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Part Two

The Case Against Cloning-to-Produce-Children

Why should we care about the possible use of human cloning to create children? It is not part of any respectable research agenda. Public opinion polls have shown consistent and overwhelming opposition to the idea of using cloning to create children.[1] Whenever the issue has been discussed by policymakers, opposition has been largely bipartisan. So why is it necessary to make a case against this practice?

One reason is that there are some advocates—both academics and activists—who have been arguing for the use of cloning to produce children, and while they are still in the minority, that may change. Their arguments in favor of a future of biotechnologically facilitated reproductive liberty may gain traction, especially if concerns about safety appear to diminish as research advances. Meanwhile, the deeper sources of Americans' opposition to the use of cloning to create children can be difficult to understand, articulate, and defend—in part because, over the last half century, sexuality and procreation have become increasingly detached in our culture.

In this section, we attempt to make the case against the use of cloning to create children. Of course, many arguments have already been made over human cloning—following the cloning of Dolly, the bioethicist Daniel Callahan claimed, not altogether implausibly, that "no arguments have been advanced this time that were not anticipated and discussed in the 1970s."[2] The best articulation of the deeper moral issues raised by human cloning can be found in *Human Cloning and Human Dignity*, a 2002 report of the President's Council on Bioethics.[3] Here, we will restate, expand upon, and update that report's arguments, defending them against the criticism they have received since 2002 and showing how the debate over cloning-to-produce-children is part of a broader conflict in our society between different understandings of the moral meaning of the family.

Health and Safety

Perhaps the most commonly cited, and the most clear and straightforward reason for opposing cloning-to-produce-children is a concern for the health and safety of those involved: the women donating their eggs

for cloning or carrying cloned children to term, and the children created through cloning. Though the pursuit of health can be taken too far, and the meaning of health can, in some cases, be ambiguous,[4] health as such is one of the clearest and least controversial of human goods.

The available scientific evidence indicates that many or most children created through cloning would suffer from medical problems as a result of the procedure used to create them. If cloning technology improves and scientific evidence comes to show that cloning may be performed with less risk to children, then safety may come to be a less important part of the debate over cloning. The contingency of ethical objections based on safety can be seen in the proposals sometimes put forward that any legislation prohibiting cloning be revisited after a few years.[5]

As we will argue in detail below, the first attempts at cloning-to-produce-children would be unavoidably unethical human experimentation. But it is also worth surveying the state of scientific evidence to see just what risks cloning will pose to children, and whether those risks have changed in recent years.

Health Problems in Cloned Animals

Cloning has been found to cause defects and health problems in animals at all stages of development, from the embryo to the mature adult.

The high death rates of cloned embryos and fetuses. In their 1997 paper, Ian Wilmut and his team described how they created 277 cloned sheep embryos; 90 percent of them failed to develop long enough to be implanted in a womb; Dolly was the only sheep to be born.[6] In 2001, Wilmut and other colleagues described the very high rates of "fetal retardation," cardiopulmonary defects, and "pregnancy failure" they were seeing in pregnancies involving cloned offspring.[7] In the years since, the situation has not changed much. As recently as 2010, about only 1 to 3 percent of cloned animal embryos transferred to females resulted in live births.[8]

There is no reason to think that cloned human embryos would fare any better. In the 2013 cloning experiments, roughly one in five cloned embryos reached the blastocyst stage,[9] while scientists from one of the teams that succeeded at human cloning in 2014 wrote that "a realistic expectation is that this protocol will result in about 10 percent of the oocytes developing to the blastocyst stage."[10] (By way of comparison, this puts the viability of cloned human embryos well below the survival rate of embryos produced through IVF, where roughly half of fertilized

embryos survive to the blastocyst stage.[11]) In their attempts to create cloned rhesus monkeys, Mitalipov and his team reported in 2010 that they had transferred 67 cloned embryos to ten females. Five pregnancies were established, with a single fetus reaching the stage at which a heartbeat could be detected before a miscarriage at eighty-one days of gestation (about half the normal gestation period for that species).[12]

Although the precise mechanisms that account for the impaired development in cloned embryos remain poorly understood, scientists do have some tentative explanations. For example, it seems that when the nuclei of adult cells are used for cloning, the newly created cells go on acting like adult cells, failing to become as embryo-like as they need to be—that is, they might continue to express genes involved in their "former lives" as, say, skin cells instead of the genes necessary for embryonic development.[13] Also, defects in the placenta have been found by scientists to account for many of the miscarriages of cloned animals,[14] including the Mitalipov team's monkey-clone pregnancy.[15] And medical problems continue to manifest during later stages of fetal development in cloned animals.[16]

In short, any project with any hope of succeeding at human cloning would result in a large number of pregnancies that miscarried, a larger number of implanted embryos that failed to result in pregnancies, and a still larger number of embryos that failed to develop to the point at which they could be implanted. This is a grim picture indeed.

Birth defects and long-term problems. Cloned animals that survive long enough to be born often suffer from health problems. A literature survey of developmental defects in cloned animals showed that while postnatal defects are relatively uncommon in mice and pigs (typically 10 percent or fewer clones display defects), they are wide-ranging in cattle (from 0 to 100 percent in selected studies, with a median of 44 percent displaying defects).[17] Common problems include kidney disorders, liver fibrosis, and heart defects.[18]

Cloned ruminants in particular often display symptoms of large offspring syndrome (LOS), which typically involves unusually large size and a variety of organ defects.[19] The symptoms of LOS are somewhat similar to Beckwith-Wiedemann syndrome (BWS) in humans. BWS entails a larger-than-usual growth pattern and a range of health risks and physical abnormalities. The fact that BWS has a significantly higher incidence among children who are produced using in vitro fertilization[20] suggests that at least some of the symptoms associated with LOS and BWS stem from embryonic manipulation rather than the cloning procedure itself.[21]

Another concern is the length of telomeres in cloned animals. Telomeres are nucleotide sequences that protect the ends of chromosomes from deterioration. Under normal conditions, the length of telomeres in an animal's cells gradually shortens through fetal development, continuing to shorten through adulthood and old age. Since somatic cell nuclear transfer involves the use of an adult cell nucleus, it has been thought that clones might have shorter telomeres than normal organisms and display accelerated aging (a concern that was first raised in the case of Dolly).[22] Analyses of cloned animals have differed in their findings on telomere length: some cloned animals display shorter than normal telomeres, some have telomeres of normal length, and some even have longer-than-normal telomeres.[23]

Supposed Benefits of Cloning-to-Produce-Children

Despite the risks described above, some advocates have argued that, if cloning could be made safe, it could offer a way to improve the health and well-being of children. This argument takes three general forms. First, cloning could allow individuals or couples who are affected by genetic disease to have children genetically related to (one of) them while reducing the risk that their children would inherit the disease. Second, cloning could allow prospective parents to protect their children from a broad array of diseases known to be associated with genetic risk factors. Third, the technique could be used to create "enhanced" children by cloning an individual considered excellent in some way.

Cloning to select against bad genes ("negative eugenics"). The most straightforward scenarios in which cloning could be used to prevent genetic disease involve what are called simple genetic diseases, or diseases that are caused by mutations in single genes and are passed on in accordance with the basic Mendelian rules of inheritance. For instance, if both members of a couple know, as a result of genetic testing or from their family history, that they each carry a single copy of the same recessive gene for Tay-Sachs disease, then there will be a one-in-four chance that any child the couple naturally conceives will inherit the recessive gene from both parents, and therefore have the disease. By instead cloning one or the other would-be parent, the couple can be guaranteed to have a child with only a single copy of the recessive disease-causing gene, thus ensuring that the child will not be affected by the disease.

However, scenarios like this one (and others involving simple genetic diseases) seem implausible, because there are other existing technologies

that doctors can recommend to achieve the same end—including sperm or egg donation and preimplantation genetic diagnosis (PGD). If a couple used a sperm or egg donor who is not a Tay-Sachs carrier (which can be ascertained through relatively simple genetic testing), the couple could be sure that their child would not be affected by the disease. Likewise, PGD could be used to select only those embryos that do not have two copies of the Tay-Sachs gene.

To be sure, neither of these methods is without its own moral problems—particularly PGD, which involves selectively discarding embryos that are deemed "defective." But the existence of these alternatives makes it less likely that cloning will be used to prevent serious genetic diseases.

Cloning to select for good genes ("positive eugenics"). In addition to preventing simple genetic diseases, cloning could also be used to reduce the risk of diseases caused by combinations of genetic risk factors. Many, perhaps even most, serious diseases—from heart disease and stroke to cancer—have some heritable, genetic component. Sexual reproduction will always result in unpredictable combinations of genes, including combinations that will dispose children to unpredictable varieties of diseases. Cloning could be used to avoid the uncertain genetic outcomes of sexual reproduction, and to give children the best, most healthful genes possible. For example, bioethicist Gregory E. Pence imagines a fictional scenario in which a couple might choose to clone the mother's healthy 90-year-old grandfather, on the assumption that "a human baby born with his genes now has a life-expectancy of 120 years."[24]

But choosing a genome that will tend to be free of disease is more difficult than simply finding a person who has lived a long and healthy life. The effect of most genes on health and well-being is not deterministic but probabilistic, and is subject to environmental influences. A perfectly healthy person, even a perfectly healthy 90-year-old, may nonetheless have genes that give him a relatively high probability of developing certain complex diseases under certain environmental conditions. It could be that the 90-year-old man's genes were uniquely suited for the place and time and ways in which he lived, but not for the conditions under which his clone will live, conditions that could be very different.

Furthermore, while improvements in technology may reduce the risks associated with cloning, using cells from exceptionally long-lived individuals to select for genes disposing to health and longevity may pose its own risks. Older individuals will have shorter telomeres and a higher chance of having accumulated mutations in their somatic cells, and will

likely have cells that will be more difficult to "reprogram" through cloning.[25] For cloning to seem like a reasonable way to ensure the health of one's child, one would need to be very sanguine about the many concrete risks of developmental defects and simultaneously very paranoid about vague genetic risk factors for diseases.

Cloning for "human enhancement." Much of the enthusiasm for and anxiety about human cloning over the years has been concerned with the use of cloning as a genetic enhancement technology. Scientists, and especially science-fiction writers, have imagined ways of using cloning to replicate "persons of attested ability" as a way to "raise the possibility of human achievement dramatically," in the words of J. B. S. Haldane.[26] As molecular biologist Robert L. Sinsheimer argued in 1972, "cloning would in principle permit the preservation and perpetuation of the finest genotypes that arise in our species."[27] Candidates for this distinction often include Mozart and Einstein, though the legacy of eugenics in the twentieth century has left many authors with an awareness that those who would use these technologies may be more interested in replicating men like Hitler.[28] (While in most cases, the idea of cloning a dictator like Hitler is invoked as a criticism of eugenic schemes, some writers have actually advocated the selective eugenic propagation of tyrants—for instance, the American geneticist Hermann J. Muller who, in a 1936 letter to Stalin advocating the eugenic use of artificial insemination, named Lenin as an example of a source of genetic material whose outstanding worth "virtually all would gladly recognize."[29])

Today, eugenics has a deservedly negative reputation, and the idea of using a biotechnology like cloning to replicate individuals of exceptional merit is *prima facie* ethically suspect. However, advocates of eugenic enhancement have never entirely disappeared, and their influence in bioethics is arguably not waning, but waxing. In recent years academic bioethicists like John Harris and Julian Savulescu have been attempting to rehabilitate the case for eugenic enhancements on utilitarian grounds.[30] For these new eugenicists, cloning-to-produce-children represents "power and opportunity over our destiny."[31]

This new eugenics needs to be confronted and refuted directly, since insisting on the self-evident evil of eugenics by pointing to historical atrocities committed in its name may become increasingly unpersuasive as memories of those atrocities dim with time, and as new technologies like cloning and genetic engineering make eugenic schemes all the more attractive. Furthermore, as the philosopher Hans Jonas noted in a

critique of cloning, the argument in favor of cloning excellent individuals, "though naïve, is not frivolous in that it enlists our reverence for greatness and pays tribute to it by wishing that more Mozarts, Einsteins, and Schweitzers might adorn the human race."[32]

In an important sense, cloning is not an enhancement, since it replicates, rather than improves on, an existing genome. However, as Jonas's remark about the human race indicates, the cloning of exceptional genotypes could be an enhancement at the population level. And from the point of view of parents who want children who can checkmate like Kasparov, belt like Aretha, dunk like Dr. J, or bend it like Beckham, cloning could represent a way to have offspring with the exceptional abilities of these individuals.

Arguably, cloning is a less powerful form of genetic engineering than other techniques that introduce precise modifications to the genome. After all, cloning only replicates an existing genome; it doesn't involve picking and choosing specific traits. This weakness may also, however, make cloning more appealing than other forms of genetic engineering, especially when we consider the genetic complexity of many desirable traits. For example, some parents might seek to enhance the intelligence of their children, and evidence from twin studies and other studies of heredity seems to indicate that substantial amounts of the variation in intelligence between individuals can be attributed to genetics.[33] But any given gene seems to have only a tiny effect on intelligence; one recent study looking at several genes associated with intelligence found that they each accounted for only about 0.3 points of IQ.[34] With such minor effects, it would be difficult to justify the risks and expense of intervening to modify particular genes to improve a trait like intelligence.

Cloning, on the other hand, would not require certain and specific knowledge about particular genes, it would only require identifying an exceptionally intelligent individual and replicating his or her genome. Of course the cloned individual's exceptional intelligence may be due to largely non-genetic factors, and so for a trait like intelligence there will never be certainty about whether the cloned offspring will match their genetic progenitor. But for people seeking to give their child the best chance at having exceptional intelligence, cloning may at least seem to offer more control and predictability than gene modification, and cloning is more consistent with our limited understanding of the science of genetics. Genetic modification involves daunting scientific and technical challenges; it offers the potential of only marginal improvements in complex traits, and it holds out the risk of unpredictable side effects and consequences.

Of course, it is possible that cloning could be used in conjunction with genetic modification, by allowing scientists to perform extensive genetic manipulations of somatic cells before transferring them to oocytes. In fact, genetic modification and cloning are already used together in agriculture and some biomedical research: for larger animals like pigs and cattle, cloning remains the main technique for producing genetically engineered offspring.[35] (The prospect of cloning being used in combination with other genetic engineering techniques is discussed in detail in Part Three.)

Using cloning as an enhancement technology requires picking some exceptional person to clone. This necessarily separates social and genetic parenthood: children would be brought into the world not by sexual pairing, or as an expression of marital love, or by parents seeking to continue and join their lineages, but by individuals concerned with using the most efficient technical methods to obtain a child with specific biological properties. Considerations about the kinds of properties the child will have would dominate the circumstances of a cloned child's "conception," even more than they already do when some prospective parents seek out the highest-quality egg or sperm donors, with all the troubling consequences such commodified reproduction has for both buyers and sellers of these genetic materials and the children that result. With cloning-to-produce-children for the sake of eugenic enhancement, parents (that is, the individuals who choose to commission the production of a cloned child) will need to be concerned not with their genetic relationship to their children, but only with the child's genetic and biological properties.

Normally, the idea of cloning as an enhancement is to create children with better properties in which the improvement resides in an individual and his or her traits, but some thinkers have proposed that cloning could be used to offer an enhancement of social relationships. This is the very reason given in the novel *Brave New World*: the fictional society's cloning-like technology "is one of the major instruments of social stability!…Standard men and women; in uniform batches," allowing for excellence and social order.[36] And as the geneticist Joshua Lederberg argued in 1966, some of the advantages of cloning could flow from the fact of the clones' being identical, independent of the particular genes they have. Genetically identical clones, like twins, might have an easier time communicating and cooperating, Lederberg wrote, on the assumption "that genetic identity confers neurological similarity, and that this eases communication" and cooperation.[37] Family relationships would even improve, by easing "the discourse between generations," as when "an older clonont would teach his infant copy."[38] Lederberg's imaginings will

rightly strike today's readers as naïve and unsettling. Such a fixation on maintaining sameness within the family would undermine the openness to new beginnings that the arrival of each generation represents.

Before we embark on asexual reproduction in order deliberately to select our offspring's genes, we would do well to remember that sexual reproduction has been the way of our ancestors for over a billion years, and has been essential for the flourishing of the diverse forms of multicellular life on earth. We, who have known the sequence of the human genome for a mere fifteen years—not even the span of a single human generation—and who still do not have so much as a precise idea of how many genes are contained in our DNA, should have some humility when contemplating such a radical departure.

Cloning as a Source of Genetically Matched Tissues

Sometimes, cloning-to-produce-children is discussed in another context—one that would not serve to benefit the created children, but rather to benefit older people with the same genome, by producing children to serve as sources of genetically identical cells, tissues, or even organs for transplantation.

The idea of creating clones to harvest their organs is a staple of dystopian science fiction; in many stories, cloned people are kept as disposable organ banks for morally depraved elites.[39] These fictional societies, in which the most basic notions of human rights are abandoned, can easily be dismissed as highly unrealistic. The National Bioethics Advisory Commission, in its 1997 report, wrote that "the notion of using human cloning to produce individuals for use solely as organ donors is repugnant, almost unimaginable, and morally unacceptable."[40] The commission went on to write that a "morally more acceptable and potentially feasible approach is to direct differentiation along a specific path to produce specific tissues (e.g., muscle or nerve) for therapeutic transplantation rather than to produce an entire individual."[41] However, since the product of human cloning is a human embryo, using cloning to produce tissues or organs directly rather than producing "an entire individual" ignores the fact that the product of human cloning already is "an entire individual," and manipulating its development to transform it into specific tissues would amount to killing it.

But there are more realistic, and less obviously unethical, applications of cloning to create genetically matched cells and tissues. Parents with a child affected by a disease like leukemia may wish to clone that child in order to provide the affected child with genetically matched cord blood or

bone marrow for transplantation. The first uses of bone marrow transplantation to treat chronic myeloid leukemia involved identical twins,[42] but doctors soon discovered that siblings, or even unrelated donors with identical human leukocyte antigens, could also provide bone marrow.[43] Today, parents with children affected by diseases like these may use IVF and PGD to have a child whose cord blood will be a match for their sick child, since one in four siblings will have compatible bone marrow and cord blood.[44] Such "savior siblings" are generally created so that they may provide hematopoietic stem cells (the stem cells found in bone marrow or cord blood) for transplantation, rather than organs like kidneys. However, scientists have found evidence that kidney transplantation is more effective between identical twins than between siblings, including siblings that have compatible human leukocyte antigens.[45] Human cloning could be used to produce children who will serve as savior siblings, providing not only cord blood, which can be collected with little risk to the child, but also perhaps organs like kidneys.[46]

Creating savior siblings through PGD and IVF is ethically problematic even when the child is subject only to the relatively safe procedure of cord blood collection. Cloning would take the instrumentalization of the newly created child even further, and may open the door toward more dangerous and exploitative forms of transplantation.

An Unjustifiable Experiment

The application of cloning to human beings will always be an ethically unacceptable form of human experimentation.

The first children to be cloned would be in no position to consent to being research subjects for the experimental use of a new technology. Whatever improvements might someday be made in the safety of animal cloning, the high variability between the health outcomes of cloned animals of different species means that the safety of cloning-to-produce-children will initially be unknowable.[47]

Similar arguments were made against IVF when it was under development in the 1970s. Medical ethics holds that "the move to human experimentation is made only when physicians secure the partnership of an informed, consenting volunteer," wrote Paul Ramsey in 1972.[48] The first IVF experiments could not be carried out ethically, he warned, since "the unmade child has not 'volunteered' to help the scientist."[49] To ensure that a technique for creating life is safe enough to be ethically justifiable would paradoxically require experiments made under conditions where

that knowledge is not available, and such experiments would themselves be unjustifiable: as Ramsey writes, "we cannot morally *get to know* how to perfect this technique."[50]

Though IVF has not been perfected—it remains associated with some elevated risks of birth defects and health problems[51]—it has apparently proven safe for the great majority of babies born through it, which is why the technique has come to be embraced by most doctors, prospective parents, and bioethicists. Some cloning advocates argue that cloning-to-produce-children might follow the same path as IVF, skipping from ethically unacceptable experimentation to a widely accepted practice. In 2001, IVF pioneer Robert Edwards compared criticism he had received in the 1970s to the criticism being leveled at human cloning, and argued that eventually cloning could come to be accepted as an infertility treatment just as IVF has been.[52] A 2006 article in the *Journal of Medical Ethics* noted that pro-cloning arguments are "highly analogous to rationalizations [that were] used to justify IVF treatment" and concluded that cloning should be permitted to proceed as IVF was.[53]

The fact that IVF has proven (relatively) safe in humans, at least for those embryos that develop into babies, is of course not evidence that the very different technology of cloning by somatic cell nuclear transfer will also prove safe in humans. And the fact that IVF has proven safe proves neither that the original IVF experiments were ethical (they were not) nor that the success of the IVF experiments provides ethical justification for proceeding with human cloning experiments (it does not). The notion that experiments can be ethically justified by their results would render medical ethics meaningless, since it implies that *any* experiment can turn out to be ethically justified if harm happens not to befall the subjects, or if the harm to some subjects is judged to be outweighed by the benefits to others. As Dr. Henry K. Beecher wrote in his seminal 1966 article on the ethics of clinical research, "an experiment is ethical or not in its inception; it does not become ethical *post hoc*—ends do not justify means."[54]

Some advocates of human cloning argue that because the cloned child does not exist until he is cloned, then the cloned child cannot claim to have been really harmed unless the harms that result from his being created are so grievous that he would be better off not existing.[55] This doctrine would leave us unable to make the most straightforward judgments about the responsibilities we owe to future generations unless we adopt the dark notion that a person can be so grievously injured that his or her life is not worth living. For example, imagine a morally odious experiment in which a scientist induces random mutations in human sperm and egg cells using

chemicals or radiation, and then uses those cells to create embryos. The scientist transfers the embryos to willing surrogates that carry the embryos to term. Such actions would clearly put the resulting children at an elevated risk of a wide range of genetic defects. Surely the scientist could be said to be responsible for the diseases and birth defects that would predictably result from having exposed the germ cells to radiation or other mutagens. And surely we would hold that these diseases and birth defects were bad for the children. Therefore we could conclude that the scientist has harmed them, and that for this reason (among others) the scientist should not have performed the experiment. Even if the scientist had been able to find gamete donors to give free and informed consent to exposing their genetic offspring to such risks, the proper response would not be to conclude that, having obtained the consent of the relevant parties, the scientist conducted the study ethically. Rather, we would condemn these callous gamete donors as complicit in a grave evil perpetrated on their children.

The above thought experiment is not meant as a suggestion that approving cloning-to-produce-children will put us on a slippery slope to such obviously unethical experiments. Rather, it is intended to illustrate the absurdity of believing that (as University of Texas law professor John A. Robertson put it) "the harmful effects of cloning cannot truly harm the clone, because there is no unharmed state, other than non-existence, that could be achieved as a point of comparison."[56] Such a lax standard denies us the most compelling and obvious reasons for condemning experiments that are clearly unethical.

Whether it is ethical to create children using experimental methods turns not only on the scientific evidence (because, among other reasons, the scientific evidence will necessarily be decisively incomplete at first) but also on the moral meaning of the relationship between prospective parents and their children. If parenthood is seen simply as a project chosen by individual adults—much like any of the other projects individuals happen to choose—then the interests of the as-yet-to-exist child and the responsibilities of the parents toward that child fall out of view. If, as argued below, we view parenthood in the context of the lived experience and traditional meaning of human procreation, we can see the obligations that parents have to those who are not yet born.

Deeper Moral Issues

The potential health and safety problems and the unavoidably experimental nature of cloning-to-produce-children are reasons enough to put

it beyond the pale. But there are other reasons that cloning is morally objectionable—deeper reasons hinted at by the indignation that the prospect of cloning elicits in many Americans. Surveys of Americans' positions on moral issues have consistently ranked cloning-to-produce-children as among the most universally condemned actions. (In a 2014 Gallup survey of 1,028 U.S. adults, marital infidelity was the only polled option to rank as less morally acceptable than cloning.[57])

The public's strong moral opposition to cloning can be unclear and difficult to express. Broadly speaking, commentators have tended to divide into two camps concerning the public's moral reaction against human cloning. Some have sought to articulate the moral insights about human procreation and the meaning of the family that concerns about cloning might intimate. Others have evaluated the public's objections to cloning in terms of moral doctrines of autonomy and individual choice, concluding that those objections are largely misplaced.

Our position is that the repugnance most people feel at the idea of human cloning is justified, if in need of articulation and clarification. The deeper moral objections to cloning also need to be defended against bioethicists and philosophers who have sought to debunk them. Americans who harbor a sense that cloning is morally wrong but cannot quite explain why should have a good conscience about their good consciences.

Repugnance and Its Discontents

In an influential 1997 essay, Dr. Leon R. Kass argued that, in crucial cases, a feeling of repugnance can be "the emotional expression of deep wisdom, beyond reason's power fully to articulate it."[58] Cloning, Kass argued, is one of those cases:

> We are repelled by the prospect of cloning human beings not because of the strangeness or novelty of the undertaking, but because we intuit and feel, immediately and without argument, the violation of things that we rightfully hold dear.[59]

While of course "revulsion is not an argument," Kass stated, we should take seriously our feelings about the wrongness of cloning, seeking to understand their origins and weigh their validity.[60]

Some critics dismiss the common revulsion at cloning as merely an emotional response that has no place in rational public debate. Kass's claim that repugnance may be "the emotional expression of deep wisdom"[61]

has been derided by some as "the yuck factor."[62] Its detractors note that disgust is an inadequate source of moral guidance, pointing out actions that are commonly thought to be disgusting but are nonetheless morally uncontroversial. For example, Martha Nussbaum mentions "open heart surgeries and colonoscopies" as examples of actions commonly thought to be disgusting but nonetheless morally acceptable.[63]

But in Kass's essay, which is generally mentioned by these critics as a prime example of faulty moral reasoning from disgust, the word "disgust" does not even appear. Kass instead uses the term "repugnance." This is not simply an issue of critics misreading a single essay, but rather reflects a distorted view of the *moral* character of the common reactions against cloning. "Repugnance" carries with it a sense of moral disapprobation, indignation, and even horror that are not at all implied in the far more morally neutral term "disgust." So when Martha Nussbaum and others note that there are many activities that are commonly thought to be disgusting but that are nonetheless morally acceptable, this has little bearing on whether a sense of *repugnance* should be taken seriously, because while colonoscopies may commonly be considered *disgusting*, no one finds them *repugnant*.

To be sure, the fact that most people find the idea of human cloning morally troubling and repugnant is not proof that cloning is wrong. There have been times when majorities have been wrong about what is morally repugnant: xenophobia and racism are often accompanied by a moralistic sense of repugnance, yet we rightly reject them both. The question is how moral philosophy should respond to powerful and widespread, yet poorly articulated, moral reactions. The philosopher Hilary Putnam offered a useful analysis of the role of strong moral reactions against cloning in a 1999 lecture, in which he argued that the strong and immediate moral condemnation of human cloning was justified, even though the grounds for this condemnation could not be "easily derived from already-codified moral doctrines."[64] Reflecting on the unease we feel about human cloning that cannot be articulated in terms of liberal individualism, Putnam argues that the family is an important "moral image," one that illustrates values like a willingness to accept and celebrate diversity, since "with one's children (and one's parents) we can only accept what God gives one to accept."[65] Rather than taking "already-codified moral doctrines" as the starting point and evaluating both cloning and the moral reactions against cloning in terms of these doctrines, Putnam took seriously the spontaneous moral horror at the idea of cloning, and by reflecting on its meaning, articulated the sense in which cloning would distort the "moral image" of the family.

Motives and Morality

Thinking about cloning-to-produce-children in terms of the way it would affect the family and the relationship between the generations requires that we think not only of its direct effects, but also of its moral context—the goods that cloning might serve or harm, the attitudes and beliefs about the family and reproduction that cloning would express or embody, and the motives that might draw individuals or families to use cloning to reproduce. Some critics have argued that this approach to the ethics of human cloning amounts to unwarranted speculation. Philosophy professor Allen E. Buchanan, for instance, argues that ethicists like Kass "insinuate that the only reasons most people have for producing a human by cloning are unseemly—for example, to act out a sick fantasy of recreating their dead child from the DNA in a strand of hair or to indulge in their narcissism."[66] As a counterexample, Buchanan offers an unnamed student who told him

> that she would definitely consider cloning—if it were perfectly safe (or at least as safe as ordinary human reproduction)—if she was at the stage of her life when she wanted a child but didn't have a partner.[67]

The student went on to point out the dangers and problems with IVF, and said that "she would rather produce a child with DNA from just one parent than 'borrow' sperm from somebody that wasn't her partner."[68] Though this student is right that IVF poses some serious dangers to women and children, these risks are hardly good reasons to use human cloning, since any remotely plausible cloning technology would involve the same risks to the mother, and would almost certainly pose more serious risks to the future child.[69] What we are left with, then, is the desire to have a child without a "partner," even an anonymous sperm donor. What the young woman seeks to acquire through cloning is precisely what Kass described as "the ultimate 'single-parent child.'"[70]

The ability to satisfy the desire for children without a "partner" is indeed one of the ways cloning would fundamentally transform the nature of human procreation. While contraception and technologies like artificial insemination and IVF have done much to separate sex from reproduction, no reproductive technology other than cloning has actually made it possible to eliminate the need for biological contributions from two human beings to create a child.[71] As the desire of Buchanan's student suggests, this radical transformation of the meaning of the relationship between the generations would not be an unintended consequence of the

use of cloning, but would in many cases be the aim of those using the technology. How would cloning affect the relationship between the generations and the ways we think about the family? A desire for a certain kind of relationship with one's cloned offspring would be an important part of the decision of prospective parents to use cloning to reproduce. Moral reflection on cloning-to-produce-children should be concerned with the question of whether it would contribute to or diminish the well-being of children, parents, and families.

Confounded Kinship Relations and the Weight of Expectations

Those who have sought to debunk the moral objections to cloning-to-produce-children have generally focused on what science tells us about what cloned children might be like. However, no evidence about the biological properties of children created through technologies like cloning could speak to the way the act of manufacturing children using these technologies will shape the relationship between the generations. Human procreation is about more than genetics and physiology; it is also about the link between the generations, between ancestors and descendants, the past and the future.

For example, some supporters of cloning point to the existence of naturally occurring identical twins as proof that we have little reason to worry about cloning. Law professor Kerry Lynn Macintosh, in a recent pro-cloning book, exhibits a sound grasp of the science of human cloning and genetics, and rightly argues that two people who share the same DNA will not possess "the same intellectual, psychological, or behavioral traits."[72] This is correct. Our experience of identical twins shows that individuals with identical genomes are capable of forming their own life plans, their own senses of who they are, and all the rest of the complex psychological and social desiderata that constitute personal identity. They have their own thoughts, beliefs, and actions, and even their own unique sets of fingerprints. The various differences we can see between identical twins provide clear evidence of the limits of genetic determinism.

However, the comparison to identical twins generally skips over an even more important sense in which cloned children will be biologically, psychologically, and socially different from the people from whom they are cloned: the cloned children will be *younger*. Whatever the genetic basis for Lebron James's talent as a basketball player, a clone of Lebron James would certainly not be born with that talent—he would be born

crying and wetting his diapers like any other baby. A baby with a genome identical to that of an adult progenitor would be physiologically, psychologically, and socially much more similar to other babies than to his older "identical twin."

While the difference in age between a cloned child and the person from whom he is cloned is the most obvious reason the two will not have identical biological or psychological properties, this difference in age is also the reason why cloned children will face challenges in forming their own sense of individuality and identity. Unlike identical twins, who grow up simultaneously, the cloned child's elder "twin" will stand as a kind of genetic prophecy, and a source of expectations for how the younger child's life might turn out, even in the unlikely event that those expectations had nothing to do with the choice to produce a clone in the first place.

An individual created through cloning is likely to experience his life quite differently if he knows that he was made to have a genome identical to some other person's—either the person (or one of the people) raising him as a "parent," or some third party selected for exceptional abilities, or a family member, perhaps deceased, whom the parents have chosen to clone. Even if a cloned child is not told of his origins, parents will, in the act of specifying their child's entire genome, be exercising control over their child's origins and identity that will shape the expectations they have for the child that could distort their own openness to the child's developing autonomy and aspirations.

Those who use cloning may *not* want their children simply to follow in the footsteps of the individuals from whom they were cloned. Rather, parents may be on the lookout for specific environmental differences that could allow the cloned children to fulfill the potential that their genetic progenitors possess. As cloning advocate Gregory E. Pence writes, cloning "would be a naturally controlled experiment.... The genome of the ancestor is the control, and variations in genes, environment, or choice will show how things could have been different."[73] Pence's specific examples here include the idea of a cloned child saying to his ancestor, "If only you tried harder, Dad, you could've published your book on James Joyce. You had the ability! After all, I published ten books before I was forty and you had your whole lifetime!"[74] Even those who are open to the idea of their cloned child being different from them will be tempted, Pence writes, to look to their cloned child to "see how things might have been different."[75]

Macintosh dismisses the distinctions between identical twins and clones as "specious," arguing that "twins who grow up together are

exposed to a barrage of information about the traits and talents associated with their shared genome" but that they nonetheless "retain their individuality."[76] But the difference between cloned children and twins is not in the information that the clone might receive about his genetic traits, but in the ways that the act of cloning will shape the expectations surrounding his life, especially the expectations of his parents. Comparisons with identical twins likewise obscure the most important relationship between the person being cloned and the cloned child: the child may be *genetically* an identical twin, but is generationally a *child*, a son or a daughter. That cloning would conflate these two kinds of kinship is a large part of the deep disquiet we feel with the way cloning transforms the basic structure of the family.

Identical twins are siblings—in addition to sharing a genome, they share a genetic mother and a genetic father. A cloned child, on the other hand, does not share a genetic mother and a genetic father with his "twin"; rather, his "twin" will be his sole direct genetic ancestor. That a cloned child will have essentially only a single genetic ancestor is at the heart of the moral meaning of cloning-to-produce-children. But some defenders of human cloning argue that a clone would indeed have two genetic parents—the two genetic parents of the person whose somatic cell nuclei were used for the cloning procedure.[77] There is a certain technical sense in which this is true—the origin of the cloned child's genome will have been the sexual reproduction of the cell donor's parents. (Cloned children could also sometimes be said to have two genetic parents insofar as the cloned child's mitochondrial DNA will be inherited from the egg donor rather than the somatic cell donor.[78] But unlike in sexual reproduction, the egg donor and the somatic cell donor will make vastly unequal genetic contributions to the child.[79])

Identifying parenthood solely with this technical sense of genetic ancestry puts a spotlight on some of the troubling ways cloning would distort the relationship between the generations. The "genetic parents" of a cloned child in this sense could be dead decades before their child is conceived, and the biological connection between them and their new genetic child will be completely mediated by another individual, namely, their child, the person whose genome has been replicated. And of course cloned children could decide one day to clone themselves in turn, further separating the technical sense of genetic parenthood from any actual relationship between the generations. Clones could be created who would be the "identical twins" of their long-deceased ancestors, with their "genetic parents" a distant memory on a bare and branchless family tree.

It is possible to imagine scenarios in which the parents of the person whose genome is replicated would also act as parents to the child created through cloning. For instance, the parents of a young child might choose to clone that child and could raise the resulting second child as if it were a natural sibling of the first. John A. Robertson points to a number of circumstances under which parents might seek to clone one of their minor children, including the desire for a "second child like the first" or one "who could be a source of tissue or organs" or a second child "to replace a dead or dying child with one with its genes."[80] As Robertson articulates it, the right to create clones and rear them is fundamentally a right of adults to define for themselves, on the basis of their own desires and interests, the meaning of the relationship between the generations. This singular emphasis on procreative liberty and self-definition is supposed to trump most other rights and interests. Thus, when it comes to creating a clone of an existing child, Robertson avers that the first child "may have no right to determine whether or not she is cloned," since the child is not herself "reproducing directly"—rather, it is her parents who are reproducing by creating a "later-born identical twin."[81] Likewise, if a person wishes to create a clone of himself, Robertson argues that he need not seek his parents' consent, even though the resulting child will genetically be a child of theirs.[82] Robertson acknowledges the risk of "confusing kinship and family relations," but he expects that with a little counseling, even those risks can be managed.[83]

As with many existing reproductive technologies, cloning undermines the connection between biological and social parenthood. Already surrogacy and the anonymous provision of egg and sperm allow prospective parents to decide whether a given biological relationship should matter to the child. These reproductive techniques are often accompanied by contractual arrangements among the various involved parties (though not, of course, the child), with the commissioning parents deciding such matters as whom the child will call "mother" and whom "father." Cloning takes this power to define the relationship between mother, father, and child even further, by allowing the prospective parent altogether to deny the child either a biological father or a genetic mother.

Concerns with Manufacturing

Another serious concern about the relationship between the generations is the way cloning would transform procreation into a *manufacturing* process. Even more than other reproductive technologies, cloning would

involve children being made by doctors and technicians in accordance with the designs and wishes of parents. This is often a theme in pop-culture depictions of cloning, with many science fiction movies featuring scenes of rows upon rows of cloned children, often growing in vats.[84] However, there is a more serious, less cartoonish objection to turning procreation into manufacturing. As the President's Council on Bioethics wrote in its report on human cloning:

> By using the terms "making" and "manufacture" we are not claiming that cloned children would be artifacts made altogether "by hand" or produced in factories. Rather, we are suggesting that they would, like other human "products," be brought into being in accordance with some pre-selected genetic pattern or design, and therefore in some sense "made to order" by their producers or progenitors.[85]

Some advocates of human cloning misunderstand and mischaracterize the argument that cloning turns procreation into manufacturing. For instance, Kerry Lynn Macintosh labels as the "artifact fallacy" the idea that "animals (or, potentially, humans) born through cloning are necessarily the flawed products of a technological process and can never be functional members of their species."[86]

Macintosh is mistaken to describe serious criticisms of human cloning in this manner. She quotes some of the Council's discussion about how cloning could result in family relations that "would differ from all existing family arrangements" because of the "unique, one-sided, and replicative biological connection to only *one* progenitor"[87]—but she then badly mischaracterizes that discussion: "This is another way of saying that the technology is unnatural and leads to unnatural results."[88] Macintosh's drastic simplification of the Council's argument would not be entirely false if the "unnatural results" were understood to be the relationships that would exist between the parents and the cloned child. But she claims that the Council's objection to cloning implies that any children "born through the technology must also be unnatural—that is, abnormal, strange, and artificial."[89]

Macintosh goes on to write that concerns over the idea of manufacturing children have "no justification in biology,"[90] but this is missing the point. As we discussed above, there are serious concerns that the use of cloning technology will result in medically harmful side effects for children, but the chief problem with the idea of transforming reproduction into a manufacturing process is *not* that this will result in the children being "flawed." The problem is that cloning would transform the meaning of the relationship between parents and children by changing the

process of reproduction from one of *begetting* to one of *making*.[91] This concern is with *how* cloning would bring children into the world (that is, by manufacturing) not with *what* the cloned children will be (that is, artifacts). Whether it is true that cloning would transform procreation into a process of manufacturing cannot be determined by examining the biological characteristics of children created through cloning. Rather, we must look to the meaning of the act itself, and how it differs from natural human procreation.

In natural procreation, children are a result not of *making*, but an outgrowth of *doing*—of sexual union between a man and a woman. Because the fruitfulness of natural procreation is not entirely under the control of the would-be parents, hope is the attitude cultivated in couples toward the prospect of children. The child can therefore be seen as a gift to be accepted in a spirit of gratitude and openness, or can at least be encountered as a new and unique being whose characteristics and future are unknown. But when made through technologically mediated processes, children can be seen by parents and doctors as products to be shaped and controlled, accepted or rejected. To some extent, this is already a problem with IVF, which gives would-be parents power over whether there will be a child; the problem is exacerbated by such "quality-control" procedures as preimplantation genetic diagnosis, which give parents a limited ability to make and select the child they want, the child that fits their plans, goals, and desires. Cloning takes the moral problems associated with these technologies much further. It puts parents in a position to specify the entire genome of the child by selecting a cell donor. Whether parents using cloning choose to clone themselves, a relative, or some other person whom they believe possesses exceptional genetic traits, the child's genome will be deliberately *chosen* by the parents. Of course, selecting the genome of a child is not a fully reliable way of determining the child's biological traits or properties, but it represents an unprecedented level of control: by creating a child with only one genetic parent, cloning allows for exact determination of a child's lineage.

By exercising this kind of control over the genetic ancestry and the genetic properties of children, cloning would undermine parents' openness toward what is novel in the next generation. Cloning would replace the attitude of unconditional parental love and acceptance with one of mastery, transforming the family into an arrangement ordered toward satisfying the desires of adults at the expense of the interests of children, rather than an institution meant to subordinate the desires of adults to the interests of children.

Macintosh argues that when cloning critics talk about cloning as manufacture, they open the door to stigmatizing and dehumanizing the children created through cloning.[92] However, as we stated above, the chief moral problems with cloning-to-produce-children are not with the cloned children themselves, but with the effects that the act of cloning will have on the relationship between the generations. *Clearly, if children are produced through cloning, they should be treated in accordance with the human rights and human dignity they share with all other human beings.*

Conclusion: Two Images of the Family

The debate over cloning-to-produce-children is chiefly a debate about a moral vision of the family that is increasingly widely held, one in which reproduction is seen as a freely chosen project of autonomous adults—supplanting the traditional image of the family in which romantic love between a man and a woman is tied together with marriage and the begetting of children.

The new moral image of the family, based on a doctrine of reproductive liberty, is an appealing one for a liberal society. The importance of freely made choice in this image of the family reflects the way philosophers sometimes imagine the structure and origins of liberal society: as autonomous individuals freely entering into contracts with one another to advance or defend their interests. This image of the family was perhaps most evocatively expressed in the Supreme Court's 1992 *Planned Parenthood v. Casey* ruling that extolled the importance of every individual being able to "define one's own concept of existence, of meaning, of the universe, and of the mystery of human life"[93] through access to technologies and techniques that add to their reproductive autonomy (in that particular case, abortion).

The central feature of this image of the family is adults freely choosing to "have a child." Thanks to biotechnology, what it means to "have a child" is increasingly becoming radically open: legal contracts allow prospective parents to choose which individuals with which biological relationships will be considered the child's parents (whether a particular woman is a "surrogate" or the recipient of a "donor embryo" is a matter of choice, not biology). Reproductive technologies increasingly allow parents to choose and control the kind of biological relationship they will have with their children.

Unlike political liberalism, however, the struggle for reproductive freedom is to a large extent not about ending systematic political or

social oppression, but is rather aimed at "ending reproductive roulette," or progressing from "chance to choice" or from "chance to purpose," to borrow from the titles of three books.[94] Reproductive technologies can allow couples who happen to be affected by the accidents of infertility or genetic disease to have healthy children. But these technologies can also dramatically expand the range of choices individuals can make about reproduction—allowing single individuals to have children without involving a husband or wife, or allowing couples or individuals to choose to have children who will possess a specific set of genetic properties by using DNA from some exceptional individual.

Of course, not all those, or for now not even very many of those, who find aspects of this vision of the family appealing endorse or even approve of cloning-to-produce-children. Many people in a liberal society believe that it is better for parenthood to be planned than for it to be "accidental," and that it is good for children to be "wanted." But few people, outside a handful of professional bioethicists, believe that autonomous choice and rational control are all there is to the family. Some technologies that allow individuals to plan their families, like contraception, are approved by the vast majority of Americans, while others like abortion are deeply divisive, and technologies like cloning and genetic engineering are widely condemned.[95]

The widespread opposition to human cloning and the controversies over other reproductive technologies are signs that Americans still find meaning in a different moral image of the family—one in which children are seen as gifts to be accepted with gratitude and in a spirit of openness to their fundamental *newness*. In this image of the family, the relationships and moral obligations of parents and children are not freely chosen, but are embedded in their biological and social contexts. This image of the family, and its place in the natural and social order was perhaps best articulated by Edmund Burke, in a famous passage:

> Dark and inscrutable are the ways by which we come into the world. The instincts which give rise to this mysterious process of nature are not of our making. But out of physical causes, unknown to us, perhaps unknowable, arise moral duties, which, as we are able perfectly to comprehend, we are bound indispensably to perform. Parents may not be consenting to their moral relation; but consenting or not, they are bound to a long train of burthensome duties towards those with whom they have never made a convention of any sort. Children are not consenting to their relation, but their relation, without their actual consent, binds them to its duties; or rather it implies their consent

> because the presumed consent of every rational creature is in unison with the predisposed order of things. Men come in that manner into a community with the social state of their parents, endowed with all the benefits, loaded with all the duties of their situation.[96]

In this image of the family, moral duties arise from the natural relationship of parents to children, duties that are not autonomously chosen or made in contracts. In our liberal society, where we enjoy so much freedom to choose those with whom we will associate in work, politics, and friendship, the family, for the most part, is a place of unconditional obligations. We rightly value our freedom to seek a "social state" other than that of our parents, but the obligations of love and support that parents owe to their children and the obligations of honor and respect that children owe to their parents remain truly obligatory, not matters of free choice.

The appeal of this understanding of the family surely helps explain why most Americans find the idea of human cloning morally repugnant. More than any other reproductive technology, cloning would undermine the "giftedness" of children, and because there are so few substantive reasons for using cloning-to-produce-children—cloning is more likely to cause harm to babies than to ensure their health—moral approval for cloning represents an extreme commitment to reproductive autonomy for its own sake.

But autonomy is a powerful force in our culture, so we should not imagine that cloning-to-produce-children will forever remain anathema to the American public. Other foundations of family life that have been held as common sense since time immemorial have been increasingly eroded by advocates of unfettered autonomy in a remarkably short time. Taking a stand against cloning now, while there is still a consensus among Americans that cloning is profoundly wrong, will be an essential part of a defense of the family in coming years.

But while it is important that we prohibit cloning-to-produce-children to prevent the long-term degradation of the family, we cannot do so without also making a strong case against the much more immediate threat posed by cloning-for-biomedical-research. It is to that case we now turn.