 1997). Recombinant DNA technology involves the combining of DNA from different species; this is possible because all living species use the same genetic code. *See id.* The DNA of bacteria, for example, may be combined with human DNA, to develop many copies or clones of the human DNA that investigators wish to examine. *See id.*

⁴⁹*See* TABER'S, *supra* note 19, at 97 (stating that anemia exists when hemoglobin content is less than that required to provide the oxygen demands of the body).

⁵⁰*See id.* at 1827 (stating that somatic pertains to nonreproductive cells or tissues).

⁵¹*See* Genomics: A Global Resource, *Genomics Lexicon*, <<http://209.52.56.28/lexicon/s.html>> (defining somatic cell gene therapy as therapy that involves "the insertion of genes into cells for therapeutic purposes, for example to induce the treated cells to produce a protein that the body is missing.... Somatic cell gene therapy is only one way of applying the science of genomics to improve healthcare").

⁵²*See* Donald S. Fredrickson, *Asilomar and Recombinant DNA: The End of the Beginning*, in *BIOMEDICAL POLITICS* 274-84 (Kathi E. Hanna ed., 1991).

⁵³*See* Davor Solter, *Cloning and Embryonic Stem Cells: A New Era in Human Biology and Medicine* <<http://www.mefst.hr/cmj/1999/4003/400301.htm>>. Solter explains:

Another recent technological advance, the derivation of human embryonic stem cells, opens up new possibilities in cell and tissue replacement therapy and heralds significant improvements in gene therapy. Besides suggesting new and potentially valuable medical applications, the insights gained through the use of these techniques could significantly enrich our understanding of basic mechanisms

transfer⁵⁴ from humans already born. These methods differ from natural twinning because they are induced by scientific technology;⁵⁵ they differ from DNA and somatic cell replication because they may produce a genetic duplicate of the entire human organism.⁵⁶

Three types of embryo cloning have already been performed in nonhuman animals: blastomere separation,⁵⁷ embryo splitting,⁵⁸ and nuclear transplantation.⁵⁹ Blastomere separation occurs through the isolation of individual cells or blastomeres, each of which is totipotent,⁶⁰ at the two- or four-cell stage of development.⁶¹ Although the process is expensive and rarely successful, nonhuman animals have been produced from each of the four cells of a four-celled embryo of the corresponding organism.⁶² In humans, blastomere separation has been used successfully in preimplantation genetic diagnosis.⁶³ Although this process is experimental, invasive, and costly, it provides

regulating human development. On the other hand, these preliminary results are viewed by many as the opening of the Pandora's box and there are loud voices clamoring that research in these areas be forbidden in perpetuity.

Id.

⁵⁴See Genomics: A Global Resource, *supra* note 51, at <<http://209.52.56.28/lexicon/s.html>>. Defining somatic cell nuclear transfer as:

A process whereby the nucleus of a somatic cell is removed and placed into an enucleated oocyte (*i.e.*, an egg cell that has had its own nucleus *i.e.*, all genetic information removed). The net result is to have the genetic information from the donor nucleus in control of the resulting cell. With further manipulation, such cells can be induced to form embryos. This process was used to create the cloned sheep "Dolly."

Id.

⁵⁵See Fredrickson, *supra* note 52, at 274-84.

⁵⁶See *id.*

⁵⁷See Howard W. Jones Jr., Robert G. Edwards, & George E. Seidel Jr., *On Attempts at Cloning in the Human*, 61 FERTILITY & STERILITY 3, 424 (1994).

⁵⁸See *id.*

⁵⁹See *id.*

⁶⁰See TABER'S, *supra* note 19, at 2013 (defining totipotent as capable of differentiating into a large variety of cells).

⁶¹See Jones, *supra* note 57, at 423-26.

⁶²See *id.* at 423.

⁶³See *id.* at 425.

a means by which women who are carriers for autosomal recessive or X-linked conditions may avoid prenatal diagnosis while obtaining definitive information about the genetic status of their *in vitro* embryos.⁶⁴

Embryo splitting is a bisection technique used in the cattle industry in order to increase the production of prize calves.⁶⁵ The method calls for blastocysts⁶⁶ obtained commercially by flushing them from the uterus after the cow has been artificially inseminated.⁶⁷ On average, bisection of the blastocyst produces 1.5 times more calves per blastocyst than would otherwise be obtained.⁶⁸ In humans, however, this method has not been successful, apparently because acquisition of blastocysts by uterine flushing usually fails, and oocytes fertilized *in vitro* seldom reach the blastocyst stage with present culture systems.⁶⁹ Howard Jones and his colleagues claim that blastocyst transfer "has itself not been found to offer any advantages over the transfer of cleaving preembryos."⁷⁰

Human blastocyst splitting has nonetheless been proposed as a means by which treatment of infertility may be enhanced.⁷¹ To that end, a prize-winning paper was presented at the Conjoint Annual Meeting of the American Fertility Society and the Canadian Fertility and Andrology Society in 1993.⁷² The paper, entitled *Experimental Cloning of Human Polyploid Embryos Using an Artificial Zona Pellucida*, by a team of researchers from George Washington University in Washington, DC, precipitated a brief but intense media

⁶⁴See *id.*

⁶⁵See *id.* at 423.

⁶⁶See Kant's second formulation of the categorical imperative in KANT—FOUNDATIONS OF THE METAPHYSICS OF MORALS 46 (Lewis White Beck, trans., 2d ed. 1990) ("Act so that you treat humanity, whether in your own person or in that of another, always as an end and never as a means only").

⁶⁷See Jones, *supra* note 57, at 423.

⁶⁸See *id.*

⁶⁹See *id.* at 424.

⁷⁰See *id.* This criticism may not apply to somatic cell nuclear transfer, whether used for cattle or humans. Some scientists believe that this technique may be at least as efficient as *in vitro* fertilization of cows. See Gina Kolata, *Japanese Scientists Clone a Cow, Making 8 Copies*, N.Y. TIMES, Dec. 9, 1998, at A8.

⁷¹See Jones, *supra* note 57, at 423.

⁷²See *id.*

frenzy concerning the possibility of human cloning.⁷³ Although the authors claimed that their results pointed the way to improved treatment of infertility, their research had not been conducted on normal human embryos of either fertile or infertile couples.⁷⁴ Because all of the seventeen embryos utilized in their experiment were abnormal, none of the separated blastocysts that developed *in vitro* was considered suitable for transfer to potential mothers.⁷⁵ Even if they had been suitable, Jones and his colleagues doubt that the method would be therapeutically effective or efficient.⁷⁶

From an ethical point of view, public discussion of the social implications of human cloning provoked by the work of the George Washington University investigators was probably valuable. As is their wont, bioethicists positioned themselves on different sides of the issue, some arguing that the technique simply adds another reproductive option to the mix to which couples already are entitled, so long as they are aware of, and have freely consented to, its risks to themselves and their potential offspring.⁷⁷ Others argued that cloning marks a point beyond the morally acceptable scope of medical assistance in reproduction,⁷⁸ for them, issues such as the loss of genetic uniqueness across generations was particularly problematic.⁷⁹ Others still addressed the issue as one more illustration of the human arrogance involved in medical manipulation of the normal and natural reproductive process.⁸⁰

⁷³See J.L. Hall, D. Engel, P.R. Gindoff, G.L. Mottla & R.J. Stillman, *Experimental Cloning of Human Polyploid Embryos Using an Artificial Zona Pellucida*, Paper presented at the Conjoint Annual Meeting of the American Fertility Society and the Canadian Fertility and Andrology Society, General Program Prize Paper, Oct. 13, 1993.

⁷⁴See Jones, *supra* note 57, at 425.

⁷⁵See *id.* at 424.

⁷⁶See *id.* at 425.

⁷⁷See Lori B. Andrews, *Mom, Dad, Clone: Implications for Reproductive Privacy*, 7 CAMBRIDGE Q. HEALTHCARE ETHICS 1, 176-86 (1998) (recapping the major arguments for and against human somatic cell nuclear transplantation).

⁷⁸See *id.*

⁷⁹See Jones, *supra* note 57, at 425.

⁸⁰See Andrews, *supra* note 77, at 176-86. Lori B. Andrews puts this point most forcefully when she compares cloning to incest, identifying the risk it entails as "hubris" or "abuse of power." See *id.* at 183.

Interestingly, while some bioethicists expressed concerns about the impact of human cloning on cloned individuals,⁸¹ none, to my knowledge, indicated that there were gender differences to worry about as well. In fact, however, as with medical technologies already available to assist infertile men or women, human cloning from embryos entails disproportionate burdens for women. More women than men are affected by the process because of the separability of gestation and genetics and because sperm are so much more numerous and accessible than ova.⁸² Even if an equal number of men and women participated in the process, women alone would be undergoing the risks, pain, and discomfort of ova stimulation, ova retrieval, embryo transfer, gestation, and childbirth.⁸³

The third method of embryo cloning is nuclear transplantation.⁸⁴ This involves the transfer of the nucleus of an embryo into an egg from which the nucleus has been removed.⁸⁵ Extensive studies show that sixty to seventy percent of calves cloned through this method from very early embryos are completely normal morphologically⁸⁶ and genetically.⁸⁷ If this method were applied to humans, it could introduce an extra risk for women because twenty to thirty percent of the cloned calves are transiently much larger than normal, requiring cesarean section delivery. Until the birth of "Dolly," there were no reports of successful cloning of mammals from nonembryonic nuclei.⁸⁸

⁸¹See Jones, *supra* note 57, at 426.

⁸²See Davis v. Davis, 842 S.W.2d 588, 591 (Tenn. 1992) (explaining that women suffer more trauma than men from the IVF process).

⁸³See Jones, *supra* note 57, at 424.

⁸⁴See *id.*

⁸⁵See *id.*

⁸⁶See *id.*

⁸⁷See *id.*

⁸⁸See Gina Kolata, *Scientist Reports First Cloning Ever of Adult Mammal*, N.Y. TIMES, February 23, 1997, at 20. I put the name "Dolly" in quotation marks as a means of calling attention to the fact that the name chosen by the researchers has offended some people, albeit not the person in whose "honor" the lamb was named. "Dolly" was cloned from mammary tissue and was reportedly named after Dolly Parton, who is well known for her mammary tissue.

NUCLEAR TRANSFER FROM MATURE SOMATIC CELLS⁸⁹

The belief that cloning from adult cells was impossible was based on evidence that irreversible nuclear changes have occurred through differentiation.⁹⁰ In amphibia, some development from differentiated cells had been induced in the past, but the resultant organisms never progressed to maturity.⁹¹ Researchers who wished to clone animals from the nuclei of mature cells attempted to reverse differentiation and to reprogram development.⁹² By establishing a state of quiescence in the nuclei of the donor cells obtained, they induced the nucleus to respond to the cytoplasmic⁹³ environment of the zygote,⁹⁴ triggering development into a whole "new" organism.⁹⁵ This whole new organism is in fact genetically identical to the adult that provided the mature cells. Although its developmental stage is earlier, the age of the DNA in the younger individual or clone is the same as that of the adult donor.⁹⁶ This has led to concerns about possible acquired mutations in the tissue that is cloned.⁹⁷

In their letter to *Nature* early in 1997, Ian Wilmut and his colleagues reported that they had induced quiescence in the nuclei of cells taken from sheep at different stages of development, all of which involved some differentiation: a nine-day old embryo, a twenty-six-day old fetus, and a six-year old ewe in the last trimester of pregnancy.⁹⁸ From 277 attempts to clone adult (mammary gland) tissue, 172 attempts from the fetal (fibroblast)⁹⁹ tissue and 385 attempts from the

⁸⁹This section is taken from MARY BRIDY MAHOWALD, GENES, WOMEN, EQUALITY 282-83 (2000) (Chapter 16: Human Cloning, Women, and Parenthood).

⁹⁰See Kolata, *supra* note 88, at 20.

⁹¹See *id.*

⁹²See *id.*

⁹³See TABER'S, *supra* note 19, at 490 (defining cytoplasm as the protoplasm of a cell outside the nucleus).

⁹⁴See *id.* at 2812 (defining zygote as the cell produced by the union of two gametes [*i.e.*, the fertilized ovum]).

⁹⁵See Kolata, *supra* note 88, at 20.

⁹⁶See Ian Wilmut, A.E. Schnieke, J. McWhir, A.J. Kind & K.H.S. Campbell, *Viable Offspring Derived from Fetal and Adult Mammalian Cells*, 385 NATURE 810, 810-13 (1997).

⁹⁷See *id.*

⁹⁸See *id.*

⁹⁹See BRUCE ALBERTS, DENNIS BRAY, JULIAN LEWIS, MARTIN RAFF, KEITH ROBERTS & JAMES D. WATSON, MOLECULAR BIOLOGY OF THE CELL G-9, 1179-80 (3d. ed. 1994) (defining

embryonic tissue, eight live lambs were produced: one from the adult cells, three from the fetal cells and four from the embryonic cells.¹⁰⁰ One of the lambs developed from fetal cells died within a few minutes of birth.¹⁰¹ Since the birth announcement of "Dolly," however, the low success rate has improved significantly because many more clones have been produced from fetal bovine cells of males and females and from mature female cells of other nonhuman animals.¹⁰² In comparison with clones of sheep and cattle, the clones of mice are particularly useful to investigators because of their shorter life cycle and the relative ease with which they can be maintained and studied in laboratories.¹⁰³

Although clones from adult male cells have been attempted, none has as yet been successful.¹⁰⁴ With "Dolly," for example, multiple ewes, but no male sheep, were directly involved in her production.¹⁰⁵ Her entire set of genes came from the mammary gland of one ewe,¹⁰⁶ which may therefore be called her genetic mother and father. Richard Lewontin, a Harvard University geneticist, alleges that her genetic mother and father were the genetic parents of her immediate progenitor, but those sheep were obviously not directly involved in "Dolly's" development.¹⁰⁷ "Dolly" may be viewed as both the identical twin and daughter of the ewe from whose tissue she was formed; the parents of that ewe might also be described as her grandparents.

fibroblast as a common cell type of connective tissue that secretes collagen and other molecules, and migrates and proliferates in wounded tissue and artificial laboratory cell growths.)

¹⁰⁰See Wilmut, *supra* note 96, at 810-13.

¹⁰¹See *id.*

¹⁰²See Gina Kolata, *Cows Cloned in First Case Like Dolly's, Japanese Say*, N.Y. TIMES, July 7, 1998, at A8; Elizabeth Pennisi, *Cloned Mice Provide Company for Dolly*, 281 SCIENCE 495-96 (1998).

¹⁰³See Pennisi, *supra* note 102, at 495-96.

¹⁰⁴Of the three types of adult cells from which mouse cloning was attempted, cumulus (from females), sertoli (from males), and neural cells (from either sex), only the cumulus cells yielded successful results. See T. Wakayama, A.C.F. Perry, M. Zuccotti, K.R. Johnson & R. Yanagimachi, *Full-Term Development of Mice from Enucleated Oocytes Injected with Cumulus Cell Nuclei*, NATURE 394 (1998).

¹⁰⁵See Wilmut, *supra* note 96, at 810-13.

¹⁰⁶See *id.*

¹⁰⁷See Richard C. Lewontin, *The Confusion over Cloning*, THE NEW YORK REVIEW OF BOOKS, Oct. 23, 1997, at 18-23.

"Dolly" had two additional biological mothers: the ewe whose egg was enucleated¹⁰⁸ to make room for the DNA obtained from the progenitor ewe, and the ewe to which the re-nucleated egg was transferred after development commenced.¹⁰⁹ Moreover, "Dolly" might have had a fourth biological mother. After the gestating ewe gave birth to her, "Dolly" might have been nursed by another ewe still, as happens with women who serve as "wet nurses" for other women's offspring. Whichever ewe nursed "Dolly," whether gestationally or genetically related to her or not, is probably the one that "Dolly" herself would have regarded as her mother.

Cloning through somatic cell¹¹⁰ nuclear transplantation¹¹¹ from adults not only involves multiple females in reproductive roles, but may involve no males at all. While strictly speaking this is not equivalent to parthenogenesis¹¹² because the progenitor ewe was derived from male and female gametes, the process could continue in a parthenogenetic manner, *i.e.*, through females alone.¹¹³ If and when male clones are produced from the DNA of adult males, females will still be required to provide ova, gestation, and lactation. These disparate biological roles of females are not without risk, discomfort, and invasiveness. While raising questions about the meaning of parenthood in general and motherhood in particular, the production of "Dolly" also illustrates a

¹⁰⁸See *STEDMAN'S CONCISE MEDICAL DICTIONARY* 339 (20th ed. 1994) (defining enucleate as the removal of the nucleus of the cell).

¹⁰⁹See Wilmut, *supra* note 96, at 810-13.

¹¹⁰See ALBERTS, *supra* note 99, at 1012 (providing a detailed explanation of cell proliferation in sexual reproduction and stating that "a useful distinction can be drawn between the cells of the germ line, from which the next generation of gametes will be derived, and the somatic cells, which form the rest of the body and ultimately leave no progeny").

¹¹¹See *Cloning Human Beings: Report and Recommendations of the National Bioethics Advisory Commission*, 38 *JURIMETRICS J.* 3, 3 (1997) (defining somatic cell nuclear transplantation through use of nuclei derived from somatic cells other than those of an embryo or fetus. Essentially, nuclei from cells derived from an adult animal can be "reprogrammed," or the full genetic complement of a cell can be reactivated well into the chronological life of the cell.).

¹¹²See ALBERTS, *supra* note 99, at 1021 (defining parthenogenesis as reproduction from an egg activated by some means, such as a chemical or physical treatment, other than contact with sperm, and stating that an egg is the only cell in higher animals that is able to develop into a new individual).

¹¹³See *id.*

social tendency that the Human Genome Project¹¹⁴ has accentuated: a genetic bias.

THE GENETIC BIAS OF HUMAN CLONING AND INFERTILITY TREATMENT¹¹⁵

The goals of nonhuman cloning include the improvement of food production and development of therapeutic modalities for use in humans.¹¹⁶ These goals parallel those that have long been pursued in plant genetics.¹¹⁷ In contrast, the principal goal of human embryo cloning, as it has developed thus far, is more effective treatment of infertility. In conjunction with that goal, cloning is a means by which women may avoid invasive procedures that they would otherwise undergo for treatment of their own or their partner's infertility. For example, the cloning of embryos already retrieved eliminates the need for further ovulation stimulation and ova retrievals in subsequent attempts to achieve pregnancy. In time, embryo cloning could also be more cost effective in treating infertility. From an egalitarian standpoint, these advantages of embryo cloning for some women and for society-at-large are desirable and justifiable so long as they are not purchased at the cost of greater disadvantages for women or others who are already disadvantaged.

¹¹⁴See *Human Genome Project MCET* <<http://www.mcet.edu/genome/overview.html>> (describing the Human Genome Project as an international research program designed to construct detailed genetic and physical maps of the human genome, to determine the complete nucleotide sequence of human DNA, to localize the estimated 50,000-100,000 genes within the human genome, and to perform similar analyses on the genomes of several other organisms used extensively in research laboratories as model systems).

¹¹⁵This section is taken from MARY BRIDY MAHOWALD, *GENES, WOMEN, EQUALITY* 283-89 (2000) (*Chapter 16: Human Cloning, Women, and Parenthood*).

¹¹⁶See P. Frati, *Bioethics, Biotechnology Products and Humans: Europe Between the Skilled Theseus and the Labyrinth-Minotaur's Syndrome*, 3 *FORUM (GENOVA)* 1, 99-105 (1999) (discussing the principles and societal implications of plant and animal genetic manipulation); A. Colman, *Dolly, Polly and Other 'Ollys': Likely Impact of Cloning Technology on Biomedical Uses of Livestock*, 15 *GENET ANAL* 1, 167-73 (1999) (discussing the beneficial uses of generating transgenic livestock, such as producing an anti-hemophilia protein).

¹¹⁷In the plant world, "genetically identical copies of whole organisms are...commonly referred to as "varieties" rather than clones." See *CLONING HUMAN BEINGS, REPORT AND RECOMMENDATIONS OF THE NATIONAL BIOETHICS ADVISORY COMMISSION* 13-14 (1997).

From that same standpoint, another projected goal of human cloning is problematic, viz., cloning one individual to provide treatment for another, e.g., through organ or tissue donation.¹¹⁸ In Kantian language, the obvious moral problem raised by such a situation is that a person is treated as a means rather than an end.¹¹⁹ Years ago, that question was considered by Mary and Abe Ayala, whose teen age daughter, Anissa, was suffering from chronic myelogenous leukemia, which required bone marrow donation for effective treatment.¹²⁰ Because neither they nor their son was a tissue match for Anissa and no other compatible donor could be found, the parents decided to try to have another child, hoping that he or she would provide the desired match.¹²¹ The attempt required a reversal of Abe's vasectomy.¹²² Even if the reversal were successfully performed, the couple realized the probability that their newborn would be a match was only one in four.¹²³ Regardless of whether the infant was a tissue match for their daughter, however, they said they would love and care for the child as fully as they loved and cared for Anissa.¹²⁴ In other words, their motives were mixed, as is true of most people most of the time. In time, their hope was fulfilled: their second daughter, Marissa, was a match to Anissa, and became a donor to her sister when she was

¹¹⁸Embryo stem cells, which can be produced from blastocysts derived from human clones, may also make it possible to grow healthy tissue or organs, rather than whole organisms, to replace their unhealthy counterparts in the cloned individual. Cf. Eliot Marshall, *Use of Stem Cells Still Legally Murky, but Hearing Offers Hope*, SCIENCE, Dec. 11, 1993, at 282. If the human blastocyst from which the replacement develops *in vitro* has no moral status, this application is less problematic than the deliberate development of whole organisms solely for the purpose of their serving as organ or tissue donors. Development of whole organisms can only occur through women's bodies. Nevertheless, the development of replaceable tissue or organs in the laboratory also depends on women for provision of the oocytes in which the cloned DNA can grow. See *id.*

¹¹⁹See STEDMAN'S MEDICAL DICTIONARY 1858 (26th ed. 1995) (stating that blastocysts consist of the inner cell mass and a thin layer of trophoblasts that enclose the blastocoele or cleavage cavity of the embryo, the trophoblast cells contributing to formation of the placenta rather than the embryo itself).

¹²⁰See Sally Ann Stewart, *Toddler May Be Sister's Lifesaver*, USA TODAY, June 4, 1991, at A3.

¹²¹See *id.*

¹²²See Bob Brown, *20/20*, (ABC News television broadcast, Nov. 6, 1997).

¹²³See Stewart, *supra* note 120, at A3.

¹²⁴See *id.*

fourteen months old.¹²⁵ About a year later, Anissa was healthy enough to walk down the aisle at her wedding, with Marissa serving as flower girl.¹²⁶

If the Ayala family could have cloned Anissa to produce another child, they would have thereby insured a match for bone marrow donation to her. Just as in the actual case, they probably would have indicated their intention to love and care for Anissa's identical twin as they did for her. They might wonder, however, whether in time the identical twin might develop the same condition as Anissa, needing donation from another identical twin who might be cloned, need donation for another, and so on for each cloned generation. Moreover, Anissa's own consent to provide her DNA for insertion into her mother's enucleated egg would be ethically required.¹²⁷ The cloning process would be accomplished through somatic cell nuclear transplantation unless Anissa herself had been generated from an embryo formed through embryo splicing, and the untransferred genetically identical embryos had been frozen for future use.¹²⁸

If Anissa's bone marrow donor had been produced by cloning Anissa and by having Anissa's mother gestate and give birth to her, the question of who is the mother is complicated not only by biology but also by psychology, *i.e.*, by the set of relationships already formed between mother and daughter. Moreover, the rationale for cloning in this case is morally different from that of those who support the procedure solely on grounds of reproductive choice.¹²⁹ The desire of the Ayalas to have a genetically related offspring was based on their desire to cure another offspring rather than the desire to replicate their own genes.¹³⁰ In fact, if they had found a non-related donor who matched Anissa's cell type, they probably would not have had another child.

¹²⁵See *id.*

¹²⁶See *Transplant Sisters Celebrate a Wedding*, BOSTON GLOBE, June 6, 1992, at 4.

¹²⁷For an account of Anissa's case and further discussion, see HILDE LINDEMANN NELSON & JAMES LINDEMANN NELSON, *THE PATIENT IN THE FAMILY* 156-57 (1995).

¹²⁸See *id.*

¹²⁹See generally John A. Robertson, *CHILDREN OF CHOICE* (1994) (discussing unexplored ethical implications of cloning in the context of organ or tissue donation as the end goal).

¹³⁰See *Transplant Sisters*, *supra* note 126, at 4.

Two cases mentioned in the President's Commission Report on Human Cloning¹³¹ provide better examples than the preceding case of a genetic bias, *i.e.*, a tendency to prefer offspring who are genetically related to oneself.

[Case One] A couple wishes to have children, but both adults are carriers of a lethal recessive gene. Rather than risk the one in four chance of conceiving a child who will suffer a short and painful existence, the couple considers the alternatives: to forgo rearing children; to adopt; to use prenatal diagnosis and selective abortion; to use donor gametes free of the recessive trait; or to use the cells of one of the adults and attempt to clone a child. To avoid donor gametes and selective abortion, while maintaining a genetic tie to their child, they opt for cloning.¹³²

[Case Two] A family is in a terrible accident. The father is killed, and the only child, an infant, is dying. The mother decides to use some cells from the dying infant in an attempt to use somatic cell nuclear transfer to create a new child. It is the only way she can raise a child who is the biological offspring of her late husband.¹³³

In Case One, the couple clearly desires to have a child genetically related to both of them, while free of a genetic disease; they also desire to avoid prenatal testing and abortion.¹³⁴ But another desire is suggested by the case description: avoidance of a short and painful existence on the part of an affected child.¹³⁵ Shortness of lifespan does not necessarily limit the quality of someone's life, but the shortness of a child's life are likely to cause suffering for the parents, thereby limiting their quality of life.

Unfortunately, the Commission does not indicate the nature of the recessive disorder for which the parents are both carriers, nor does it

¹³¹See Cloning Human Beings, Report and Recommendation of the National Bioethics Advisory Commission 79 (1997) [hereinafter *Cloning Human Beings*].

¹³²See *id.* at 78-79.

¹³³See *id.* at 79.

¹³⁴See *id.*

¹³⁵See *id.*

define the type of condition it considers "lethal." Sickle cell anemia¹³⁶ and cystic fibrosis¹³⁷ are the most common recessive conditions in African Americans and Caucasians, respectively, but affected individuals typically survive to adulthood and beyond.¹³⁸ Tay Sachs disease, a recessive, progressive, neurological disorder that particularly affects Ashkenazi Jews, is considered lethal because those who are affected die in early childhood.¹³⁹ Whether the experience of the disease is painful to the child, however, depends on the systems affected, the treatments administered, and whether adequate palliation is provided. In light of these possibilities, it is questionable whether even the most severe genetic disease *necessarily* entails pain for the person affected. Parents, however, surely experience a great deal of anguish or suffering in the course of caring for an affected child.

The desire to be a parent is as natural and good as the desire to have a genetically-related child, but the two desires are not the same, and the fulfillment of neither is essential to one's health or life. Choosing to remain childless in a situation such as Case One may not only be morally permissible but commendable, depending on its rationale. Adoption is also a morally commendable option. Neither childlessness nor adoption illustrates the genetic bias that supposedly motivates the couple's desire for cloning. In contrast, Case One suggests a gender-based genetic bias on the part of the President's Commission. The Commission represents the genetic tie as the most important one for the potential parents, ignoring the non-genetic biological tie that the woman may have through gestation and childbirth. Egg donation in this case would allow both partners to avoid the risk of transmitting the genetic condition for which they are carriers.

Case Two illustrates cloning itself as the objective of reproductive assistance. Presumably, the woman could have another child through adoption, artificial insemination by a donor, or sexual intercourse with a new partner, but she apparently desires not only to raise a child who

¹³⁶See RICHARD C. LEWONTIN, HUMAN DIVERSITY 124-25 (2d. ed 1995).

¹³⁷See LUIGI LUCA CAVALLI-SFORZA & FRANCESCO CAVALLI-SFORZA, THE GREAT HUMAN DIASPORAS: THE HISTORY OF DIVERSITY AND EVOLUTION 249 (1995).

¹³⁸See LEWONTIN, *supra* note 136, at 124-25; CAVALLI-SFORZA, *supra* note 137, at 249.

¹³⁹See LEWONTIN, *supra* note 136, at 156.

is genetically related to her but to insure that the child be the genetic duplicate of her son. Of course, the genetic duplicate would not be the same person as the son who is dying; rather, he would be the son's identical twin, born several years later and genetically related to her dead husband and to her. Interestingly, the woman's genetic bias in this case is mainly oriented towards propagating another's genes rather than her own. She could, after all, replicate the entirety of her own genome by cloning herself, or she could be as genetically related to a new child as to her dying son by simply repeating the process through which the latter had been conceived.

From an egalitarian standpoint, the woman's desire to have her son cloned is an understandable instance of genetic bias, but cannot be justified on that basis alone. Unlike the Ayala case, which involved the goal of effective treatment for a child already born, this case involves no effective treatment for anyone. In fact, the woman's recovery from the loss of her husband and son might be impeded by the attempt to replicate the genetic contribution of one and the genome of the other. Although the Ayala case also raises the question of treating a child as a means rather than an end, this case raises that question yet more problematically because the clone is apparently desired for more individualistic than therapeutic reasons.

As already mentioned, the desire for a genetic tie to offspring is natural and prevalent, but less strong in many women than in men.¹⁴⁰ While both men and women prefer to have children biologically rather than through adoption, the gestational tie established through pregnancy may be at least as important as the genetic tie for women. To the extent that the genetic tie induces individuals to stay together and to protect and nurture one another, it is surely a good thing. Interestingly, however, the origin of families is precisely *not* a genetic tie between parents themselves. Despite the high incidence of divorce in contemporary society,¹⁴¹ the fact that so many couples do stay

¹⁴⁰See Dorothy E. Roberts, *The Genetic Tie*, 62 U. CHI. L. REV. 209, 239-40 (1995); Lori B. Andrews & Lisa Douglass, *Alternative Reproduction*, 65 S. CAL. L. REV. 623, 623 (1991); John A. Robertson, *Technology and Motherhood: Legal and Ethical Issues in Human Egg Donation*, 39 CASE W. RES. L. REV. 1, 1(1989).

¹⁴¹See Penelope Eileen Bryan, *Women's Freedom to Contract at Divorce: A Mask for Contextual Coercion*, 47 BUFF. L. REV. 1153, fn 17 (1999) (stating that "[s]ome predict that

together and protect and nurture each other argues for the enduring significance of nongenetic ties. The nongenetic tie between partners is reinforced in most societies by their choosing each other as mature individuals who are aware, to some degree at least, of each other's strengths and weaknesses.

The lack of a genetic link between stepchildren and one of their social parents has been associated with a higher incidence of violence in their families, as compared with the families of adoptive children and families in which all of the children are genetically related to both parents.¹⁴² Adoption represents the desire of both parents to have a child who is not genetically related to either of them; egg or sperm donation represents a desire to have a child genetically related to one but not both; a couple's decision to initiate or continue a pregnancy to which both have contributed their gametes represents a desire to have a child who is genetically related to both parents. Each of these scenarios involves a specific decision on the part of both partners to be parents. In contrast, stepfamilies are formed by partners' choosing each other, but not necessarily choosing to be parents of children produced through previous relationships. The fact that ties between children and their adoptive parents tend to be stronger than ties between stepparents and their stepchildren suggests the importance not only of nongenetic ties but also of the autonomy of both partners in decisions to have children. Children themselves, whether adopted or not, do not have that opportunity. Another factor that may contribute to successful parenting by adoptive couples is the fact that they are usually screened by professionals for their suitability to be parents.¹⁴³

While a genetic bias is natural, prevalent, and good in most instances, it can lead to social inequities as well. Consider, for example, the fact that medical and technological assistance in acquiring genetically related offspring is a growth industry whose benefits are virtually unavailable to the poor, who are just as apt, or more apt, than

more than one-half of all marriages in the United States will end in divorce," and that "[s]ome predict an even higher percentage").

¹⁴²See Jane E. Brody, *Genetic Ties May Be Factor in Violence in Stepfamilies*, N.Y. TIMES, Feb. 10, 1998, at C1.

¹⁴³See Remi J. Cadoret, *Adoption Studies*, ALCOHOL HEALTH & RES. WORLD, June 1, 1995, at 195 (explaining that adoption is not a random process because agencies carefully screen adoptive parents).

the affluent to be infertile.¹⁴⁴ Consider also the economic disparity that usually prevails between gamete donors and their recipients.¹⁴⁵ In a sense, the former sell their genes in order to allow others to (re)produce their partners' genes.¹⁴⁶ The greater reluctance of women to be egg donors than of men to be sperm donors is undoubtedly influenced by the greater invasiveness and risk of egg donation.¹⁴⁷ A woman's reluctance may also be influenced by her limited number of eggs and a desire to insure her own capability for pregnancy and childbirth.¹⁴⁸ Commercial surrogacy is perhaps a clearer illustration of social inequity associated with a genetic bias. When the surrogate is both gestationally and genetically related to the offspring, she, like an egg donor, sells her genes so that someone can fulfill his genetic bias. If she is not genetically related, she contributes to the genetic bias of both partners whose embryo she gestates.

Human somatic cell nuclear transfer offers the prospect of extreme and unnatural genetic bias. It is extreme because it entails the contribution of not only half but all of one's genetic material.¹⁴⁹ It is unnatural because this never occurs in nature.¹⁵⁰ Both factors make human somatic cell nuclear transfer radically different from other modes of reproductive assistance. The other modes conform to the model of combining gametes from a male and female to produce genetically new offspring related to both of the contributing partners. Human somatic cell nuclear transfer might be more accurately described as replicative assistance than reproductive assistance. Replicative assistance might be further characterized as radically

¹⁴⁴See Roberts, *supra* note 140, at 244 (stating that the high cost of fertility treatment largely restricts its availability to only the affluent).

¹⁴⁵See *id.* at 247 (stating that people who hire surrogates for *in vitro* fertilization procedures are usually wealthier than the women who provide the service).

¹⁴⁶See *id.*

¹⁴⁷See Gina Kolata, *Price Soars for Eggs, Setting Off a Debate on a Clinic's Ethics*, N.Y. TIMES, Feb. 25, 1998, at A1 (stating that, in contrast to the availability of sperm, eggs are in short supply, requiring potential recipients to wait a year or more for donor eggs. To entice egg donors, one infertility clinic has raised its payment to them to \$5,000 for a month's worth of eggs. This is twenty times what donors were typically paid when the practice began over a decade ago. Clinicians may encourage use of donor eggs from younger women because it improves their success rate in treating older women, attracting more infertility patients.).

¹⁴⁸See *id.*

¹⁴⁹See Cloning Human Beings, *supra* note 131, at 79.

¹⁵⁰See *id.*

conservative because it attempts to preserve a phenotype that has already been expressed, forgoing not only the risk of a new genetic combination but also the possibility of a superior phenotype.¹⁵¹

Beyond the priority that many women impute to the gestational link to their offspring, a genetic bias has historically been associated more with men than with women.¹⁵² Without recognizing that infertility in couples is as likely due to the male partner as the female partner,¹⁵³ women have in fact been blamed for childlessness. In biblical times, the “barrenness” of a woman was grounds for her husband’s “lying” with another woman in order to have a child, or, if his wife had only had daughters, to have a son.¹⁵⁴ The practice of women taking their husbands’ surnames is a way of indicating the male’s genetic lineage only.¹⁵⁵ Although sperm “donation” is mainly undertaken for money, the keener interest of men in sperm “donation” than women in egg donation suggests that men may also be motivated by a desire to propagate their own genetic endowment. Women are sometimes prone to support that motivation on the part of their partners, resorting to extreme measures to have children genetically related to their husbands.¹⁵⁶ In postmenopausal gestation, for example, women undergo hormonal stimulation, embryo transfer, and gestation after *in vitro* fertilization of donor egg’s with their husband’s sperm, in order to give birth to children who are genetically unrelated to them.¹⁵⁷

The language in which adoptive parents and biological parents are sometimes described also connotes a genetic bias. The latter, for example, are sometimes called “real” parents, even if they have never been involved in parental nurturance.¹⁵⁸ In Chicago, for example, in

¹⁵¹See CAVALLI-SFORZA, *supra* note 137, at 74-105 (discussing the molecular mechanism of human genetic recombination and the evolutionary adaptive advantages and disadvantages of human genetic diversity).

¹⁵²See Roberts, *supra* note 140, at 239-40.

¹⁵³See *id.*

¹⁵⁴See *Genesis* 16:1-2.

¹⁵⁵See Merle H. Weiner, *We Are Family: Valuing Associationalism in Disputes Over Children’s Surnames*, 75 N.C. L. REV. 1625, 1625 (1997) (providing an in-depth discussion of men’s and women’s viewpoints on bestowing surnames and their historical and societal implications); Omi, *The Name of the Maiden*, 12 WIS. WOMEN’S L. J. 253, 253 (1997).

¹⁵⁶See Roberts, *supra* note 140, at 239-40.

¹⁵⁷See *id.*

¹⁵⁸See *id.*

the early 1990s a child known as Baby Richard was adopted by a couple who cared for him from his fourth day of life until he was nearly four years of age.¹⁵⁹ At that point, the couple was ordered by a judge to surrender the child to his genetic father.¹⁶⁰ The child had been conceived in the course of an affair after which the genetic father went abroad and developed another sexual liaison.¹⁶¹ On giving birth, Richard's biological (gestational and genetic) mother legally surrendered the child to the couple who became his adoptive parents.¹⁶² When the genetic father learned of the boy's birth he initiated a legal effort to take him from his adoptive home, claiming he had a right to do so because he was the child's "real" father.¹⁶³ Although the genetic father married the biological mother while engaged in his effort to take Richard from his adoptive family, her "real" motherhood status was neither acknowledged nor legally restored, even after her husband separated from her and Richard several years later.¹⁶⁴

REAL PARENTS, REAL MOTHERS¹⁶⁵

Was Baby Richard's genetic father his real father? Genetically, he was as really the boy's father as a sperm donor is the real father of a child he never intended to see or nurture. Comparing the two, the sperm donor is intentionally a genetic parent, while Baby Richard's genetic father was not, at least until sometime after the child was born. Sperm donors never become legal parents;¹⁶⁶ in most states, the husband of a

¹⁵⁹See *In re* Petition of Doe, 649 N.E.2d 324, 326-27 (Ill. 1994). See also Scott A. Resnik, *Seeking the Wisdom of Solomon: Defining the Rights of Unwed Fathers in Newborn Adoptions*, 20 SETON HALL LEGIS. J. 363, 371-75 (1996).

¹⁶⁰See *id.*

¹⁶¹See *id.*

¹⁶²See *id.*

¹⁶³See *In re* Petition of Doe, 649 N.E.2d at 326-27. The basis for the ruling against the child's adoptive parents was the fact that the biological father did not consent to the adoption. See *id.* Opposition to the ruling was mainly based on the fact that the child's best interests should have been the grounds for determining his placement. See *id.* at 349-52.

¹⁶⁴See Mark Brown & Adrienne Drell, *Baby Richard Battle Back in Court*, CHL. SUN-TIMES, July 17, 1997, at 1.

¹⁶⁵This section is taken from MARY BRIODY MAHOWALD, *GENES, WOMEN, EQUALITY* 289-92 (2000) (Chapter 16: *Human Cloning, Women, and Parenthood*).

¹⁶⁶See John Lawrence Hill, *What Does It Mean to Be a "Parent"?* *The Claims of Biology as the Basis for Parental Rights*, 66 N.Y.U. L. REV. 353, 373 (1991) Hill states that under

woman who is artificially inseminated with donor sperm is considered the child's legal father.¹⁶⁷ Richard's genetic father became his legal father only after a lengthy court battle and a controversial judicial decision.¹⁶⁸ He was the child's only legal parent even after he left the family, while Richard's biological mother remained to care of him even though she was not legally his parent.¹⁶⁹ Once removed from his adoptive family, Richard had no legal mother.¹⁷⁰

A different view of what constitutes a real parent was articulated by a sperm donor in a letter to his potential genetic offspring: "I am not your parent," he wrote, even though I am your (genetic) father because I never gave you anything. I never held you or cared for you. The man who did those things for you is your real parent."¹⁷¹ From an egalitarian perspective, something similar might be said by an egg donor. Because of the physical demands and risk of egg "donation," however, it is less likely that a woman who provides gametes would

current statutory law, paternity is largely presumed. *Id.* He further notes that, under the Uniform Parentage Act of California, for example, a third party may assert paternal rights only when there is no presumed father under another section of the Act. *Id.* Therefore, the husband of the mother of the child retains legal rights simply by virtue of his relationship with the mother. *Id.* The legal standing between a nonbiologically related father and child remains steadfast even in the context of permitting consensual artificial insemination by a sperm donor. *Id.* This rule protects the paternal status of the surrogate's husband while simultaneously providing that the sperm donor is not to be considered the father of the child. *Id.* Professor Hill underscored that this presumption applies only in marital relationships and does not extend to either heterosexual or homosexual cohabitation. *Id.*

¹⁶⁷*See id.* See also New York State Task Force on Life and the Law, *Assisted Reproductive Technologies: Analysis and Recommendations for Public Policy* (1998) (citing New York law making the husband of a woman who is artificially inseminated with donor semen the legal father of any child born after the insemination, so long as the procedure was performed by a licensed physician with the husband's consent).

¹⁶⁸*See In re* Petition of Doe, 649 N.E.2d at 349-52 (asserting that the majority opinion failed to take into account the best interest of the child). From a systemic perspective, it is important to notify genetic fathers who are not sperm donors so as to promote their support of children for whom placement resources are limited. In this case, however, by the time the genetic father learned of his birth and pursued custody, the child had already been legally placed.

¹⁶⁹*See Resnik, supra* note 159, at 371-75.

¹⁷⁰*See id.*

¹⁷¹Some sperm donors have expressed this sentiment as a means of acknowledging their lack of involvement in the parental role. Genetic information relevant to the sperm donor is usually provided by him without compromising his desired anonymity. This information is communicated to the infertile couple or to the woman who is inseminated, to be available to the child who may be born as a result of the insemination.

say that she gave her genetic progeny “nothing” even though she is paid more than a sperm “donor.”¹⁷² What sperm donors and egg donors do have in common is that neither intends to be a parent.¹⁷³ For a woman, that intention tends to be more encompassing than for a man because it necessarily entails the negation of a greater degree of involvement through gestation and childbirth,¹⁷⁴ and usually entails negation of a greater degree of responsibility for child care or nurturance.¹⁷⁵

If and when human somatic cell nuclear transfer becomes available, both men and women may donate their DNA with much less discomfort or risk than a woman undergoes in providing ova. Female recipients would still be required to gestate and give birth. Because DNA is so easily obtainable from donors, its value would be negligible unless the donor was a particularly prized tissue source. Even then, it would be difficult for such a donor to prevent others from freely obtaining DNA traces from cells left through routine touching.¹⁷⁶ According to Davor Solter, a molecular geneticist at the Max Planck Institute, the unique role of women in human somatic cell nuclear transfer suggests an advantage for them.¹⁷⁷ Whether the procedure is used to generate whole organisms or specific organs or tissue, women’s eggs are necessary to that generation, and “women hold all the eggs.”¹⁷⁸ Solter observes that a woman, therefore, “could use one of her own eggs to create an organ she needs. But a man would have to buy eggs from a woman, if he could find a woman to provide them and if he could afford them.”¹⁷⁹ Although Solter seems to think that their egg

¹⁷²If the motivation of gamete “donors” is to obtain money, the term “donor” is misleading. Although the money that a gamete provider receives in exchange for his or her gametes is (legally and clinically) described as compensation rather than remuneration, whether it is one or the other depends on the amount of the “compensation” vis-à-vis the risk and discomfort for which the provider is “compensated,” as well as the economic status and motive of the gamete provider. In most cases of sperm “donation” and some cases of egg “donation,” the term “vendor” more accurately describes the gamete provider.

¹⁷³See Hill, *supra* note 166, at 373.

¹⁷⁴See *id.*

¹⁷⁵See *id.*

¹⁷⁶See *id.*

¹⁷⁷See Gina Kolata, *In the Game of Cloning, Women Hold All the Cards*, N.Y. TIMES, Feb. 28, 1998, at 6.

¹⁷⁸See *id.*

¹⁷⁹See *id.*

producing capacity might make women all powerful in society,¹⁸⁰ many are likely to disagree with that assessment. Most of us, I think, are likely to construe the fact that we already hold all the eggs as disempowering, although not necessarily so. Men, after all, have always depended on women not only to provide eggs but also DNA and the uterine environment necessary to produce their offspring. So long as men hold more economic power than women do, further dependence on women for enucleated eggs is hardly likely to result in reverse sexism.

In its dependence on use of enucleated eggs, somatic cell nuclear transfer introduces a new way in which women may be biologically related to offspring. Even if men provide the entire genetic complement to an embryo, they remain biologically related to the eventual offspring through that mode alone. They may in fact be described as genetic mother and genetic father. But women may be related biologically through (enucleated) egg provision, through gestation, and through lactation. Even the enucleated egg contains mitochondrial DNA¹⁸¹ which influences the health of the developing embryo or fetus, regardless of whether the nuclear DNA transferred into it comes from a male or female progenitor.¹⁸² Through use of one woman's nuclear DNA and another woman's enucleated egg, a lesbian couple may have a child who is biologically related to both without requiring sperm donation.

All of these biological roles for women may be viewed as grounds for calling them mothers. But are women who serve only as DNA providers, egg providers, gestation providers, or lactation providers—*real* mothers? Certainly they may all be called biological mothers because they all fulfill biologically determined maternal roles. But are all biological mothers real mothers or real parents? Traditionally, mothers have been defined as those who give birth. This definition implies that gene providers (whether they contribute all or only half of

¹⁸⁰*See id.*

¹⁸¹*See* CAVALLI-SFORZA, *supra* note 137, at 65-70. (defining mitochondria as once being free bacteria a billion or so years ago and now being contained in all living cells. Each mitochondrion contains one or more rings of DNA which operates symbiotically with the nuclear DNA of a living cell. One's mitochondrial DNA is inherited from one's mother.).

¹⁸²*See id.*

the recipient's DNA) and enucleated egg providers are not mothers unless they also gestate and give birth. The traditional definition was formulated in the absence of the technical possibility of separating genes from gestation. Probably it was also formulated with the assumption that one who gives birth goes on to nurse the child, as gestation and childbirth itself prepare her to do; in other words, continuity between natural and nurturant roles of mothers was presumed. Once nurturance is introduced as a maternal function, we need to recognize that men as well as women can and do nurture infants. Women alone of course can fulfill the nurturant function of breast-feeding, but men are fully capable of bottle-feeding, which many women choose as well. Essential nurturance of infants is thus a parental function fulfillable by either mothers or fathers. Moreover, it is fulfillable by men or women who are not biological parents but who are committed to the child's nurturance, *i.e.*, by adoptive parents, whether mothers or fathers.

Real motherhood may be defined as encompassing different demands and degrees of lifegiving, both qualitatively and quantitatively. Genes as well as environment figure significantly in the determination of individual traits.¹⁸³ In cloning, the individual's genetic endowment is determined by one parent, whether male or female.¹⁸⁴ But the ovum in which that parent's DNA is inserted represents a significant environmental influence on development, and the mitochondrial DNA adds a genetic component to the environment of the nuclear DNA.¹⁸⁵ The individual who provides the egg is another parent, always female and therefore a mother, who undergoes greater risk and discomfort through her lifegiving than does the genetic parent. Another crucial environmental influence is the individual who gestates and gives birth, one who may be described as another parent and another mother, who undergoes greater risk and discomfort through her lifegiving than either of the other parents. In human somatic cell nuclear transfer, a lactating mother is another significant environmental influence, but a father or mother who feeds an infant by bottle may be equally significant.

¹⁸³ See LEWONTIN, *supra* note 136, at 68-70.

¹⁸⁴ See *id.*

¹⁸⁵ See CAVALLI-SFORZA, *supra* note 137, at 65-70.

As a child develops, however, whether cloned or not, the most important environmental determinant of the person he or she becomes is the parent or parents who provide care and nurturance towards adulthood, regardless of whether they are biologically related to the child. In time, the adoptive parent becomes more really a parent than any of the others. A real mother, then, is first and foremost a woman who cares for a child, from any stage of development, until the child no longer needs that care. A real father is a man who does the same when he can, *i.e.*, after the child is born.

CONCLUSION

Ordinarily, real parents contribute to their children both biologically and environmentally. When they are not biologically-related, their parenthood is real to the extent that they contribute themselves, *i.e.*, their love, work, thought, income, communication, etc., throughout the child's lifetime. By this rationale, if I were asked to compare the different mothers involved in cloning, I would probably resort to the traditional definition by saying the woman who gives birth is the real mother at that point. For some time after birth, a lactating mother could be a real mother as well. But an adoptive mother would in time be more real a mother than any of the others, regardless of the lack of a biological tie to her child.

From the standpoint of gender equality, it is hard to see how genetic ties alone ever provide an adequate basis for defining real mothers *or* real fathers.