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Personhood and Cloning: Modern Applications and Ethics of Stem Cell and Cloning Technology

Sariah Cottrell McCarrey
Brigham Young University - Provo

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Sariah Cottrell McCarrey

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Steven L. Peck, Chair
Byron J. Adams
Jamie L. Jensen

Department of Biology

Brigham Young University

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ABSTRACT

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Sariah Cottrell McCarrey
Department of Biology, BYU
Master of Science

Within many communities and religions, including the LDS community, there is some controversy surrounding the use of stem cells – particularly embryonic stem cells (ESC). Much of this controversy arises from confusion and misconceptions about what stem cells actually are, where they come from , and when life begins. The theology of the Church of Jesus Christ of Latter-day Saints has interesting implications for the last of these considerations, and it becomes less a question of "when does life begin" and more an exploration of "when does personhood begin" or "when does the spirit enter the body." With no official Church stance, statements from Church leaders vary on this topic, and this first section of the thesis explores the philosophical and practical meaning of personhood with a biological background intended for those not familiar with the origin or uses of stem cells.

The second portion of the thesis explores possible cloning technologies. Recent events and advances address the possibility of cloning endangered and extinct species. The ethics of these types of cloning have considerations uniquely different from the type of cloning commonly practiced. Cloning of cheetahs (and other endangered or vulnerable species) may be ethically appropriate, given certain constraints. However, the ethics of cloning extinct species varies; for example, cloning mammoths and Neanderthals is more ethically problematic than conservation cloning, and requires more attention. Cloning Neanderthals in particular is likely unethical and such a project should not be undertaken. It is important to discuss and plan for the constraints necessary to mitigate the harms of conservation and extinct cloning, and it is imperative that scientific and public discourse enlighten and guide actions in the sphere of cloning.

Keywords: embryonic stem cells (ESC), personhood, spirit, body, *in vitro* fertilization (IVF), deontology, moral status, cloning, extinct, endangered, conservation, ethics, utilitarianism, somatic cell nuclear transfer

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BECOMING A PERSON: STEM CELLS AND LDS TEACHINGS

Introduction

Toying with life and death is a dangerous business. Recent scholarship demonstrates how deeply Mormon views are conditioned by our understanding of life and death and its relation to the eternities (Brown, 2012). Be it creating life or ending it, it is a weighty thing when we attempt to influence the existence or non-existence of a child of God outside of His system and direction. We know that the creation of life and the completion of life are two of the most important and beautiful events in earthly existence. Two of the Ten Commandments are dedicated to these ideas: "Thou shalt not commit adultery" and "Thou shalt not kill." Is it any wonder, then, that as a church we have very strong commitments towards anything that might involve either of these great themes? Is it any surprise that we meet issues of this kind with anxiety?

Because of the blessings we enjoy as our knowledge of the world increases, we have many difficult issues unique to our day. The issue of embryonic stem cell research is one of these. Interestingly, this issue involves both the giving and taking of life; it encompasses both ends of the spectrum of earthly existence. At first glance, some conclude that researching cells from embryos is the same as murder in the name of science. If this is right, then this research would certainly be wrong. That makes us hesitate. Fortunately, such is not likely the case. Embryonic stem cell research is a much, much bigger issue than this, and to say "Stem cell research is murder" is too simplistic, because it does not address the myriad of questions within this field of research. Here we will explain what embryonic stem cell research is, why it is an issue, and

investigate how we can reconcile the resulting moral questions with our unique Latter-day Saint perspective.

What are stem cells? What does "embryonic" mean?

Cells are the smallest unit of life, and every living thing consists of at least one or more cells. In this article, "cells" will refer exclusively to "human cells." There are different types of cells in humans, and they all have different tasks: a muscle cell's task is to contract, a neuron's task is to pass along information, etc. A neuron cannot contract like a muscle cell because it is already specialized (or differentiated) for its specific function in the nervous system.

Stem cells are unspecialized, which means they have the ability to develop into many different types of cells. Our bodies use stem cells constantly: in our intestines and bone marrow, stem cells regularly divide to repair and replace worn-out or damaged tissues.

The two main sources of stem cells we will discuss here are embryonic stem cells and somatic (or adult) stem cells. *Embryonic* stem cells come from an embryo, meaning the beginning stages of development after an egg is fertilized. Embryonic stem cells are remarkable because they can become any of the more than 200 types of cells found in humans; the same embryonic stem cell has the potential to become a cell in the heart, brain, taste bud, or kneecap. Somatic (adult) stem cells have significantly less potential than embryonic stem cells, because they can each only specialize into a limited handful of cell types. These include bone marrow, cord blood, and intestinal cells, among others. Somatic stem cells are commonly applied in medical procedures to replace or regenerate tissues that are damaged as a regenerative therapy. Although somatic stem

cells are routinely used safely and effectively, they do not have the same broad potential as embryonic stem cells for future medical advancements.

What do we use stem cells for? What potential do they hold?

We study stem cells not only because we hope to learn about cellular processes, we also use these cells to treat diseases and provide regenerative therapy. Embryonic stem cells' remarkable potential renders them more useful than somatic stem cells for achieving these goals. Embryonic stem cells have an especially promising role in therapies for the treatment of major human diseases and disorders (Stojkovic, Lako, Strachan, & Murdoch, 2004). The evidence indicates that, at this time, research on embryonic stem cells holds a great deal more promise than research on adult stem cells (United States, 2006, p. S7659).

Embryonic stem cell research has three specific areas of promise: (1) the study of human biological development, (2) testing of new and existing drugs and compounds, and (3) the cultivation of different types of cells, tissues, and organs (Baune et al., 2008). Each has great potential to impact our lives, but the third area of promise causes the most excitement. If we were able to cultivate artificial human tissue, this would open up possibilities for reducing rejection of transplanted tissues and to deal with shortages of necessary tissues for those needing organ or tissue transplants, as well as provide a means to repair significant damage that might otherwise result in severe disabilities or death (Bobbert, 2008).

Literally billions of lives could be affected, improved, or saved through advances achieved through embryonic stem cell research. Many scientists agree that stem cell therapies will be

critical for treating heart disease, cancer, and degenerative diseases of aging, including Parkinson's disease. Over half the world's population "will suffer at some point in life with one of these three conditions…. Stem cell research is a pursuit of known and important moral goods" (McGee & Caplan, 1999, p. 154). To arrive at these promising ends, scientists must take and use cells from embryos. Some perceive this as "killing" a person (i.e. the person the embryo can no longer become). However, this initial perception is neither logical nor true.

Stem cells have a great potential for helping humans fulfill Christ's directive to clothe the naked and visit the sick (Matt 25:34-36), which has always been one of the guiding tenets of our church. Mankind as a whole has likewise held service and compassion in the highest regard, as seen in the Hippocratic Oath. Both "the Western ethic of rescue and the practical structure of contemporary health care and other social institutions make it clear that among the deepest moral habits of human life is that of compassion for the sick and vulnerable" (McGee & Caplan, 1999, p. 153). It is our duty as Christians to be charitable. The Hippocratic Oath sworn by Western doctors includes the obligation to "respect the hard-won scientific gains of those physicians in whose steps I walk" and the promise to "apply, for the benefit of the sick, all measures [that] are required …. [and to] prevent disease whenever I can, for prevention is preferable to cure" (Tyson, 2001). These last two obligations reflect the modern medical ethics of beneficence (promoting the wellbeing of others) and non-maleficence (doing no harm). This oath means that doctors must respect and cannot dismiss scientific knowledge of the medical field, much of which has and likely will result from stem cell research. It also means that doctors support preventative medicine and methods, which stem cell research will certainly lead to. And most importantly, it means that doctors will do all that they can to help those in their care. These

obligations are heavy indeed if one views stem cell research as unethical; it invites the utilitarian question of greater good: which is more important, all the good that can be done through the research, or the potential for harm to the embryo? Of course, if there are reasons to believe that real harm is being done in this research to living persons, the question of its benefits will be outweighed by the rights of that being. So the question must be answered: who or what is harmed, and in what way? It is to that question we now turn.

What exactly is the issue?

The cells being researched in embryonic stem cell research come from an embryo. The conflict comes from the question of whether embryos are people, and whether it is killing a person to take embryonic cells for research. To understand the answers to this, it is important to understand and investigate the implications of: (1) the source of the embryos providing the stem cells, (2) when life begins, and (3) if scientists are killing people when researching embryonic stem cells.

Where do embryos come from?

Embryos for embryonic stem cell research primarily come from donations from IVF (*in vitro* fertilization) clinics. Embryos used in stem cell research coming from IVF clinics do *not* come from aborted fetuses or from eggs fertilized in a woman's body (Health, 2010); they come from surplus embryos slated for destruction at IVF clinics.

Infertile couples who want to have children have several options available to them, including IVF treatments to help the couple conceive. *In vitro* literally means "in glass," meaning in a test tube or an artificial environment *outside* of a living organism. *In vitro* fertilization is a technique

where an egg is fertilized in a lab, an artificial and external environment. The fertilized eggs are then transferred into the mother's uterus. IVF is expensive: including medications, the simplest IVF process runs around $10,000 (Medicine, 2011), and this is excluding any of the other diagnostic or analytical processes the couple will have already undergone prior to commencing IVF.

Pregnancy is not guaranteed through IVF, so several eggs are fertilized for each couple during IVF treatment in the event that either the attempt is unsuccessful or should patients want additional children in the future. Couples may preserve these embryos for future use by freezing and then storing them through embryo cryopreservation, with a starting rate of $1,000, and an annual cost of about $400 after the first year (Medicine, 2011). While this is expensive, it is much cheaper than undergoing the entire IVF process again should the couple want more children later. In 2002 there were nearly 400,000 frozen embryos in storage in the United States (Hoffman et al., 2003; United States, 2006). Occasionally, genetic screening tests on these test tube embryos reveal severe genetic disorders, and the couple selects another embryo. These embryos in particular will never be used by the couple for children – the purpose of the IVF clinic was to exclude embryos of this kind. These embryos, as well as other unneeded embryos, provide the couple with an ethical dilemma. When people have a surplus of embryos they do not need or want, they must choose between donating the embryos to other couples, discarding them, donating them for stem cell research, or paying to keep them frozen in storage indefinitely (Bangsboll, Pinborg, Andersen, & Andersen, 2004).

Viewpoints opposing embryonic stem cell research overlook the significance of the origin of these cells. Some say that donating these embryos to research equates to murder, and is the equivalent of abortion, but abortion deals with fetuses (more developed than embryos) inside a woman's womb, while stem cells donations involve embryos that were never and will never be in a womb. These IVF embryos slated for destruction do not have the potential to become people because they will never be transferred to a uterus. Former Senator Connie Mack, a pro-life Catholic, said: "For me, as long as that fertilized egg is not destined to be placed in a uterus, it cannot become life" (Wahrman, 2002, p. 59). In fertility treatments, there will inevitably be test tube embryos that are not needed and which will never be placed in a uterus. These embryos do not have the potential to become people if left in a test tube where there is no place for them to grow and develop, so of their own accord, these embryos lack all potential to become persons.

Let's investigate the above listed three alternatives for surplus embryos. Donating an embryo to another couple could be a way to avoid destroying the embryos outright, possibly seen as a form of adoption, but the LDS Church Handbook "strongly discourages in vitro fertilization using semen from anyone but the husband or an egg from anyone but the wife" ("Handbook 2: Administering the Church," 2011), so while donating embryos is a definite and real option, it is not necessarily consistent with church standards. Discarding embryos is to destroy them permanently as biohazardous waste. Discarding one's embryos seems to be the worst of these options: the embryo has no promise to ever become a person nor to ever be useful to mankind if it is disposed of. Keeping embryos frozen indefinitely may seem like postponing the couple's decision, but during the time the couple is not using those embryos it is just as surely preventing the embryos from becoming people as discarding them. There is far less controversy against the

costly freezing of embryos than there is against stem cell research, yet arguably, cryopreservation is no more ethical.

But if, instead of discarding embryos or preventing embryonic development, couples donate those embryos to research, those cells that will never become people have a great potential to be of permanent, lasting use to mankind. There is good reason to believe that this research is "necessary to develop cures for life-threatening or severely debilitating diseases … when appropriate protections and oversight are in place in order to prevent abuse" (Commission, 2000, p. 52).

To argue against embryonic stem cell research is, in part, to argue against IVF treatment. We, as a church, clearly do not contend that IVF is an immoral practice. Senator Hatch reported to the Senate in 2006 that at that time, "over 200,000 Americans [had] been born through this technique [IVF] that is widely accepted today" (United States, p. S7659). Hundreds of thousands of Americans exist *because* of this process. Our church is known for our emphasis on families, and accordingly, Utah has a high number of fertility clinics to help couples conceive, many of which provide IVF. In 2009, in just one of the IVF infertility clinics in Utah, 348 cycles were started, meaning that process of IVF (medications, egg and sperm retrieval, fertilization, and embryo transfer) was begun 348 times (Technology, 2011). Clearly, using fertility clinics is not found immoral by the Church or even America, as seen in these levels of IVF activity. Since the IVF process is designed to produce excess embryos, any evaluation of IVF needs to address the use of all embryos produced. Senator Hatch told the Senate, "It seems to me that you would have to believe that the in vitro fertilization process was unethical to begin with if you believe that it is

unethical to use spare embryos that would never be used for fertility purposes and were slated for routine destruction" (United States, 2006, p. S7660).

Donating embryos for research actually "lend[s] permanence to the embryo" because the only unique part of an embryo, in terms of its cellular components, is the recombined DNA from the father and mother (McGee & Caplan, 1999, pp. 154-155). In an embryo conceived naturally, if it survives to birth, the DNA of that embryo is what directs and defines the identity of that person. The stem cells harvested to form cell lines each contain "in dormant form, the full component of embryonic DNA. The DNA in the cell lines has a much greater chance of continuing to exist through many years than does the DNA of a frozen embryo (which in most cases already will have been slated for destruction by the IVF clinic that facilitated the donation, and which would have no better than a 5 to 10 percent chance of successful implantation in any event)" (McGee & Caplan, 1999, p. 155). Donating embryos to research not only prevents permanent destruction of the genetic identity of that individual, but provides that unique genetic material with a far greater chance for existing indefinitely as a contribution to the quality and length of human life. Donating embryos is far preferable to discarding embryos or allowing embryos to remain frozen indefinitely because the embryo's identity will not be lost, but may rather have a permanent effect on the wellbeing of mankind.

Part of the question about the use of embryos centers around the question of when life begins. A brief exploration of this shows that LDS thought contains no fixed doctrine on this issue that might be used as a pivot point for considering how this question is answered.

When does life begin?

The National Bioethics Advisory Commission presented a thorough review of the ethical issues of human stem cell research to President Clinton in 1998, wherein they determined:

> The fundamental argument of those who oppose the destruction of human embryos is that these embryos are human beings and, as such, have a right to life. The very humanness of the embryo is thus thought to confer the moral status of a person …. Although it is not clear that those who advance this view are able to establish the point at which, if ever, embryos first acquire the moral status of persons, those who oppose the destruction of embryos likewise fail to establish, in a convincing manner, why society should ascribe the status of persons to human embryos. (Commission, 2000, pp. 50-51)

We can safely say, then, that the main point of this controversy is rooted in this question: *when does life begin*? But that question is confusing. Are we asking at what stage we're dealing with living matter? The answer is: we're dealing with living matter at all stages. All cells are living. The egg and the sperm that formed the embryo were living. At no point was the embryo or its constituents not living. In that case, are we asking at what stage does the embryo become a human? Again, the answer is at all stages. The egg and sperm themselves were human, came from a human, contained one copy of a human genome; the cellular material and DNA never stopped being human. So the question becomes, when does the life of *what* begin? (Kenny, 2008). The question here is not a question about being human or a question of being alive: it is about personhood. We want to know when living human cells become a person.

This question has had variety of answers in different areas of the world and in different religions. Historically, in some cultures, you were not a person until you had been alive for a year or more.

An important rabbinic text in Judaism indicates that the individual human life begins when a child's head emerges from the womb (Kenny, 2008). Some Stoics believed that just as life ends when we draw our last breath, it begins when we draw our first breath. A statement of the Prophet Muhammad is understood by Muslim scholars to mean that the soul is breathed into the embryo at 120 days, at which point the embryo becomes a person (Eich, 2008). Since 1869, the dominant position of Roman Catholics has been that life begins at conception. Further study of the history of the topic "makes it abundantly clear that there is no such thing as *the* Christian consensus on the timing of the origin of the human individual" (Kenny, 2008, p. 169). Most of Western society believes it's somewhere between conception and birth.

Our church has unique doctrine surrounding what is meant by "life," as regarding the essence of a soul. We believe that our soul is our spirit and our body together. Neither the body without the spirit, nor the spirit without the body, as it were. Both the Old Testament and the Pearl of Great Price tell us that God "formed man from the dust of the ground, and breathed into his nostrils the breath of life; and man became a living soul" (Genesis 2:7; Moses 3:7). For us, personhood is the creation of a soul, or the union of the spirit and body. We existed long before conception or birth, and our existence does not cease after physical death. We are eternal spirit children of God; one of the purposes for our mortality is to obtain a body. For members of the Church of Jesus Christ of Latter-day Saints, the question is not *when does life begin*, but more specifically, *when does the spirit enter the body*?

Unfortunately, this question cannot easily be answered by a simple appeal to statements by church leaders. Just as there were a number of answers to the beginning of life question outside

the Church, there are also many answers within the Church. A deeper investigation of the issue in church history and revelation reveals many answers which seem to fall into three main categories. The words of church leaders support three main possibilities for when "life begins," or when the spirit enters the body: at conception, at or immediately prior to birth, or at some point in between the two.

At Conception

Personhood beginning at conception is the most relevant of these options in terms of the embryonic stem cell issue. If life begins at birth, or significantly after conception (i.e. when the embryo has developed into a fetus and is no longer an embryo), then the issue is closed: it is not killing a person if an embryo is not a person. It is only *if* personhood begins at or very close to conception (or fertilization) that embryonic stem cell research is problematic. We will therefore spend more time investigating the implications of personhood beginning at fertilization than the other options.

The idea of personhood beginning at conception has unreasonable implications. This position of personhood is supported by Elder Nelson, of the Quorum of the Twelve Apostles, who wrote: "I learned that a new life begins when two special cells unite to become one cell, bringing together 23 chromosomes from the father and 23 from the mother" (2008). We do not disagree with Elder Nelson's statement: at conception, an embryo is a living cell. However, if this were the time when personhood absolutely and unequivocally began, what does that mean for miscarriages? It is estimated that approximately half of all pregnancies will result in miscarriage, largely before the mother even knows she's pregnant (Wilcox, Baird, & Wenberg, 1999). This can occur before

or after implantation of the embryo in the uterus (Wilcox et al., 1988). That means that if personhood begins at conception, approximately *half* of God's children have never had an earthly existence. The two main purposes for our mortal experience are to get a body and to be tested; we might ask, would God have designed a plan that excluded this many of his children from participating?

The other unnerving implication of fertilization as the commencement of life involves our own responsibilities for the lives of others. Some forms of contraception do not prevent fertilization, but rather prevent implantation of the zygote (the one cell resulting from fertilization) into the uterine wall. If personhood begins when sperm and egg unite, then deliberately acting in a way that will prevent that embryo from developing into a full human body could be considered murder. Additionally, most miscarriages (also known as spontaneous abortions) are caused by chromosomal problems that make development of the embryo impossible, but other miscarriages result from either physiological or behavioral traits of the mother. Physiological maternal factors include hormonal imbalances, problems with reproductive organs, maternal age, or disease. Behavioral factors contributing to miscarriages include substance abuse as well as other lifestyles more commonly engaged in by church members: malnutrition, obesity, excessive exposure to certain toxic substances, or extreme physical activities that would result in trauma on the mother or the fetus. If a woman miscarries because she has been eating unhealthily or she engages in extreme activity, and if personhood begins at conception, is she guilty of destroying a person? Since most miscarriages happen very early on in pregnancy, a mother could not even know she is pregnant and be killing unknowingly.

Fortunately, Heavenly Father does not trick us into sin. It is not reasonable to think he would allow us to be responsible for such grand scale of "killing" without it having been a choice on our part. Agency is key in his plan; would he allow such a great number of us to ignorantly commit and be held accountable for one of the most serious sins? If these are the consequences of personhood beginning at fertilization, then surely that is not the time when personhood truly begins. Embryos from IVF fall into this category, and if naturally conceived embryos are not persons at conception, then neither are artificially fertilized embryos persons at fertilization.

At or Immediately Prior to Birth

The second option is that life begins at birth or just prior to birth, which is supported by some of the Brethren, but opposed by others. Theodore M. Burton of the first Quorum of the Seventy said that "when the body is prepared and the spirit enters the body, a living soul is created ready for birth. Without that spirit … the creation process would not be complete" (Burton, 1982, p. 3). This means that a body must be prepared prior to the spirit entering that body, so an embryo is not a person because it is not a body yet; it is a mass of cells. The creation process of a person is not complete without the spirit.

In the Church, temple ordinances are not performed for stillborn children ("Member's Guide to Temple and Family History Work," 2009). This is different than the temple ordinances that are not performed for children who died before the age of eight; in the case of stillborn children, though we still keep records of them in our family history, these children are not sealed to their families. While some Church leaders have stated that parents will get to raise their stillborn children in the future (McConkie, 1966), the Church's stance on temple ordinances suggests that

stillborn children did not have their spirits enter their bodies, and are therefore not complete souls nor are complete persons. This also forestalls the idea that personhood began any time at all before birth: if this is true, then embryos are certainly safe from the potential to be killed because they are definitely not persons if personhood begins at birth.

At Some Point Between Conception and Birth

The third option is that life begins somewhere between conception and birth, perhaps the most vague and yet prevalent opinion. Instead of a specific point, this opinion encompasses anywhere within the many months of pregnancy. This opinion provides a slippery slope because it is easy to hedge back to the personhood at conception idea: if we don't know at what point embryos become people, we can avoid crossing that line if we assume life begins at conception. Fortunately, while some Church leaders are extremely vague about at what point this is, some leaders give opinions that still exclude embryos from personhood.

Bruce R. McConkie and Joseph Fielding Smith both give quotes to support a vague sense of post-conception, pre-birth personhood, while Brigham Young is more specific. Elder McConkie advocates "the concept that the eternal spirit enters the body prior to a normal birth" (1966, p. 768). In 1954, Joseph Fielding Smith stated in his controversial book *Man: His Origin and Destiny* that "the body of a man enters upon its career as a tiny germ or embryo, which becomes an infant, quickened at a certain stage by the spirit whose tabernacle it is, and the child, after being born, develops into a man" (1954, p. 354). Brigham Young's more detailed, yet inexact statement is: "When the mother feels life come to her infant, it is the spirit entering the body preparatory to the immortal existence" (as quoted in McConkie (1966, p. 354)). Many today

agree with this idea that when the infant's movements are perceptible, it is then a distinct individual separate from the mother, and the spirit has entered that body.

In the world today, many people consider the beginning of personhood to be 14 days after conception. Philosophically, this has a great deal of merit. In its early days, the cells of a zygote or embryo can become something that is not a human being (the placenta arises from the fertilized egg alongside the embryo), something that is one human being, or something that may be more than one human being (identical twins). It is therefore difficult to say that the fertilized egg itself is an individual, because it is at least also the placenta (not a person) and possibly could become more than one person. Before the placenta and zygote are separated, you cannot say that an embryo is "a person" because it is a person and a placenta. Up until day 14, a zygote may still split to become identical twins, so it is impossible to say that before day 14 an embryo is "a person" because it may well be two or three people. After day 14, this is no longer an option, so the earliest you could say an embryo is, for sure, *a person*, is at that point, which excludes personhood beginning at the time of fertilization. Counting embryos is not the same as counting human beings (Kenny, 2008).

Embryos from IVF clinics are far too "young" to be considered people, according to these ideas of personhood beginning between conception and birth.

Are scientists killing people when researching embryonic stem cells?

It appears that the argument for the beginning of personhood at fertilization is the only definition that would qualify such research as killing. This is not consistent with the Plan of Salvation. But

even if we were to proceed with the assumption that personhood *did* begin at conception, the principle doesn't necessarily apply to the embryos involved in stem cell research because of where they come from. These discussions of when personhood begins generally refer to naturally conceived individuals, but embryonic stem cells come from surplus IVF clinic embryos, so the differences between natural conception and artificial fertilization is an additional factor in deciding whether scientists are killing people when researching embryonic stem cells.

Senator Orrin Hatch, an LDS Senator from Utah, succinctly describes the relevancy of the origin of embryonic stem cells when considering the ethics of this research:

> When I considered the question of the moral status of stem cells created for, but no longer needed in, the in-vitro fertilization process, I did so from a long and fervently held pro-life philosophy.
>
> After much thought, reflection, and prayer, I concluded that life begins in, and requires, a nurturing womb.
>
> Human life does not begin in a Petri dish. I do not question that an embryo is a living cell. But I do not believe that a frozen embryo in a fertility clinic freezer constitutes human life ….
>
> I cannot imagine, for example, that many Americans would view an employee of a fertility clinic whose job it is to destroy unneeded embryos as a criminal. Yet this is a task that is performed thousands of times each and every year by hundreds of fertility clinic employees.

> I find both fertility treatment and embryonic stem cell research to be ethical. I believe that being pro-life involves helping the living. Regenerative medicine is pro-life and pro-family; it enhances, not diminishes human life. (United States, 2006, p. S7660)

Any consideration of personhood applies only to embryos that can continue to develop and have the potential to become people. Embryos generated by IVF clinics have no such potential unless actively transferred to a womb. Embryos donated from IVF that would otherwise have been discarded have absolutely no potential to become people. In the womb, an embryo's potential comes from the possibility for implantation, nourishment, and development, but outside of the womb, an embryo will never become a person. There is no chance that an embryo fertilized externally will become a person if it remains external. The embryos being donated to research are never going to be transferred into a uterus; they will be discarded if not researched. Embryos from which we extract stem cells have no potential to become people. Their "life" did not begin at conception; they have yet to even be considered as having the potential of becoming persons. Senator Hatch quotes Senator Gordon Smith, from Oregon, who powerfully and simply captures the heart of this issue:

> When does life begin? Some say it is at conception. Others say it is at birth. For me in my quest to be responsible and to be as right as I know how to be, I turn to what I regard as sources of truth. I find this: "And the Lord God formed man of the dust of the ground and breathed into his nostrils the breath of life, and man became a living soul." This allegory of creation describes a two-step process to life, one of the flesh, the other of the spirit. . . . Cells, stem cells, adult cells, are, I believe, the dust of the earth. They are essential to life, but standing alone will never constitute life. A stem cell in a petri dish or frozen in a

> refrigerator will never, even in 100 years, become more than stem cells. They lack the breath of life. An ancient apostle once said: "For the body without the spirit is dead." I believe that life begins in the mother's womb, not in a scientist's laboratory. Indeed, scientists tell me that nearly one-half of fertilized eggs never attach to a mother's womb, but naturally slough off. Surely, life is not being taken here by God or by anyone else. (United States, 2006, p. S7660)

Applying our LDS theology to this idea, we appreciate the difference between a living body and a living soul – the difference is inhabitation by a spirit. Embryos used in embryonic stem cell research come from cells fertilized in a test tube, and have no potential to become anything other than cells. These embryos are bodies without spirits: they are not human souls. It is not murder to harvest cells from these embryos. No potential is destroyed; in fact, potential is being created, for these cells hold numerous possibilities for bettering the life of mankind. Their potential can only be brought forth by using the technological and scientific blessings unique to our time. Indeed, embryonic stem cells themselves are a blessing unique to these latter days.

Beyond Religion: Implications of the Moral Status of Embryos

In America, embryos are not constitutionally protected persons, and legally, do not have rights: in a court case in 1973, the Supreme Court determined that "the word 'person,' as used in the Fourteenth Amendment, does not include the unborn" (Rao, 2008, p. 1481). One problem with ethical issues that involve a party "without a voice," such as embryos, is that the silent party often gets overrepresented. Those who argue against embryonic stem cell research "make the assumption that an embryo has not only the moral status of human person, but also a sort of super status that outweighs the needs of others in the human community" (McGee & Caplan,

1999, p. 152). Embryos should never have a higher moral or legal status in our country than adult citizens. The National Bioethics Advisory Commission concurred, agreeing that while an embryo does merit "respect as a form of human life," it does not merit "the same level of respect accorded persons" (Commission, 2000, p. 50).

Many complications arise if embryos are legally defined as persons, and if personhood legally begins at conception. One such complication is found in the biological fact that nearly 50% of all fertilized embryos are aborted from the female human body naturally (Ord, 2008). Should these be given the status of personhood, we would be under an ethical mandate to do all we can to save these "persons." It would require monumental efforts to identify and save all of these embryos, and no one makes an argument for doing that. It is clear that conferring the status of personhood on embryos is extremely problematic, and biological evidence and LDS religious perspectives suggest they are not yet persons.

Conclusion

When dealing with difficult issues surrounding life and death, we naturally seek to both be ethical and follow church policy, yet it seems apparent that Latter-day Saints have no clear doctrine on when personhood begins. Moreover, there is an implicit assumption within LDS culture that fertilization clinics provide a needed service for infertile LDS couples seeking to follow the mandates of the Church and create families. This holds true despite the creation of large numbers of embryos that will be disposed of. If that disposal can provide blessings to living persons, then it seems clear that this use of embryos is ethically justified from an LDS position. Just as Heavenly Father gave us our bodies so we could become living souls, He also gave us

blessings of technology and modern medicine that help us enhance and protect these physical bodies. In embryonic stem cell research, we have an opportunity to increase our knowledge of our bodies and use medical advances to improve the quality of our mortal lives.

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RESUSCITATION AND RESURRECTION: THE ETHICS OF CLONING CHEETAHS, MAMMOTHS, AND NEANDERTHALS

Introduction

Since the birth of Dolly the sheep in 1996 (Wilmut et al. 1997), 'cloning' animals generally means cloning via somatic cell nuclear transfer (SCNT). SCNT follows specific steps for cloning: an egg cell has its nucleus removed; an adult (or somatic) cell has its nucleus removed and then inserted into the prepared egg, which is then stimulated with an electrical shock; finally, the egg cell begins to divide. This embryo is put into the uterus of a surrogate mother, and, hopefully, it implants and is later successfully born. The resulting individual, or clone, has nuclear DNA identical to the donor of the somatic cell. Over the decades, cloning has made stunning progress (See Figure 1), with cloned dogs and cats commercially available and livestock regularly cloned. Cloning is very expensive: the cost just to preserve tissue from a dog or a cat for future cloning is about $1,000 per year (Shiels 2004), while the cost of having a dog or cat cloned ranges from $32,000 to over $100,000, averaging at around $50,000 (Boyce 2006; News 2004; Flock 2012). Cloning livestock is less expensive, with a cloned cow costing at least $15,000 and a pig costing $4,000 (Plume 2009).

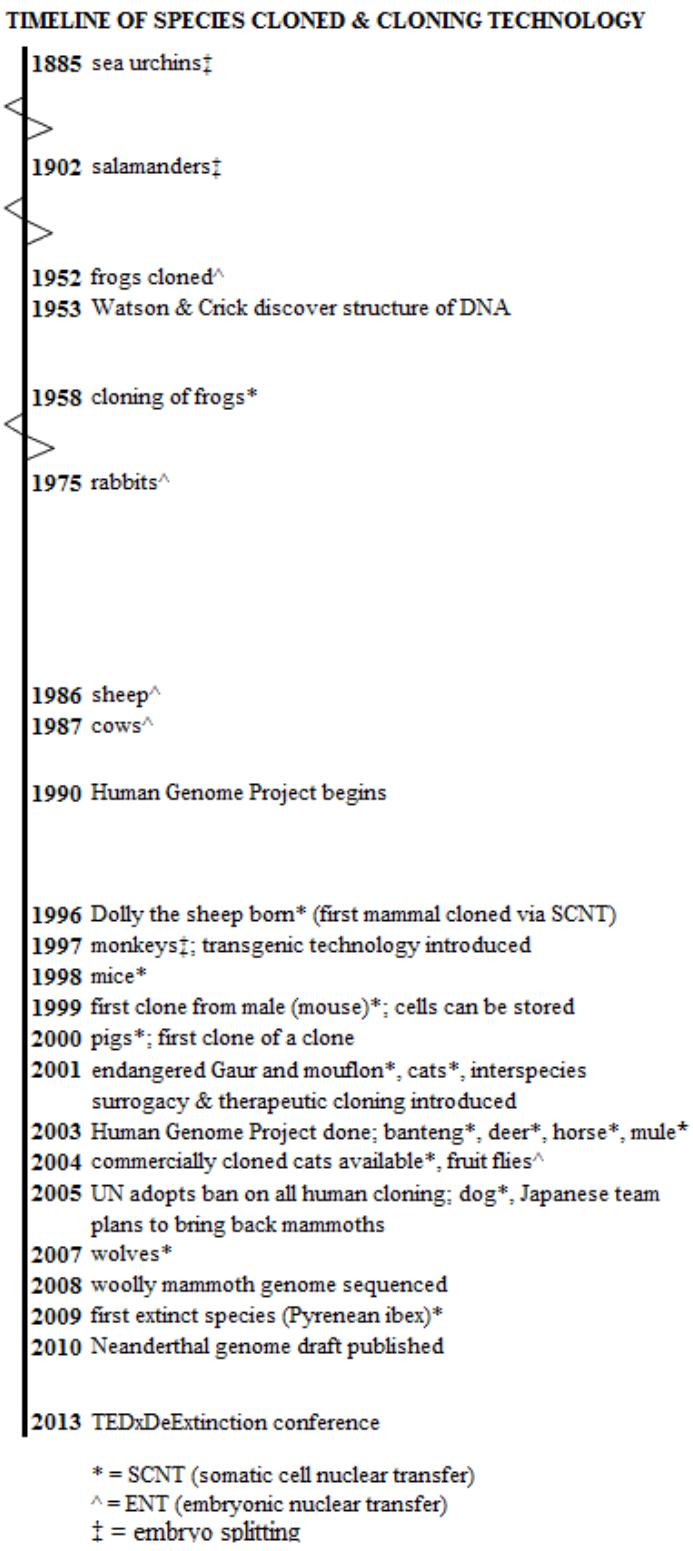


Figure 1. Timeline of Species Cloned and Cloning Technology

All of these applications of cloning were unthinkable before Dolly but have since become realities. Cloning has seen much discussion with apt and erroneous applications for animals and humans alike, with implications ranging from concerns about a violation of animal welfare (Fiester 2005) to human safety (Lane 2006) and the ramifications of 'playing God' (Chadwick 1982). After cloning Dolly, her creators wrote:

> We were not thinking about…creating hillock upon hillock of identical sheep to guarantee a good night's sleep. We were not thinking about helping lesbians to reproduce without the help of a sperm bank of multiplying movie stars. We were certainly not thinking of duplicating dictators. (Wilmut and Highfield 2006)

Those who cloned Dolly foresaw neither the future they enabled, nor its ethical implications, and it is important to examine the ethics before certain kinds of cloning before they are attempted.

But can we clone more than our pets and livestock – can we use cloning to save endangered species or resurrect extinct ones? Cloning for conservation purposes may be the next step of cloning technology (Ryder and Benirschke 1997), and restoring extinct species may soon follow. Recent events (TEDx 2013; RT 2013; Gross 2013) and publications (Zimmer 2013a) have drawn attention to the possibilities of cloning extinct species. However, cloning is not equally ethically appropriate for all species. I will examine the ethics of endangered and extinct cloning from deontological and utilitarian perspectives. The aspects of deontology I will use are Kant's Categorical Imperative (that our ethical duties are only those that we can universalize and that we never treat people merely as a means but as an end in themselves), Kant's view of human dignity, and briefly Divine Command Theory (an action is morally good if it is commanded by

God). The utilitarian basis for my arguments focuses on the greatest good for the greatest number, both maximizing happiness and minimizing suffering, with attention to the costs and benefits. Using these approaches, I will analyze the special considerations and ethics of cloning cheetahs, mammoths, and Neanderthals.

Cheetah (*Acinonyx jubatus*)

Much discussion has centered on the use of cloning as a tool to alleviate the current massive rate of mammal extinction (Ehrenfeld 2006; Pina-Aguilar et al. 2009; Ryder and Benirschke 1997; Lee 2001; Ryder 2002). The concept of cloning endangered species is not new, but it is less common than cloning livestock or domestic animals, and factors unique to conservation cloning require examination. I will begin with special considerations for conservation cloning and will explore the ethical arguments for and against cloning the vulnerable species of cheetahs.

Special considerations

Conservation cloning has two special implications: assessing which species to clone and how to address animal rights. Cloning via SCNT at this time is largely restricted to mammals. We are limited in our current cloning capabilities, and the long wait may be longer for whatever additional threatened species man wants to clone, particularly if that species is a bird or reptile. One species may be more imminently threatened than another, but that doesn't mean they will get priority:

> Cloning is expensive – only charismatic animals are likely to be cloned….True, cheaper, easier, and more efficient cloning techniques are being developed, but the cloning of

> endangered rays, caecilians, or vipers may have to wait until we have done the showier rare birds and mammals. (Ehrenfeld 2006)

This is troubling for conservation but reflects reality. Another reality to consider is relative animal rights. This, too, is not new. Different animals receive different considerations: spiders warrant less sympathy than kittens. Similarly, different feelings may emerge about cloned versus non-cloned animals: cloned cheetahs and naturally-born cheetahs are the same species, but they may enjoy different rights and protections. The goal of conservation cloning would be to introduce the clones into the wild, but even there a clone and a naturally-born animal would have different worth. Cloning a species for the first time is more expensive than an established cloning technique for an animal, and so the cost to clone a cheetah is easily $100,000 and probably much more. Subsequent clones will become cheaper, but the price will remain high for some time. Because there was a higher cost in producing the clone than a naturally-born cheetah, clones have a higher economic value, and there may be a higher investment in saving the clone over other individuals. This appears to result in a different and superior moral status for the clone, and creates a disparity in favor of a clone over its non-cloned counterparts.

Positive ethical aspects of cloning cheetahs

For many people Divine Command Theory could be seen to require the preservation of cheetahs as part of our biblical contract to dress and keep the earth (see Genesis 2:15, *Holy Bible,* King James Version). This is particularly true if such advocates view that humans failed their theological directive by contributing to cheetah endangerment; in such a view it would be considered ethical to do whatever we can to conserve cheetahs. A Kantian view also finds this appropriate, as kindness and moral responsibility towards animals reflects and develops humane

feelings towards mankind (Kant). It is rational and universalizable to limit our negative impact on the environment, and cloning cheetahs as a way to preserve them may fulfill this duty to animals and to mankind.

The utilitarian perspective is just as appealing, as cloning cheetahs could achieve societal and environmental benefits for many species. Societal benefits such as increased endangered species awareness and international cooperation are valuable, and the benefits of research are especially advantageous. Research gained in cloning a cheetah would assist in furthering cloning technology and, if it incorporates artificial genetic manipulation in an attempt to expand genetic variation in cheetah populations, it would advance gene therapy technologies, benefitting humans and other species. Cloning cheetahs could contribute to the overall eventual wellbeing of mankind and conservation.

The environmental effects of cloning cheetahs are also advantageous. Cloning may increase habitat conservation, as both donors and the public would find it in their best interest to provide adequate habitat for their cloning efforts. Increased habitat conservation will, in turn, serve a greater good by benefitting naturally-born cheetahs and other species within their habitats. The role of predators is important to ecosystem dynamics, and preserving cheetahs keeps the ecosystem balanced (Lima 1998). The whole habitat could benefit from this practice.

Cloning cheetahs not only benefits their habitats, but also affects cheetahs by expanding knowledge of their genetics and husbandry. The restricted gene pool of cheetahs is the result of a bottleneck event about 12,000 BP (Culver et al. 2010), and cheetah ranges and numbers have

dwindled significantly in the last century (Durant et al. 2010). It is possible that humans, through genetic therapy and manipulation, may provide additional genetic variation in cheetah populations. The future of cheetah populations may depend on their genetic viability enabling them to better survive current pressures (Durant et al. 2010), and the long-term benefits of improved genetics in this already genetically restricted species may lead to healthier cheetah populations (Ryder and Benirschke 1997). Cloning cheetahs in conjunction with genetic manipulation would benefit both cheetahs and other species down the road for which this technology might be employed. Cloning cheetahs could provide a great deal of good for a great number of species, including our own.

Negative ethical aspects of cloning cheetahs

Cloning cheetahs does not address the problems leading to their extinction (e.g. habitat loss, hunting) (Jabr 2013), so we cannot, in any practical sense, make it a universal maxim to clone all endangered or vulnerable species. Society is unlikely to provide resources to universalize this, and it may be irresponsible to create such a maxim. Of course, this does not forbid the cloning of cheetahs; it simply denies this as an ethical obligation.

Utilitarian drawbacks of cloning cheetahs include laws, costs, and resource allocation. Cloning is expensive, and exploring genetic manipulations for cloned cheetahs is also costly. Another significant cost in play is the living cost, or the cost on living organisms. Cheetahs are protected ([CITES] 2012), and while cheetahs would be ideal donors (Ehrenfeld 2006), it may be counter-productive to use cheetahs as donors or surrogates for the clones. It has often taken hundreds of embryos and attempted pregnancies to produce viable clones (Jabr 2013), so this requires many

eggs from donors and much risk on surrogate mothers. The death or serious injury of a surrogate is an unacceptable living cost, and this cost of many individuals to achieve even one viable clone outweighs the benefits of that clone. The use of an interspecies surrogate changes but does not eliminate this cost (Poland and Bishop 2002). Finally, clones introduced into the wild may constitute a living cost on wild coalitions (a group of cheetahs), or possibly on the clone itself in the wild. Paying these costs can only be justified if the benefits outweigh them.

The potential reallocation of resources – the worry that cloning cheetahs would siphon funds that would otherwise have helped habitat preservation – is another drawback to cloning cheetahs. The Cheetah Conservation Fund operates on an annual budget of around $1.8 million (personal communication with B. Fellenstein, Cheetah Conservation Fund, USA, May 2013). To lose money from this budget would seriously affect the organization's contributions to preservation. Assisted reproduction and other efforts are more effective for conservation than cloning (Pina-Aguilar et al. 2009; Ryder and Benirschke 1997), and the money spent in assisted reproduction is more likely to result in increased cheetah populations than cloning is. This misplaced investment in cloning is frustrating to conservationists; however, there is no reason to assume that money donated to cloning cheetahs would otherwise have gone to conservation (Lee 2001). Since cloning does not necessarily remove money from other funds, it is only unethical in this sense if it detracts from conservation efforts.

Conclusion on cloning cheetahs

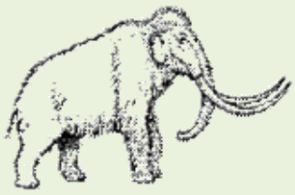
There are many ethical reasons to attempt to clone cheetahs, though these reasons are not sufficient to ethically *require* this practice. Cloning cheetahs is only unethical if its costs

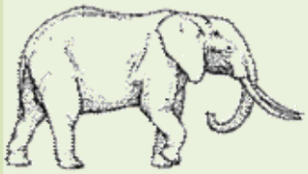
outweigh the benefits. The considerable potential benefits of cloning a cheetah could contribute to the preservation of a large number of species. If even some of these benefits were realized by prudent conservationists, then cloning a cheetah is an ethically permissible practice. In order for cloning cheetahs to retain its ethical value, however, it must avoid the potential costs described and it must not eliminate, replace, or reverse the overall goals of conservation.

Woolly Mammoth (*Mammuthus primigenius*)

'If you want to bring a species back to life, the mammoth would be almost as dramatic as a dinosaur' (Nicholls 2008). Cloning extinct species presents different ethical considerations than cloning domestic or endangered species. Despite the possibility of creating mammoth-elephant hybrids (Lister 2007; Stone 1999, 2002), this section focuses specifically on the ethics of cloning mammoths (see Figure 2). After examining a problem unique to cloning extinct species, I will explore the ethical factors of cloning mammoths.

DIFFERENCES BETWEEN MAMMOTHS AND ELEPHANTS





SPECIES	**Woolly mammoth**	**Asian elephant**	**African savannah elephant**
	Mammuthus primigenius	*Elephas maximus*	*Loxodonta africana*
HEIGHT	9-11 ft (2.75-3.4 m)	8-10 ft (2.4-3 m)	10-11 ft (3-3.4 m)
WEIGHT	4-6 tons	3-5 tons	4-6 tons
BACK SHAPE	sloping	humped	saddle-shaped
FUR	dense	sparse	very sparse
HEAD	high single dome	double dome	low single dome
EAR	very small	medium	large
TUSKS	curved and twisted	gently curved	gently curved
TRUNK TIP	1 short, 1 long "finger"	1 "finger"	2 equal "fingers"
TAIL	short	long	long

WOOLLY MAMMOTH FACTS

Life history

* The heyday of the woolly mammoth was ~50,000 BP
* Most woolly mammoths went extinct ~10,000 BP, and the last population survived until ~4,000 BP
* Woolly mammoths once had a range stretching from Ireland east across Asia and North America
* Woolly mammoths had hairy coats, sloped backs, and large tusks and were adapted for a life in the co
* An adult woolly mammoth ate about 400 lbs of grass and sedge a day
* Mammoths were likely social creatures with a similar social structure to elephants
* The lifespan of woolly mammoths was about 60 years, and they weighed about 6 tons
* Mammoth tusks grew throughout their life, laying down daily and yearly cone-shaped tusk rings

Two theories for why woolly mammoths went extinct:

(1) Being hunted by humans

(2) Warming temperatures and climate change at the end of the ice age

Figure 2. Woolly Mammoth Facts

Special consideration

One argument that seems ethically problematic with cloning mammoths stems from some general anti-cloning arguments that are amplified when applied to extinct species. It starts with the argument that cloning is 'playing God' and is therefore wrong. It is unclear what is meant by

'playing God' and why exactly that is wrong. (For further reading on the 'playing God' argument, see (Van Den Belt 2009) and also (Chadwick 1982).) Related to the 'playing God' argument is the 'unnatural' argument, which follows a similar pattern: this is unnatural, therefore it is wrong, again unclear as to what is 'unnatural' and why it is wrong. Ruth Chadwick argued:

> What is claimed when anything is objected to on the ground that it is 'unnatural' is far from clear, and it is no clearer in the case of cloning than anything else. It is not that cloning does not occur 'in nature'…the point is rather that cloning is unnatural *for the species*. (Chadwick 1982)

Despite the tenuousness of these arguments, they nonetheless carry intuitive appeal. Any opposition to cloning because this sort of reproduction is 'unnatural' for the species is multiplied in the cloning of mammoths. Mammoths are extinct and do not currently exist on the earth; it is unnatural for them to be reproducing *at all*, much less via cloning. This is true regardless of what led to their extinction. Any *living* aspect of a mammoth is unnatural. However, the unnatural and playing God arguments have not prevented the cloning of extant animals, and it is unlikely that these alone would forbid the cloning of mammoths. It is significant, however, that there is a greater natural aversion to cloning extinct species than to cloning extant ones.

Positive ethical aspects of cloning mammoths

Several perspectives support the ethical appropriateness of cloning mammoths. First is the deontological viewpoint based on the cause of mammoth extinction. There is some suspicion that humans played a part (Nogués-bravo et al. 2008; Thomas 2012). Ethicist Hank Greely (2013) recently asked, 'If we killed them and now we have the ability to bring them back, do we have a duty to bring them back? Do we owe it to them?' Is restoring a species that mankind eliminated

from the earth part of our mandate to 'keep' the earth as it was? If true, as de-extinction advocate Mike Archer suggests (Woodford 2000), there may be deontological reasons that support cloning mammoths *if* humans drove them to extinction. This duty, however, seems vague and unjustified. Humans already failed the mandate to preserve the species; does restoring them eliminate that failure? The implication is current humans are accountable for the actions of a few humans in the distant past. If humans hunted mammoths to extinction, it was likely a hunting-to-eat rather than a hunting-for-sport scenario, where killing mammoths kept our species alive, and surely we had a higher duty to our own species than another. Cloning extinct species may resonate with arguments from Divine Command Theory, but is ungrounded as to our current liability or duty, so it cannot *obligate* us to clone mammoths. Furthermore, it is not certain that humans alone are responsible for the extinction of mammoths, in which case the deontological argument proves problematic.

Cloning mammoths seems best considered under a utilitarian umbrella: the potential scientific progress and other benefits from cloning mammoths are staggering. Cloning mammoths would describe their life history and biology (Loi et al. 2011), possibly illuminating proboscidean evolution (Proboscidea is the order containing elephants and several extinct families including mammoths and mastodons), and could improve biotechnology in ways that will be applicable to multiple species, including humans. The monetary benefits alone are hefty: profits for researchers and laboratories; the worth of the mammoths and their offspring; money for zoos or institutions housing or working with mammoths; and most importantly, the generation of considerable private funding. A resurrection project like this has great allure, and with private

donations would not require or detract from federal funds. The potential benefits of cloning a mammoth make it a very attractive project.

A final utilitarian consideration considers the idea of providing the greatest happiness for the greatest number (Bentham 1891), and there is certainly a great deal of happiness available through cloning mammoths. If the clones were kept in zoos and not released into the wild, it would minimize unhappiness stemming from damaged ecosystems or species and also maximize public happiness of those viewing the mammoth. Cloned mammoths also provide fulfillment for its creators, satisfaction for the project's donors, and enjoyment for those benefiting from any resulting tourism. Some of this will be true if the clones are reintroduced into the wild, but happiness is maximized by keeping the mammoth in a zoo, where the happiness of the clone itself is equal to or greater than other zoo animals – donors and researchers did not spend time and money only to let the clone languish in an ill-funded or inhumane zoo. Happiness from cloning mammoths, as a utilitarian measure of greater good, is abundant.

Negative ethical aspects of cloning mammoths

Most ethical arguments against cloning mammoths are rooted in utilitarianism, but some stem from deontology. Consider the problem of universalizing this type of project. It appears irrational because (a) we do not have the ability (the 521 year half-life of DNA, it is impossible to resurrect species that have been dead for more than a few million years, see (Allentoft 2012)), nor can we reasonably know of all species that are extinct, or even all those that mankind has driven to extinction, and (b) using resources to universally restore extinct species conflicts with other duties to our own species. Arguably, our highest duty is first to humans, and then to animals.

Kant, for example, supports humane behavior towards animals as a reflection of our humanity (Kant), but cloning mammoths itself is not particularly reflective of our duties towards humanity, as this involves animals that are not currently in existence, so we have no current duties towards them. Furthermore, if the clones are destined for zoos or laboratories to study, then this is using them as a means and thus problematic. There is therefore no compulsion for us to clone mammoths because it is too vaguely defined and fails to engage Kantian ideals; however, it is not deontologically *unethical* to clone mammoths; it is simply not endorsed.

In light of this failure to satisfy deontological requirements, let us consider the utilitarian implications of cloning mammoths and the accompanying harms: societal harm, living costs, and harm to the environment. First, the societal harms. Mammoths do not grow without laboratories, and money does not grow on trees. Cloning a mammoth will be very expensive, much more than cloning cheetahs. Similar to the cheetah scenario, it would be unethical to displace funds destined for other causes to clone mammoths. Cloning mammoths may lead to other societal costs as well. Consider, for instance, the potential court battles (ownership, animal rights, money spent and earned in the project, etc.).

Further consider the societal and monetary costs of creating and enforcing mammoth conservation laws. Once a mammoth is cloned, it will be the only one of its kind, becoming an endangered species, and will qualify for those protections allocated to other endangered species. We would be creating an endangered species from one that is not currently endangered (nor currently living), and we would need to protect and preserve. Just as the cloned cheetahs in the wild may merit greater protection than their naturally-born counterparts, cloned mammoths in

the wild may receive more protection than other extant species indigenous to the cloned mammoth's environment. This is partly due to the fact that a small population or even just one mammoth is more in danger of extinction than are endangered elephants, and their endangered status is more severe for there will be fewer of them living than there are elephants. It is unacceptable to for the moral status of a species that *does not currently exist* to exceed the moral status of animals that do exist. It is more important to conserve extant and endangered species than it is to clone extinct ones (Pina-Aguilar et al. 2009). If knowing that we can clone extinct species reduces society's incentive to preserve living and endangered species, then that makes it less ethical.

The living cost of cloning mammoths affects surrogates, donors, and the clones themselves. The ideal surrogate and egg donor for mammoths is the Asian (also called Indian) elephant (Nicholls 2008), which is an endangered species. The endangered status of Asian elephants makes it 'completely unethical to use these animals for cloning a mammoth' (Pina-Aguilar et al. 2009). The cost on the elephants is too great; the individual elephants could develop ovarian tumors or be otherwise harmed through harvesting eggs or through the surrogate process, where mammoth fetuses may be unsuited to the uterus of the elephant (Nicholls 2008) and may do her harm. The potential death or harm to the elephants is too great a cost. This is problematic because Asian elephants are used as beasts of burden (History 2009), which is tolerated. If this is allowed, why not use elephants as mammoth surrogates? If mankind is truly intent to conserve elephants, perhaps these current practices ought to be reconsidered. (Aside: one difference between the two scenarios is the benefit to human livelihood from elephants as beasts of burden, which may

outweigh the cost, but human life is not benefited through using elephants as surrogates for clones.)

Nevertheless, the cost on the clones themselves is possibly the greatest of the living costs. Mammoths are believed to have been social creatures (Lister 2007), and living in isolation would reduce the quality of a mammoth's life, necessitating multiple costly mammoth clones, preferably of different genomes to allow for reproductive success and to minimize inbreeding. Furthermore, suppose the clones will be unable to survive our current climate and climate change because, as is possible, climate was a factor in mammoth extinction? (Thomas 2012; Nogués-bravo et al. 2008) Add to this the potential difficulties seen in many clones (ex: congenital defects, abnormal development, reduced immunity, or vulnerability to aging or disease; see (Poland and Bishop 2002; Wells 2005; Jose et al. 2002)) which may be greater for extinct species with less-intact DNA. These living costs suggest cloning mammoths may not be ethical until these issues are addressed and technology has developed sufficiently to minimize them. In the utilitarian goal to minimize pain and maximize happiness, much must be done to mitigate the living costs of cloning mammoths.

The potential environmental harms of cloning mammoths are uncertain but have serious and long-term implications. If mammoths are reintroduced into the wild, the habitat needs to withstand this. If the habitat intended to hold reintroduced wild mammoths would not support them, then it is not ethical to waste resources in cloning mammoths only to have them die. Moreover, what of the habitat's ability to survive the mammoths? The habitat in which mammoths once lived does not exist. Reintroducing mammoths to the wild will not reestablish

their former ecosystem (Rees 2001); the clones will have to forge a new one. Asian elephants already have a rocky relationship with humans due to depleted habitat, and regularly kill humans and raid crops (Jadhav and Barua 2012). Might not cloned mammoths have similarly negative effects? Woolly mammoths were big creatures and ate about 181 kg (400 lbs) of grass and sedge a day (Lister 2007). Can the ecosystem that will house wild mammoths spare 181 kg of grass per mammoth per day? Mammoths may also take a large toll on ecosystems through competition or changing ecosystem dynamics, and could cause the extinction or threat of other species in the area. If a cloned mammoth would cause the extinction of another species, then cloning mammoths is unethical and counter-productive for species conservation. The extant species has moral priority, and the greatest good for the greatest number of species is achieved through either preventing the cloning of mammoths or keeping the clones out of the wild.

Conclusion on cloning mammoths

Many effects of cloning mammoths are merely hypothetical, so where does our moral responsibility lie? On one hand, the potential harms and their long-term effects seem more certain and serious than the more vaguely-defined potential benefits. It is not very practical or utilitarian, especially if the clones are reintroduced into the wild and harm other species. On the other hand, the practice avoids many of these harms if there are restrictions placed on mammoth cloning (namely, placing the clones in a zoo and requiring the project to be privately funded) to minimize negative impacts and maximize benefits. With these restrictions, the costs and benefits start to equal out and cloning mammoths is no longer unethical.

Even with these restrictions, cloning a mammoth is still something of an ethical stalemate. Just because it is not unethical to clone mammoths does not make it ethical to do so. Conflicting deontological viewpoints also point to the conclusion that it is neither ethically obligatory nor ethically prohibited. The ethical stalemate allows researchers to proceed with cloning mammoths, provided they keep the clones in zoos and are privately funded. Researchers must consider these ethical issues, and there is some worry that they will fail to do so:

> Enthusiasts seem unperturbed by the ethical problems associated with mammoth resurrection and oddly uninterested in finding a sound justification for the process. For [some], raising the mammoth is simply an engineering goal, with no fundamental obstacles in the way except the will to forge ahead. (Levy 2011)

It is important that the ethical problems of cloning mammoths not be ignored and, if attempted, that the practice adhere to the stated restrictions.

Neanderthal (*Homo neanderthalensis*)

Cloning Neanderthals carries with it not only the ethical aspects of cloning an extinct species, but is also constrained by one major difference: Neanderthals are closely related to humans (see Figure 3). The motivations of cloning Neanderthals play a role in the ethicality of the practice, and will be examined throughout this section. The biggest special consideration in evaluating the motivations and ethicality of cloning Neanderthals is whether they may merit human rights.

NEANDERTHAL FACTS
* Neanderthal fossils have been found in Europe and in parts of Asia * Neanderthals were stronger and more robust than modern humans. Their skeletons were wider and shorter, and their skulls were elongated and low, with receding chins and large brow ridges, housing brains slightly larger than modern human brains. Their sturdier frame adapted them for harsh climates and demanding * Similar to modern humans, Neanderthals were a social species * There is some debate about whether Neanderthals had a language * Evidence shows that Neanderthals built tools and dwellings * Neanderthals were mostly carnivorous * Neanderthals existed from approximately 200,000 to 35,000 BP * Neanderthals are the hominin most closely related to humans * Some popular theories of Neanderthal extinction are climate, competition with humans, or interbreeding with humans

Figure 3. Neanderthal Facts

Special considerations

If it is unethical to clone humans, and if cloned Neanderthals would be morally equivalent to humans and receive human rights, then it is likewise unethical to clone Neanderthals. Cloning humans is widely considered to be unethical. Francis Collins, director of the Human Genome Project, argued:

> Scientists, ethicists, theologians, and lawmakers are essentially unanimous that reproductive cloning of a human being should not be undertaken under any circumstances…. Implanting the product of human SCNT into a uterus is profoundly immoral and ought to be opposed on the strongest possible grounds. (Collins 2006)

Collins further explains that this opposition to human cloning extends to both theology and safety (Collins 2006). Ian Wilmut, leader of the project that resulted in Dolly the sheep, agrees

that cloning humans is 'criminally irresponsible' (Wilmut and Highfield 2006). Cloning humans is illegal in many states and countries and was banned by the U.N. in March of 2005 (Assembly 2005; Cameron and Henderson 2008). Laws vary on whether both reproductive and therapeutic human cloning are banned, but generally, cloning a human for reproductive purposes (to create a new human) is not an internationally sanctioned practice. Duties to these laws and bans make it unethical to clone humans. Further, by surrogate, donor, and clone as means it violates most deontological considerations. Kant also described the importance of human dignity (Kant 2002), and German politician Brigitte Zypries argued against human cloning with that idea:

> It is…incompatible with human dignity – more specifically the dignity of the born human – to deny him what is part of every human existence: to stem from a random combination of the father's and the mother's hereditary construction. Regardless of whether we characterize this genetic combination as random, willed by God or as fate: its independence from human disposal is the basis from which human autonomy and thus human freedom accrue. (Zypries 2004)

Cloning humans is unethical because it reflects poorly on our humanity, violates our duties and the categorical imperative, and denies autonomy and human dignity.

While it appears unethical to clone humans, the question remains, does this include cloning Neanderthals? It seems so, if Neanderthals would have the moral status, rights, and privileges of humans. Neanderthals differed genetically from *Homo sapiens*, but today they might not be considered a separate species (Zorich 2010). Even if they are different, they would still likely receive the moral rights and privileges of humans. Law professor Lori Andrews said that 'there would be no question' that a cloned Neanderthal 'would be recognized as having human rights

under the Constitution and international treaties' (Zorich 2010) Having these rights complicates matters, as Andrews described:

> It's going to be studied and it's going to be experimented on. And yet, if it is accorded legal protections, it will have the right not to be the subject of research, so the very reasons for which you would create it would be an abridgment of rights. (Zorich 2010)

Many of the motivations for cloning Neanderthals (for research, beasts of burden, etc.) are not permissible given that Neanderthals are legally equivalent to humans.

Neanderthals would receive human rights not only because of their legal equivalency to humans, but also for their behavioral and reproductive equivalency. Paleoanthropologist Trenton Holliday believes that if we raised 'a Neanderthal in a modern human family he would function just like everybody else…he could speak and do all the things that modern humans do' (Zorich 2010). (There is some debate about whether Neanderthals could speak, but they could certainly communicate somewhat; see (Barney 2012)). We would be hard-pressed not to give individuals human rights if they were behaviorally equivalent to humans. We would be ethically bound to treat Neanderthals as humans. Thus they could not be kept in labs or zoos, but ought to be incorporated into human society. As for reproductive potential, Neanderthals and humans may or may not have historically interbred (Zimmer 2013b; Eriksson and Manica 2012). If they were cloned, such interbreeding may happen, and the offspring of that union would most certainly receive human rights, so the potential reproductive equivalency of Neanderthals and humans suggests they would be considered as humans, and the cloning of Neanderthals is equally unethical.

Positive ethical aspects of cloning Neanderthals

While the deontological view does not necessitate cloning Neanderthals, it does not fully condemn such an act, and the utility of an act attempts to justify cloning Neanderthals. Similar to the mammoth, if humans contributed to the extinction of the Neanderthal, there is a vague but optional call for us to restore the species. George Church, a researcher who has recently (Boyle 2013) albeit perhaps mistakenly (Remal 2013) garnered attention as an avid advocate of cloning Neanderthals, wrote about this duty. He maintains that cloning a Neanderthal or any other animal minimizes the extinctions our Holocene epoch has wreaked on the world and increases species diversity (Church and Regis 2012). This is a nice idea, though not an ethically obligatory one.

Other benefits of cloning Neanderthals with reasonable motivations have relevant and varied implications for humans. The technology for cloning Neanderthals will increase our knowledge about human development, which will aid efforts in therapeutic human cloning. Neanderthals may have genes that will help us develop resistance to human-specific diseases (Church and Regis 2012). These clones would also 'give *Homo sapiens* a sibling species that would allow us to see ourselves in new ways. It might give us an inkling into another form of human intelligence, or of different ways of thinking' (Church and Regis 2012). We may learn things about humans or Neanderthals, but the value of this knowledge is at best vague and undefined.

Negative ethical aspects of cloning Neanderthals

There seem to be few duties endorsing cloning Neanderthals. We cannot make 'cloning all extinct hominins' a universal maxim. We have a duty to obey laws, and therefore not to clone Neanderthals. Theoretically, if Neanderthals were denied human rights, they could be cloned to

the benefit of mankind. As beasts of burden, they could work for us, making money for employers, or in laboratories they could improve clinical trials, drug development, and medical advancements with no loss of human life. However, these scenarios to use Neanderthal clones as slaves, for monetary gain, or as lab rats are blatantly unethical, for if Neanderthals do receive human rights, this is using them as a means. Even if we don't use them for these purposes, we are still using them as a means and not as an ends; the overall purpose of cloning a Neanderthal is to study it and learn from it, which treats the end product of a cloned Neanderthal as a means – their end *is* a means, which is categorically unsound. Finally, it reflects poorly on humanity and dignity to clone Neanderthals, as described by two researchers, Jean-Jacques Hublin and James Noonan. Hublin said, 'We are not Frankenstein doctors who use human genes to create creatures just to see how they work' (Zorich 2010) James Noonan commented, 'If your experiment succeeds and [if] you generate a Neanderthal who talks, you have violated every ethical rule we have, and if your experiment fails…well. It's a lose-lose' (Zorich 2010) We cannot condone cloning Neanderthals for curiosity's sake alone because it deliberately violates ethical tenets.

Cloning Neanderthals also shares the disadvantages of cloning mammoths, but with different living and societal costs. The surrogates in this case would likely be humans or other great apes (Church and Regis 2012), which is unacceptable, because it treats humans as a means and also subjects humans and endangered great apes to risks during egg retrieval or pregnancy and birth. The living costs on the clones is also great, given that they have human rights, and these costs could include having weak immune systems, inadequate metabolisms, and being unable to cope with current civilizations. They may also suffer socially, both for want of a social group and also as they fear or are the object of fear from society (Zorich 2010). Incorporating Neanderthals into

human society somewhat alleviates our need to provide them with a social group, but this may also take a toll on our society. Some postulate that our society would also suffer in another way from cloning Neanderthals: 'What if the thing we learned from cloning a Neanderthal is that our curiosity is greater than our compassion? Would there be enough scientific benefit to make it worth the risks?' (Zorich 2010). Cloning Neanderthals would be bad for humans, for the clones, and for society at large.

Conclusion on cloning Neanderthals

The benefits of cloning Neanderthals are uncertain, and the costs certainly outweigh the benefits. Because it is unethical to clone humans and because Neanderthals would likely receive human rights, cloning Neanderthals is unethical. While cloned Neanderthals offer possibilities for learning about hominin evolution and the medical advancements of humans, mankind is hardly hung up for a lack of cloned Neanderthals. However, there remains concern that some might clone a Neanderthal regardless of its grave implications (Levy 2011). If Neanderthals were cloned, it seems unlikely to be justified and nothing more than our chance to say, 'We did it!' Surely the ethical implications of the effects on society and clones outweigh curiosity.

Conclusion

There is a worry that curious and uncurbed scientists will make these decisions about cloning before there is public debate about the issues. Scientists may worry that the biased and uninformed public will halt essential progress. Science is necessary to envisage such projects as these, and the public is necessary to make them possible. It is important in the case of cloning

endangered and extinct species to adequately communicate about whether we *should* before focusing solely on whether we *could*. Francis Collins wisely wrote:

> It would be a mistake to leave [these] decisions to the scientists. Scientists have a critical role to play in such debates, since they possess special expertise that may enable a clear distinction of what is possible and what is not. But scientists can't be the only ones at the table….Their moral sense is in general no more or less well developed than that of other groups, and they are unavoidably afflicted by a potential conflict of interest that may cause them to resent boundaries set by nonscientsits. Therefore, a wide variety of other perspectives must be represented at the table. The burden is heavy upon those participating in such debates, however, to educate themselves about the scientific facts…[because] hardened positions can sometimes develop long before the nuances of the science have become clear, to the detriment of the potential for real dialogue. (Collins 2006)

Cloning cannot easily be simplified as 'ethical' or 'unethical,' particularly in the case of endangered or extinct species. It is my hope that the discussion in this paper will open dialogue surrounding the current frontier in cloning. We should have discussion before beginning projects to curtail, restrict, or fund those projects we find the most ethical. When communication is complete, a realistic future can be planned.

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