The Christian and Medical Ethics

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Scripture and Science Series

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INTRODUCTION

On October 13, 2001–just thirty-three short days after the World Trade Center tragedy–America lost eight more precious innocent souls. It was not until Sunday, November 25, 2001, that scientists at Advanced Cell Technology, Inc. announced they had created human embryos through a process known as somatic nuclear transfer (cloning). [This is the same group of scientists who reported in the May 22, 1998 issue of *Science* that they had created a "transgenic" cow/human hybrid embryo.] In discussing their latest endeavor to clone humans, Dr. Michael West, president and CEO of the company, remarked: "I don't think this is safe yet for human reproduction" (see CNN, 2001), and he then stressed that he does not support cloning to create human beings as a means of reproduction. However, his overall goals are not as altruistic as they might first appear. While Dr. West and his colleagues do not support human cloning as a means of human reproduction, they have absolutely no problem creating human embryos through cloning in order to extract the precious stem cells of which those embryos are composed. West argued: "There are people out there, people we all care for, who are suffering and dying and need therapies now" (CNN, 2001). How is it that we now find ourselves trying to redefine human life?

It was on April 25, 1953, that James Watson and Francis Crick published a scientific paper describing for the first time the intricacies of the DNA molecule. For their attainment, they received the Nobel Prize–and initiated a biological revolution. The elucidation of the molecular biology of the gene clearly ranks among the greatest scientific achievements of all time. Because of this discovery, a new age has dawned–the Genetic Age.

In the opinion of many scientists, the last great revolution in science was the coming of the Nuclear Age. Nuclear technology tends to be viewed as either the most powerful industry for human benefit, or the most dangerous tool for human destruction, ever available for mankind's use. With the development of genetic engineering, the potential for controversy is even greater because in their experiments scientists no longer are dealing with inanimate nature but with **human** subjects, and the consequences are far-reaching indeed. Some have made comparisons between current advances and those that led, little more than a generation ago, to the dropping of the atomic bombs over Nagasaki and Hiroshima. Science fiction writers have created, in the true tradition of Dr. Frankenstein, modern-day monsters ranging from potentially killer microorganisms to exact duplicates of Adolph Hitler. Some among us see the immediate demise of the human race; others see, and tremble before, the prospect of a Huxleyan *Brave New World*-type society that promises the complete and utter dehumanization of mankind. What, then, is the truth of the matter?

Today the citizens of most civilized countries are better fed, better clothed, and healthier than they have ever been. Transportation, educational, medical, industrial, and even recreational facilities are vastly improved compared to those of previous generations. Prospects for the future should be brighter than ever. But are they? There are ominous signs that the future may hold some of the worst of times as well. The truth is that man increasingly desires to be his own "god." The words of the infidel poet, William Ernest Henley, in his famous composition, *Invictus*, reflect the attitude of many in contemporary society–"I am the master of my fate; I am the captain of my soul." The late George Gaylord Simpson, evolutionary scientist of Harvard University, concluded one of his books by saying that man is "his own master. He can and must decide and manage his own destiny" (1953, p. 155). Such a philosophy, if widely accepted, will spell ultimate disaster.

No one knows what the future will hold, but whatever comes, there are growing indications that much of it may not be for good. The irony is that man has become more smug as scien-

tific knowledge has increased. In his egotistical pride, man has drifted farther and farther from God. Humanity progressively attempts to cut itself loose from the moral, ethical, and spiritual guidelines found within God's Word. It is safe to say that the average person of our day knows far less about the Bible than the common man of a half-century ago. What will happen, then, as science accelerates, while man's relationship with and knowledge of his Creator degenerates? The possibilities are staggering. And the frightening thing is that now we are confronting situations we thought only future generations would have to face.

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GENETIC ENGINEERING– AN OVERVIEW

In the past, genetic engineering generally was looked upon as an area of science dealing with the substitution of new ("improved") genes for old (damaged) ones. But to the man on the street today, it usually means far more than that–like conjuring up ideas of recombinant DNA monsters or cloning world-famous figures such as Stalin or Churchill. In this book, the term is used in its broadest sense to include any form of artificial reproduction or genetic manipulation. The questions we shall attempt to answer are these: (a) how extensive is our current technology; and (b) what should be the Christian's response to that technology?

The motivation behind most human genetic engineering research certainly is commendable. Scientists want to alleviate human suffering by the correction of genetic or behavioral defects, therapeutically control and rehabilitate those who are dangerous to society, and improve the general functioning and future potential of the human race. Few would argue with the goal of helping people function better. Even opponents of human genetic engineering would concede that most scientists are not attempting to be malicious or oligarchical elitists.

We must remember, however, that even scientists are not completely free of the desire for power. Further, some scientists work on the underlying assumptions that suggest: (a) we can do better than nature (or as the Christian would say, better than God); (b) we are responsible to no higher being than ourselves; (c) economic value is the final test in considering what should or should not be done; and (d) the end justifies

the means. Clearly, the potential for a very real and very serious problem exists. Should this attitude become dominant, there may be no effective barrier against irresponsible uses of genetic engineering. Thus, the biblical injunction for Christians to be the "salt" of their society (Matthew 5:13) carries tremendous import.

As we examine the ideas and practicalities of genetic engineering, we must distinguish between the various types of genetic research. The first has to do with modification, which involves making minor changes in an existing structure by splicing in new genetic material, or by altering the material already present. Generally, this type of procedure has as its goal the improvement of an organism, or the prevention or cure of disease. Few would oppose such beneficial uses of genetic engineering–if scientists follow proper guidelines.

A second, more controversial type of genetic engineering has to do with the creation of new life forms. Some scientists see the day approaching when we shall go beyond merely small-scale genetic modification to produce more inventive and novel living beings. This is a drastic departure from conferring a specific trait on an existing organism or genetically modifying an organism so as to give it a healthier, longer life. One writer has referred to this as "engineering the engineer," as opposed to "engineering his engine" (Kass, 1971, p. 779). Not surprisingly, there is disagreement in both the scientific and legal communities on the limits that should be imposed regarding the creation of new life forms.

A third type of genetic research relating to both animals and humans centers on procreation. Technology that, initially, was available only for use in animals, now is available to allow people to reproduce when previously they were unable to do so. Additionally, technology is available that can prolong (or shorten) a person's life–in keeping with the wishes of that person or his relatives and friends. It is such areas of human genetic engineering that engender much of the discussion about the ethical and moral issues confronting us as we explore these new technologies.

A BRIEF HISTORY OF GENETIC ENGINEERING

Historically, experiments intended to alter human life began in 1970 when Stanford Rogers, a physician and biochemist, attempted to introduce into his patients a gene for production of the enzyme arginase. The patients' systems were incapable of manufacturing the enzyme–a factor that eventually would cause their deaths. Dr. Rogers injected his subjects with a virus that was able to produce the enzyme, in the hope that the virus would infect their DNA. Subsequently, the host's immune system would destroy the virus, yet leave behind the gene for arginase production. The experiment failed, resulting in a swift and serious outcry of criticism from the scientific community.

In July of 1980, a more extensive experiment was attempted by Martin Cline, then head of hematology and oncology at the University of California at Los Angeles. Working with him was a team of Israeli medical doctors, headed by Eliezer Rachmilewitz of the Hadassah Hospital in Jerusalem. Patients under the care of Dr. Rachmilewitz had a rare-but-fatal disease known as beta zero thalassemia. Dr. Cline injected their bone marrow with a gene that had been cloned through recombinant DNA technology, in the hope that the new gene would correct the defect in the patients' systems. Such was not to be, however. This experiment failed as well, and cost Dr. Cline his job and research grants. Few in the scientific community, at this early stage in the history of genetic experiments, were willing to put their professional careers on the line. With human lives at stake, the risk was too great. Fewer scientists still were willing to forgive those who tried–and failed.

It appeared, then, that whatever benefits might accrue to humanity from biotechnology would come only indirectly. Indeed, early successes in the field of genetic engineering seemed to confirm that fact. By the early 1980s, business ventures had been formed for the specific purpose of advancing and investing in various kinds of genetic research, the offshoots of which certainly would benefit mankind. Compounds

such as interferon, and even human insulin, soon were being produced by genetically altered bacteria. Later, human growth hormone was added to that list. People **were** benefiting, indirectly, from genetic engineering.

By the late 1980s and early 1990s, however, the benefits derived from genetic engineering no longer were indirect. Advances in the field were coming at breakneck speed. Hardly a day passed that scientists from one corner of the globe or another did not announce still another breakthrough that conferred additional genetic blessings on humanity. For example, an article on "Conquering Inherited Enemies" in *Time* magazine announced:

> Genetic engineers at a handful of U.S. laboratories are getting ready to embark on the first trials of human gene therapy, a revolutionary approach to conquering inherited ailments. Employing the subtlest available techniques of recombinant DNA, the scientists will attempt to inject healthy copies of the affected gene into the bone marrow cells of a victim of a genetic disorder. If all goes well, the good genes will begin producing enough of the missing enzyme to cure the disease. That will be cheering news for the hundreds of thousands of patients who suffer from the 3,000 known genetic disorders (Angier, 1985, p. 59).

Five years later, another *Time* article reported about an epochal event surrounding the treatment of a 4-year-old girl.

> Last week, on the 10th floor of the massive Clinical Center of the National Institutes of Health (NIH) in Bethesda, MD., the still unidentified child assumed a historic role. In the first federally approved use of gene therapy, a team of doctors introduced into her bloodstream some 1 billion cells, each containing a copy of a foreign gene. If all goes well, these cells will begin producing ADA, the essential enzyme she requires, and her devastated immune system will slowly begin to recover (Jaroff, 1990, p. 74).

No longer, then, are the potential benefits to humanity from genetic engineering indirect. On February 16, 2001, a special issue of *Science* was devoted almost entirely to the human genome. In that report, scientists revealed that the human genome consisted of 2.91 billion nucleotide base pairs. How-

ever, this rough draft was accomplished using a "shotgun" approach to the entire genome, and as such, there were many gaps left to fill. Since that time, researchers have been slogging away to collect data from those areas not examined by the initial survey. On April 14, 2003, the International Human Genome Consortium announced the successful completion of the Human Genome Project–more than two years ahead of schedule. The press report reads: "**The human genome is complete and the Human Genome Project is over**" (see "Human Genome Project…," 2003, emp. added). This announcement came almost fifty years to the day after James Watson and Francis Crick unveiled their description of the DNA double helix.

We now have passed the point where people live longer, healthier lives simply because they can take insulin or interferon produced by genetically altered bacteria. Now, people themselves are part of the experiments–experiments that, if we are to believe the early reports, may bode well for humanity in both the near and distant future.

THE BIBLE AND GENETIC ENGINEERING

What shall be the Christian's response to these various situations? How can one know what is right? How is the morality of such practices to be determined? Someone might suggest that "the Bible has the answer." Indeed that is true. The grass withers, the flowers fade, science comes and goes, but the Word of God abides forever (Isaiah 40:8). That Word, which is a complete and perfect source of moral and spiritual information (2 Timothy 3:16-17), is eternally applicable to human needs and problems (2 Peter 1:3).

On occasion, the comment is made that "the Bible is not a science textbook." Those who make such a statement often intend to cast dispersion on various parts of the biblical record for their own self-serving purposes. While it is true that the Bible is not **strictly** a textbook on science (any more than it is strictly a textbook on history, philosophy, etc.), the statement that "the Bible is not a science textbook" leaves the false impression that the scientific information presented between its covers somehow is spurious or flawed. This is not the case.

Whenever the Bible touches upon **any** area of scientific inquiry, one may be sure that it is infallibly accurate, for the same God Who authored nature, which science seeks to study, also authored the sixty-six books of the Bible. Therefore, the two will be in harmony, for God is not the author of confusion, much less contradiction (1 Corinthians 14:33). Those willing to devote the time and effort to a study of the Bible's scientific statements will discover that, far from being spurious or flawed, they always are unfailingly accurate. On numerous occasions, the Bible writers presented scientific foreknowledge that was light-years ahead of its time. In fact, entire books have been written detailing the marvelous scientific accuracy of the Bible (see Morton, 1978; Morris, 1986, Barfield, 1988).

Nevertheless, the matter is not always as simple as saying "the Bible has the answer." Often it is much more difficult to discover **how** the Bible is to be applied to the complex problems of modern society, because there are many specifics of science about which the Scriptures do not speak. The Bible does not mention, for example, such things as inoculations, blood transfusions, birth control, genetic engineering, transsexual surgery, artificial insemination, cloning, psychosurgery, etc. How can the morality of these practices (and others like them that are not mentioned in the Bible) be determined?

The solution is that the Word of God must be probed diligently and studied intently for the **principles** that will be applicable to any act. The Bible is a book containing many timeless principles that are intended to serve as guidelines for an infinite variety of specific problems. Scripture does indeed contain the answer(s). But we must now, as never before, study our Bibles with the greatest sense of urgency if we would know how to answer an inquiring world and deal with the challenges that present themselves at our doorstep in increasing numbers every day.

3

THE BIBLICAL ETHICS OF REPRODUCTIVE TECHNOLOGIES

There are four distinct areas in which biblical ethics relevant to human reproductive technologies is of concern: (a) **before** conception; (b) **at** conception; (c) **pre**natally; and (d) **post**natally. We would like to consider the biological and biblical aspects of each of these.

BEFORE CONCEPTION

Before conception, there are three main areas involved in human reproductive technology: (1) contraception; (2) sterilization; and (3) genetic counseling. Of these, the first two fall beyond the scope and intent of the present discussion. However, genetic counseling is a practice that should be mentioned.

Twenty years ago, in 1979, conservative estimates suggested that approximately 5 million couples in the United States could benefit from some form of personal genetic counseling (Ellison, 1979, p. 14). Certainly, with the advanced technology, testing capability, and increased knowledge we now possess, that number has increased drastically. In fact, many people who do not seek such counseling are engaging in what has been called "reproductive roulette" (Fletcher, 1974). But what, exactly, is genetic counseling, and how does it work?

Genetic counseling is a medical speciality that uses the latest information on birth defects and inherited diseases to help people as they strive to plan their families, protect their health, and protect the health of their children. Counselors may be

physicians, nurses, or others with special training in genetics. Their goal is to translate up-to-date genetic knowledge into practical, useful information. To date, scientists have isolated over 3,000 genetic defects among humans. For people who may be "at risk" regarding these defects, genetic counseling can play an important part in their decision-making process. Those at risk would include people who have a family history of inherited disease(s), women who have experienced two or more miscarriages, workers whose jobs expose them to a potentially harmful environment, those married to first cousins or other blood relatives, etc.

Some diseases can be detected through genetic screening, among which are the following examples: (a) Tay-Sachs disease (which causes babies to go blind and die); (b) sickle-cell anemia (a fatal blood disease); (c) phenylketonuria (a disease in newborn infants who lack the ability to break down phenylalanine); (d) achondroplasia (a form of dwarfism); and (e) hemophilia ("free-bleeder's" disease). There are, of course, limits, because at present we do not have a simple, reliable test for each genetic disease. And although no one wants to put a price on a human life, scientists are forced to draw a line somewhere in terms of cost versus benefit, due to the lack of available research funds. If a disease (e.g., homocystonuria) occurs only once in every 160,000 people, it often becomes unfeasible economically to test everyone for that disease.

Current statistics indicate that genetic counseling is on the rise. At present, it is offered on a strictly voluntary basis, and we believe it should remain so. Both the counseling and the results are completely confidential and, whatever the results, final decisions are left to those being counseled. However, some couples are being pressured to terminate a pregnancy if the fetus is found to be "defective." This concept is both unethical and unscriptural, and will be discussed at some length later in this book. One of the most popular screening programs (concentrating not on prevention but on early diagnosis and treatment) is for newborn infants. As one lawyer predicted several years ago, "Within the next decade, virtually every newborn in America may be tested for a whole host of genetic diseases" (Reilly, 1976, pp. 55-57).

Scripturally speaking, the choice to have, or not to have, children is left entirely to the potential parents. Scripture makes it clear that we are creatures of freedom of choice (cf. Joshua 24:15; Isaiah 7:16; John 7:17; Revelation 22:17). While it is true that ultimately we are responsible for the choices we make, and for any consequences stemming from them, in this area the Scriptures do not mandate a particular decision regarding the bringing of children into the world. Birth control, for example, certainly is permissible scripturally (see Jackson, 1985). And there is no command given to modern-day man and woman to produce children [the command given to Adam and Eve to "fill the earth" (Genesis 1:28) is not to be interpreted as a strict command for every married couple, because at that time it involved a specific purpose–i.e., the propagation of the human race through the lineage of Adam and Eve]. A couple, in keeping with biblical edict, may elect not to have children. Especially is this true if there is evidence that the couple might bring into the world a diseased or disabled child. It would be wise stewardship, though admittedly a difficult decision, on the part of the potential parents **not** to have children in such an instance.

AT CONCEPTION

Reproductive technologies at conception usually include: (1) cloning; (2) artificial insemination; or (3) *in vitro* fertilization.

Cloning

In recent times, there has been a great deal in the news about cloning. The English word "clone" derives from the Greek *klon* (meaning a sprout or twig) and in science refers to an asexual process of reproduction that results in an exact genetic duplicate of the original. In biology, the **noun** "clone" refers to a cell or an organism that is genetically identical to another cell or organism from which it was derived. For example, some organisms (like bacteria) reproduce themselves by copying their DNA and then splitting in half. The two resulting bacteria are thus clones. The **verb** "clone" refers to the process of creating cloned cells or organisms.

Cloning is quite natural for many of Earth's life forms. For example, when the amoeba reproduces by splitting into two parts, it is cloning itself. In essence, then, cloning is a way to grow many identical cells or organisms from a single ancestor. However, most plants and animals reproduce sexually–a process that requires a contribution of genes from both the male and female of the species. Therefore, any attempt to clone such organisms, including humans, must involve sophisticated technology. The science fiction version of cloning uses a body cell (known as a somatic cell) to make a copy of an individual. In the past, cloning of relatively complex creatures, such as mammals, for example, began with an egg, or perhaps even a fertilized egg. Only then could scientists make copies of one unique set of genes.

The beginnings of what we today refer to as cloning actually go back to the early part of the twentieth century–1901 to be exact. Hans Spemann (1869-1941) was a German embryologist who was a professor of zoology (1919-1935) at the University of Freiburg. In 1901, he split a 2-cell newt embryo into two distinct parts, successfully producing two different larvae. In 1914, he conducted the earliest known experiments on nuclear transfer. By using a tiny strand of baby hair, Spemann partially constricted a newly fertilized egg (zygote), thereby forcing the nucleus to one side of the cell and the cytoplasm to the other side. As the nucleus side of the cell began to divide into a 16-cell stage, the nucleus slipped over to the cytoplasm on the other side. Cell division began on this side too, and the hair knot was tightened to prevent any additional nuclear transfer. Twin larvae developed, with one side (the side with the initial nucleus) being slightly older than the other (the side with the initial cytoplasm). This proved that the nucleus from a 16-cell stage could direct the growth of another larva. From his observations, Dr. Spemann proposed removing the nucleus from an unfertilized egg and replacing it with the nucleus from a fertilized cell. In fact, he did just that, and used the nucleus from a 16-cell salamander embryo to create an identical twin. By transplanting embryonic tissue to a new location within the embryo (or to another embryo entirely), he was able to identify the agency that governs the growth

and differentiation of cells. He received the 1935 Nobel Prize in Physiology or Medicine, and three years later described his award-winning research in his classic text, *Embryonic Development and Induction* (1938).

During the 1950s, F.C. Steward of Cornell University demonstrated how to clone plants, and produced carrots by the thousands through such a procedure (see Steward, 1970). In 1952, Robert Briggs and Thomas King of the Institute for Cancer Research in Philadelphia cloned a leopard frog (see Briggs and King, 1952). Since then, carrots, tomatoes, fruit flies, and even frogs have been cloned. The successes (and there were many) were the result of painstaking research carried out using embryonic or neonatal somatic cells (viz., non-adult cells). Then, on April 25, 1953, James Watson and Francis Crick published their scientific paper describing for the first time the intricacies of the double-helical structure of the DNA molecule (Watson and Crick, 1953). For this attainment, they received the 1962 Nobel Prize in Physiology or Medicine–and simultaneously initiated a biological revolution.

The same year that Watson and Crick were awarded the Nobel Prize, John Gurdon of Oxford University cloned sexually mature frogs from the intestinal cells of adult frogs (1964, 4:1-43). A year later, in 1963, British scientist J.B.S. Haldane first employed the word "clone" to describe Gurdon's frog experiments in his chapter, "Biological Possibilities for the Human Species of the Next Ten-Thousand Years," in the book, *Man and His Future* (Haldane, 1963). Three years later, Gurdon and Uehlinger succeeded in growing an adult clawed frog from an injection of a tadpole intestinal cell nucleus into an enucleated oocyte (which, unlike Briggs' tadpoles, was allowed to grow into an adult), thus representing the first cloning procedure that resulted in an adult vertebrate (see Gurdon and Uehlinger, 1966; Gurdon and Laskey, 1970a, 1970b).

In 1970, Paul Berg and Stanley Cohen of the United States achieved a monumental breakthrough in genetic engineering with the first successful gene splicing (see Cohen, et al., 1973). [Splicing occurs when pieces of genetic material, such as DNA or RNA, are cut and removed and the remaining pieces are rejoined.] Together, they created the first recombinant

DNA organism using techniques pioneered a year earlier by Paul Berg (who received the 1980 Nobel Prize in Physiology or Medicine in recognition of his new gene-splicing technology).

On January 22, 1973, the nine justices that comprised the United States Supreme Court issued their infamous *Roe vs. Wade* (7-2) decision legalizing abortion, which resulted in a moratorium on government financing for embryo research. The 1974 National Research Act, which addressed this issue (among others), contained among its provisions a temporary moratorium on federally funded fetal research either "before or after abortion." That moratorium remained in effect until 1975, at which time the Department of Health, Education, and Welfare (now known as the Department of Health and Human Services) issued extensive regulations governing federally funded fetal research.

By the late 1970s, scientists lamented that, in spite of numerous attempts in laboratories around the world, "...no one has yet shown that it is possible to clone a mammal by using a body cell nucleus from an adult" (Lygre, 1979, p. 41). Something–no one quite knew what–seemed to make the somatic cell of the adult an unlikely candidate for cloning procedures. However, investigators did not abandon their efforts, and attempts to clone organisms using adult somatic cells continued at an unprecedented pace.

Clement Markert of Yale University perfected a method that allowed researchers to remove one set of chromosomes–either those from the sperm or those from the egg–just after fertilization. Through biochemical means, the remaining set could be made to double, producing an egg with two sets of the sperm's (or egg's) chromosomes. The same number of chromosomes as a fertilized egg then was present, and embryonic development could begin. Peter Hope and Karl Illmensee at the Jackson Laboratory in Bar Harbor, Maine, employed this technique in mice, and produced seven female offspring. While none of the seven was a clone of the genetic parents, if the same procedure were repeated on those seven mice (retaining the chromosomes of their eggs), their offspring would be clones.

Then, in 1980, the U.S. Supreme Court ruled that a new, genetically altered bacterium (i.e., a non-natural microorganism) could be patented (see Supreme Court of the United States, 1980). This widely publicized case demonstrated to scientists the profitability of genetic research; living things genetically altered by man now could be patented. In 1981, Curt Civin, director of pediatric oncology at Johns Hopkins University School of Medicine, discovered how to isolate and purify human stem cells. That same year, Dr. Civin discovered the first stem-cell antibody, winning a patent to the entire class of cell hunters. In 1984, after extensive experiments with mice, Davor Solter of the Wistar Institute of Philadelphia claimed that the cloning of mammals was biologically impossible. The last phrase of the last line of Solter's paper (published in *Science*) has reverberated through the halls of academia ever since. He wrote: "The cloning of mammals by simple nuclear transfer is biologically impossible" (McGrath and Solter, 1984, 226:1317-1319). Solter's conclusion was accepted as "fact," and for years to follow, funding for research on cloning was marginalized and almost impossible to obtain. [Just five years earlier, in 1979, R. McKinnelly, a professor of genetics and cell biology at the University of Minnesota who specializes in frog cloning, wrote in his book *Cloning:* "I never expect to witness the construction of carbon copy humans. I do not believe that nuclear transplantation for the purpose of producing human beings will ever routinely occur" (1979, p. 102).]

On the other side of the globe, in 1984, Steen Willadsen of Denmark cloned a lamb by transferring a single cell from an 8-cell sheep embryo to an unfertilized egg whose nucleus had been destroyed. Three of the four reconstituted embryos transferred to ewes' oviducts developed into genetically identical lambs. He also mixed embryonic cells of different species to create sheep-goats and sheep-cows. Other scientists followed his example, and cloned a variety of animals. His work was the first verified cloning of a mammal using the method of nuclear transfer. A year later, Willadsen joined Grenada Genetics, a bioengineering company, and was the first to clone a farm animal using the nuclear-transfer method (when he used

his cloning technique to duplicate the embryos of prize cattle). Willadsen's work, however, still involved embryonic cells, not adult cells.

In 1986, while working at Grenada Genetics, Willadsen cloned a cow using differentiated, one-week-old embryo cells. His efforts proved that the genetic information of a cell did not diminish as the cell specialized, and that DNA could be returned to its original state. Willadsen's work (1986) was an extremely strong influence on Scottish scientist Ian Wilmut's decision to attempt to clone sheep from adult cells, which he ultimately accomplished with the famous 1996 birth of Dolly (discussed below).

In one popular technique, known as nuclear transfer (also known as somatic nuclear transfer), an unfertilized egg is harvested from the female, and its nucleus either is destroyed (e.g., by radiation) or removed. The nucleus from a body cell then is placed into the egg, which, when implanted in the uterus, behaves as if it has been fertilized—except that all of its genetic information has been derived from a single individual rather than two parents.

This type of cloning possesses potential benefits. Its greatest value, however, is not as an alternative means of reproduction, but as a powerful laboratory research tool, especially in developmental biology. Cloning can aid in the study of nuclear differentiation, helping scientists to better understand how an embryonic cell becomes a nerve cell, a blood cell, etc. It also can be very helpful in the study of immunology and organ rejection. Additionally, cloning can be employed with great benefit in medical research. For example, it can be used in the study of cancer, and also can be used in the study of the aging process.

But what about attempts at human cloning? Landrum Shettles reported in the *American Journal of Obstetrics and Gynecology* that he personally had cloned human embryos to the blastocyst stage (the point in early development where the whole embryo has the appearance of a hollow sphere; see Clark, 1979, p. 99). As one writer summarized the experiment:

> According to the report, he had removed the genetic material from a human egg cell and replaced it with the nucleus of a human spermatogonium, the precursor of the sperm cell. Because the spermatogonium contains a double set of chromosomes, it is a complete blueprint for the individual. The egg was fertilized, cell division began, and three days later the embryo was at the morula stage, its cluster of cells ready for implantation. **If the paper was true**, then it meant that the first glimmering of a human being had already been cloned (Kahn, p. 164, emp. added).

The operative phrase here, of course, is "if the paper was true." Most scientists working in this field did not believe that it was, and remained skeptical of Dr. Shettles' experiment. Why? "Shettles never presented evidence that the egg was enucleated,...nor did he use genetic markers that would have proved that the sole parent of the embryo was indeed the transplanted spermatogonium" (Kahn, p. 164).

In 1978, freelance science writer David Rorvik authored, and the J.B. Lippincott Company of Philadelphia, Pennsylvania, published *In His Image: The Cloning of a Man.* The book, which told the story of a purported 67-year-old eccentric millionaire who had himself cloned, spawned a serious scientific controversy, since it had been published as **non**fiction (Rorvik, 1978). The book caused such a furor that the United States Congress held hearings on the veracity of the account as reported by Rorvik. Most scientists dispute claims such as those made by Rorvik and others in regard to the cloning of humans. One scientist suggested concerning Rorvik's work: "His book sets new standards for the label 'nonfiction' " (Lygre, 1979, p. 41). In its publication, *ASM News*, the American Society for Microbiology stated:

> Four eminent cell biologists have testified before congress that adult cloning of humans has not been and may never be achieved because of biological barriers. They also called David Rorvik's book, *In His Image: The Cloning of a Man*, a fictional work replete with scientific errors (*ASM News*, 1978, p. 334).

In 1981, after reviewing the evidence, U.S. District Court judge John Fullam ruled the book to be fiction (Fullam, 1981, p. 2-F)

and, in 1982, Lippincott was forced to acknowledge publicly that the book was a hoax (but only after making some $730,000 in sales!).

To some, however, the idea of human clones is not beyond the realm of possibility. More than three decades ago, Kimball Atwood, professor of microbiology at the University of Illinois, went on record as stating that humans could be cloned "within a few years" (as quoted in Rorvik, 1969, p. 9). Nobel laureate James Watson later predicted that "...if the matter proceeds in its current nondirected fashion, a human being born of clonal reproduction most likely will appear on the earth within the next twenty to fifty years, and even sooner, if some nation should actively promote the venture" (1971).

Who can know what the future may hold in this regard? The interest in such genetics-based projects certainly exists. In October 1990, the National Institutes of Health officially announced the beginning of the Human Genome Project, a massive, international collaborative effort to locate the estimated 50,000 to 100,000 genes within the human genome, and the sequencing of the estimated 3 billion nucleotides that compose that genome (see Thompson, 2000a; 2000b). Then, in October 1993, at a meeting of the American Fertility Society in Montreal, two American scientists, Jerry Hall and Robert Stillman, touched off an unexpected controversy when they presented a paper on facets of their research in the area of *in vitro* fertilization techniques. At the time, Dr. Hall was the director of the *in vitro* laboratory at George Washington University; Dr. Stillman headed the university's entire *in vitro* fertilization program.

Starting with 17 microscopic human embryos ranging from the two-cell to the eight-cell stage, Hall and Stillman used new technology to multiply the embryos from 17 to a total of 48. Major newspapers and news magazines heralded the landmark event with feature articles. The *New York Times* published a front-page article under a headline that screamed, "Scientist Clones Human Embryos, and Creates an Ethical Challenge." *Newsweek* and *Time* both prepared cover stories on the Hall/Stillman experiments (see Adler, 1993; Elmer-Dewitt, 1993).

The controversy caused by the Hall/Stillman experiment was due, in large part, to the fact that human embryos were involved. However, it is important to note what the experiment did, and did not involve. First, the experiment did not involve the type of cloning of science fiction fame–in which genetic material from a mature individual is nurtured and grown into a living replica of the original. Second, the experiment did not involve the cutting and splicing procedures by which DNA strands from cells are mixed and matched. In some instances, to mention just one example, molecular biologists have inserted human genes into the DNA of bacteria to produce insulin in large quantities. But the Hall/Stillman experiment did not involve this kind of genetic engineering.

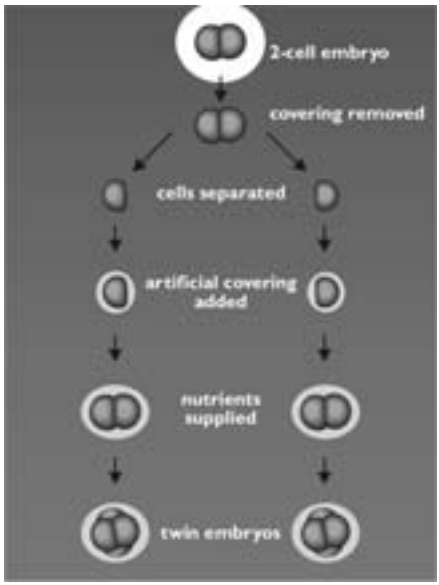

Figure 1 – Method by which Hall and Stillman produced twin embryos from a single embryo (after Kolberg, 1993).

Hall and Stillman were searching for a way to make *in vitro* fertilization more successful. A woman in which only a single embryo is implanted has somewhere between a 10 and 20% chance of becoming pregnant–if all goes well. But if that single embryo could be cloned into three or four, then the chances

of a successful pregnancy would increase dramatically. These two researchers were not trying to produce cloned embryos that would be implanted into a potential mother. Rather, they were examining embryos resulting from fertilization of an egg by multiple sperm cells, and that therefore would not be able to live more than a few days at best.

Their experiment involved allowing the single-cell embryos to divide into two distinct cells, and then quickly separating them. In order to do this, the outer coating around the cells–known as the zona pellucida–that is essential to the embryo's proper development had to be removed. Once the cells had been separated, an artificial zona pellucida had to be created to take the place of the original one that had been destroyed. Hall and Stillman developed an artificial zona pellucida from a gel derived from seaweed. Once the artificial coating was replaced, the cells began to grow.

The experiment, so far as Hall and Stillman were concerned, had been a success and was repeated numerous times, producing 48 clones in all. But none of the clones lived more than six days. A detailed description of the process used by Hall and Stillman was published in *Science News* (see Fackelmann, 1994a). While many scientists praised the novel experiment, criticism from some in the academic and scientific communities was quite strong in certain instances (see Fackelmann, 1994b). Unfortunately, the conclusions suggested by headlines in major newspapers or articles in national news magazines were not always completely representative of the actual facts of the matter. Humans had not been cloned.

While we cannot condone the manner in which the Hall/Stillman research was carried out (i.e., accepting the inevitable death of living human embryos as the by-product of a scientific experiment), at the same time it is important that we understand exactly what the new technology allowed them to do, and that we not overstate the case in regard to what was accomplished. As Major has observed:

> The next stage may involve implanting viable embryos into women as part of an IVF [*in vitro* fertilization–BT/BH] program.... What we must realize is that the IVF technique, with or without artificial twinning,

> involves the death of human beings. Whether an embryo has one cell or a thousand cells, it deserves the sanctity granted by God to all human life (1993, 13:93).

In 1994, just one year after the Hall/Stillman experiments were published, the Human Embryo Research Panel, a body convened by the National Institutes of Health, concluded that embryonic stem-cell research should be publicly funded, as long as the embryos were not created originally for research purposes. That same year, the U.S. Government published guidelines for research on transplantation of fetal tissue. Also in 1994, United States scientists M. Sims and N.L. First cloned calves from cells of early embryos (1994).

In 1995, Ian Wilmut and Keith Campbell of Great Britain produced the world's first cloned sheep, Megan and Morag, from 9-day-old embryos (Campbell, et al., 1996). In 1996, federal money was banned for stem-cell research involving embryos. In 1997, the first human embryonic stem cells were isolated (Thomson, 1998; Gearhart, 1998), and Scottish scientist Ian Wilmut and his colleagues created Polly, the first sheep with a human gene in every cell of its body (Schnieke, et al., 1997). Plus, University of Massachusetts researchers reported the successful cloning of cattle using fetal cells (Kato, et al., 1998).

Up until 1996, successful cloning procedures required the use of **embryonic** cells. Why so? The reason had to do with the fact that as they grow, embryonic cells rapidly undergo a process known as "differentiation," which means that groups of cells follow a route of development that causes them to be "different" than other cells. Some will end up as bone marrow cells; some will end up as brain cells; some will end up as optic nerve cells; and so on. Philip Elmer-Dewitt, a writer for *Time* magazine, expressed the problem quite well when he wrote:

> There is a vast difference between cloning an embryo that is made up of immature, undifferentiated cells and cloning adult cells that have already committed themselves to becoming skin or bone or blood. All cells contain within their DNA the information required to reproduce the entire organism, but in adult

> cells access to parts of that information has somehow been switched off. Scientists do not yet know how to switch it back on (1993, p. 66).

In this statement, Elmer-Dewitt echoed what seemed to be a commonly shared view among researchers involved in cloning procedures. No one had been able to clone mammals using **adult** somatic cells, because for some unknown reason a great portion of the DNA in those cells had been "switched off," which is why scientists such as Davor Solter (quoted earlier) concluded: "The cloning of mammals by simple nuclear transfer is biologically impossible" (McGrath and Solter, 1984, 226:1317-1319). But, as the old saying goes, "That was then; this is now."

In the February 27, 1997 issue of *Nature* (the official publication of the British Association for the Advancement of Science), there appeared what seemed at first glance to be an innocuous article titled "Viable Offspring Derived from Fetal and Adult Mammalian Cells" (Wilmut, et al., 1997). That article, however, announced the results of scientific research so significant that it not only would make history, but also would change forever the way scientists viewed cloning in both animals and humans.

Researchers from the Roslin Institute near Edinburgh, Scotland, had accomplished what almost everyone in the scientific community thought to be impossible. Headed by embryologist Ian Wilmut, Scottish scientists produced a lamb using genetic material from the mammary cell of an **adult** ewe. The young lamb, named Dolly, did not owe her existence to a procreative act occurring between a ram and a ewe. Instead, Dolly was the result of a laboratory exercise in cloning.

When her arrival was announced, scientists around the world gasped–first in disbelief, then in "udder" awe. The "news" part of the story was not merely that a mammal had been cloned; that had been accomplished in the past. The news was that a mammal had been cloned from an **adult** cell–something that even scientists like James Watson and Francis Crick (who were awarded the 1962 Nobel Prize in Physiology or Medicine for their elucidation of the molecular structure of

DNA) had gone on record as stating was very likely impossible. Dr. Wilmut and his team at the Roslin Institute outside of Edinburgh, Scotland, had shown that it **was** possible. As *Time* put it, the Scottish researchers had succeeded in

> ...scoring an advance in reproductive technology as unsettling as it was startling. Unlike offspring produced in the usual fashion, Dolly does not merely take after her biological mother. She is a carbon copy, a laboratory counterfeit so exact that she is in essence her mother's identical twin (Nash, 1997, p. 62).

Briefly explained, here is what Dr. Wilmut and his coworkers did to make Dolly a reality. As noted earlier, embryonic cells are easier to use in cloning experiments than adult somatic cells because, for the most part, they are **undifferentiated**. In other words, they have not matured to the point where they have been able to carry out the instructions contained in the DNA within their nucleus that direct them to become skin cells, brain cells, eye cells, etc. In its young, embryonic state, an undifferentiated cell can become any other cell in the body

Figure 2 – Dolly (cloned from a mammary gland cell of a Finn Dorset ewe) and her Scottish Blackface surrogate mother

because it has the capacity to activate any given gene on any given chromosome. Non-embryonic somatic cells, however, already have carried out their DNA instructions, and as a result they are **differentiated** (i.e., in their mature state, they have become nerve cells, muscle cells, blood cells, hair cells, etc.).

As a result, huge portions of the DNA instructions have been "deactivated" so that mature cells can carry out their particular function(s). Thus, much of the information that is coded within the DNA of adult cells no longer is accessible, due to the fact that it was "switched off" at maturity because it no longer is needed by the cell.

In the past, most scientists involved in the broad area of genetic engineering thought that the differentiation process was irreversible. However, Dr. Wilmut and his coworkers disproved that idea by devising a way to "reactivate" portions of the DNA molecule that previously had been deactivated, thus making adult somatic cells candidates for cloning.

First, the Scottish scientists searched for a mechanism that would allow them to arrest the normal cell cycle (i.e., the process through which cells go as they mature and prepare to reproduce themselves). They surmised that this might be accomplished by starving cells of the nutrients they needed in order to grow. Some of the cells chosen for the experiment were from the udder of a six-year-old Finn Dorset ewe. Once deprived of these critical nutrients, the mammary gland cells fell into a sort of "suspended animation" (what, in live animals, would resemble hibernation), a state in which they remained for one week.

Second, using the procedure mentioned earlier known as "nuclear transfer," Dr. Wilmut took an unfertilized oocyte (i.e., an egg cell) from a Scottish Blackface ewe and carefully removed its nucleus, leaving the remainder of the cell (cytoplasm, cell membrane, etc.) completely intact (see Stewart, 1997). Then he took the quiescent mammary gland cell, placed it next to the oocyte, and gently applied short bursts of electrical current, which prompted the egg cell to bond with the somatic cell and absorb its nucleus (containing a full comple-

ment of chromosomes). As a result, the egg cell possessed the number of chromosomes it would contain if it had been fertilized by the male's sperm. The biochemical activity usually associated with a zygote (the cell that results when sperm and egg combine) then began to occur.

Third, after one week of carefully monitored growth, the laboratory-engineered embryo was inserted into the uterus of a surrogate ewe to see if it would implant successfully and grow to term.

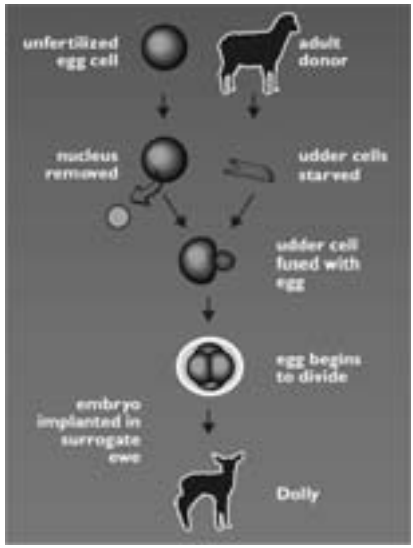

Figure 3 – Technique used by Wilmut, et al. to clone a sheep. The breakthrough involved starving body cells of nutrients, thus interrupting the normal cycle of growth and division. In this quiescent stage, the cell can be "reprogrammed" to function as a newly fertilized egg (after Travis, 1997, 151:215).

All of this may sound quite simple, but it is not. Dr. Wilmut's success came only after a long string of failures. In fact, he reported in his article in *Nature* that out of 277 eggs fused with udder cells, he and his team were able to produce only 29 embryos that survived more than six days. Of those 29, all died before birth except Dolly.

Not long after Dolly's arrival, scientists worldwide began to report one success story after another using the same procedure (or ones similar to it) to clone additional mammals from adult cells, including mice (Wakayama, et al., 1998; Travis, 1998c), cattle (Kato, et al., 1998; Travis, 1998b), goats (Baguisi, et al., 1999), pigs (Onishi, et al., 2000; Polejaeva, et al., 2000), cats (Shin, et al., 2002), rabbits (Chesné, et al., 2002), mules (Woods, et al., 2003; Pearson, 2003c), horses (Galli, et al., 2003; Thompson, 2003; Weiss, 2003a), and deer ("World's First Cloned Deer Revealed," 2004; "Texas A&M Scientists…," 2004). [Perhaps the reader shares our astonishment at the thought of someone actually wanting to clone–**rabbits**!]

This kind of success silenced forever skeptics who felt that the events and procedures that resulted in Dolly were mere "flukes." Furthermore, the April 25, 1998 issue of *Science News* reported that Dolly had been bred to David, a Welsh Mountain ram, and was pregnant (see Travis, 1998a, 153:263). [Actually, by the time the story got press, Dolly already had given birth. On April 13, 1998 she produced a 6.7-pound baby ewe by the name of Bonnie. Almost a year later, on March 24, 1999, Dolly gave birth to three healthy lambs–two males and one female.] This news dispelled the idea that as a clone she might be sterile, and paved the way for future successes in the breeding of clones.

To the uninitiated, all of this may seem much ado about nothing. Why go to all the trouble and expense to clone an animal when normal procreative processes can produce it without all the bother? "Just let nature take its course," some might say.

There is much more to it than that, however. Cloning has the potential to make animal husbandry more efficient. Imagine (to use just one example) the plight of the dairy farmer searching for a way to breed cattle that produce better milk in greater quantities. If he could isolate the cattle that consistently produced more, and better, milk than all the others, he could have them cloned, thus guaranteeing whole herds of the highest quality milk-producing animals.

In addition, cloning has the potential both to reduce human suffering and to extend human life. Suppose (again, to choose just one hypothetical example) that scientists were able to discover a mechanism by which they could alter chimpanzees genetically so that portions of their immune systems, or products manufactured by those immune systems, were indistinguishable from those in humans whose own immune systems were diseased or damaged (and thus incapable of fighting off disease). These chimpanzees then could be cloned so that as many copies as needed could be produced, thereby ensuring life-saving animal products in an endless supply for use in humans.

Further, cloning has the potential to enlarge our knowledge about how cells differentiate and reproduce. Using information gleaned from the study of the cell during cloning, scientists believe they can learn more about why cancer cells grow out of control, or why birth defects occur. In short, cloning **does** hold forth immense potential in many different areas and, used properly, could offer tremendous benefits to mankind (see *Scientific American,* 1997).

The operative phrase here is "used properly." With cloning, as with many of the technologies offered by modern science, there can be serious scientific, biblical, and ethical implications. Rarely is the technology, in and of itself, morally objectionable; instead, it is the **use** of the technology that makes it so. Part of the problem is the fact that science itself is not equipped to deal with moral issues. There is nothing within the scientific method, for example, that can dictate whether nuclear energy should be used to destroy cancer cells, or entire cities. That is a judgment far beyond the scope of science to make.

Unfortunately, once the technology becomes available, there are those who are prepared to employ it, regardless of any ethical problems that might be associated with it. Since many scientists either do not believe in God, or do so only accommodatively, they neither are interested in, nor restricted by, the guidelines and principles set forth in His Word. As a result, in their eyes the simple fact that the technology is avail-

able is reason enough to use it. Within the scientific community, this often is referred to as the "technological imperative"–whatever **can** be done **should** be done!

In regard to cloning, the most pressing questions on almost everyone's mind are ones such as: (a) why would anyone want to clone a human in the first place; (b) if attempts at cloning humans are successful, would a clone be an exact duplicate of the original; (c) will we eventually be able to clone humans; and (d) would humans produced by cloning possess a soul? We will address each of these issues at some point during this discussion.

Why would anyone want to clone a human? First, parents might want to clone a child as a "replacement" for one that had died. Second, parents might want to clone a child to provide compatible organ transplants for a diseased relative. [There already have been cases of women becoming pregnant so they could abort the child to provide fetal brain cells for transplantation into a relative (e.g., a parent or grandparent suffering from Parkinson's Disease).] Third, individuals might want to have themselves cloned to guarantee immortality–if not in soul, at least in body. Fourth, some may desire to clone a human simply for the prestige and adulation that inevitably will result from having accomplished what no one else has been able to do. A Nobel Prize can provide a very strong incentive indeed!

If attempts at cloning humans are successful, would a clone be an exact duplicate of the original? A clone would be an exact **genetic** duplicate of the original–the word "genetic" providing a critical distinction. Merely possessing identical **genes** does not guarantee identical **people**. Ask anyone with identical twins. In fact, twins would be more alike than clones for the simple reason that the twins would have shared the same environment, upbringing, etc. Humans are more than merely a "bag of genes." Each of us is the end product of many different external forces that influence us from cradle to grave. Our personalities and attitudes are formed by parents, friends, teachers, daily routines, societal interactions, and many other factors that affect us during our lifetimes.

Will we eventually be able to successfully clone humans? That remains to be seen. Scientists cannot answer that question, for to do so would require that they possess the ability to predict the future—something neither a scientist, nor science, is equipped to do. Furthermore, there are too many unknowns. At this point in time, we do not know if human adult somatic cells will respond the same way adult somatic cells from sheep responded. We do not know if the process used to produce Dolly (nuclear transfer) can work successfully in humans. And so on.

However, if the question were reworded so as to ask, "Will scientists **attempt** to clone humans?," We think the answer would be an unqualified "yes." An analogy might be helpful. When mountaineers are asked **why** they ascend a challenging (and often life-threatening) mountain, they routinely respond: "...because it's there." Some scientists likely will take the same approach. When asked **why** current technology should be used to clone humans, they will respond: "...because it's there." One writer has suggested:

> ...it is not a question as to **whether** we will attempt to clone a human being or not. Many technical hurdles will have to be overcome first before we can attempt to produce cloned humans, so they say. But if the moral and ethical scientists want to wait, or even shrink in fear from such an undertaking, there are many in the world who have the financial means, who do not have any scruples or reservations about cloning humans. What about them? (Sinapiades, 1997, p. 6, emp. in orig.).

It no longer is a matter of **if** attempts will be made to clone humans using this new technology, but **when**. Eventually some scientist, or group of scientists, will yield to the temptation to apply the Scottish scientists' methodology to the human race—a scenario we discuss at some length below. There can be no doubt that it is only a matter of time until someone, somewhere, attempts to add humans to the list of creatures that already have been cloned. As Michael Shermer, editor of *Skeptic* magazine (and an outspoken critic of religion), wrote in his 2001 volume, *The Borderlands of Science:* "[C]loning is going to happen whether it is banned or not, so why not err

on the side of freedom and allow scientists to freely explore the possibilities–not to play God, but to do science?" (p. 77). Waiting in the wings are the rogue scientists who are more than willing to "freely explore the possibilities" (and yes, even play God in the process!). In yet another 2001 book, *The Shattered Self: The End of Natural Evolution*, Pierre Baldi asserted:

> Thus, in time and with the proper technology, we will be able to clone any human being whose DNA is available in sufficient amount and viable form.... Of all the scenarios we have discussed, human cloning is probably the most pressing and concrete.... **[H]uman cloning is essentially available today**. ...Cloning, gene therapies, advanced molecular medicine, and surgical procedures such as organ transplantation, together with a better understanding and control of environmental factors, **can render our bodies essentially immortal** (pp. 82,121, emp. added).

That concept–potential human immortality–has not been lost on some within the scientific community.

Early in 2004, South Korean researchers reported that they had brought us one step closer to the reality of a human clone. Woo Suk Hwang, Shin Yong Moon, and their colleagues in the School of Veterinary Medicine at Seoul National University, produced the most advanced human embryonic clones to date. BBC News headlines confirmed: "Scientists Clone 30 Human Embryos" (Amos, 2004). And *Time* magazine, in its April 26, 2004 special issue of "The *Time* 100," featured doctors Hwang and Moon in the "scientists and thinkers" division, under the heading of "Adventures in Cloning" (see Kluger, 2004).

Not only did the group succeed in creating 30 human embryo clones, but they also allowed the developing embryos to progress to an advanced stage. The team allowed the embryos to grow for a week to the blastocyst stage, and then purposefully destroyed every single one in order to obtain the stem cells inside.

The researchers collected 242 eggs from 16 volunteers. From those oocytes, 176 then were used in the somatic-cell nuclear transfer procedure (Hwang, et al., 2004). Thirty em-

bryos resulted from their nuclear transfer techniques. Researchers speculated they "were able to obtain ~25% of the embryos to the blastocyst stage" (p. 2). The presence of a blastocyst indicates that the embryo has advanced far enough that two cell types are now forming: the embryoblast (inner cell mass on the inside of the blastocele), and the trophoblast (the cells on the outside of the blastocele). From the 30 blastocysts, 20 inner-cell masses (ICM) containing the desired stem cells were isolated, and one embryonic stem-cell line was derived.

In layman's terms, the researchers took about 250 egg cells from human females by over-stimulating their ovaries. The "insides" of the egg were removed. The scientists then took a non-reproductive (somatic) cell containing the woman's DNA, and transferred it into the empty egg cell. In order to get the egg to begin dividing, they activated it with an artificial stimulus. The egg then began dividing like a normally fertilized egg cell. Once it reached the blastocyst stage, the inner cell mass containing the stem cells was removed, using microsurgical techniques.

One key problem with this study is that Hwang and his colleagues used egg cells and somatic cells from the same person. As such, it is impossible to actually "prove" that the embryos developed from the non-reproductive somatic cell nucleus, rather than genetic material from the egg cell that was not completely removed. Nevertheless, this report has reinvigorated the idea of "therapeutic cloning." The authors concluded: "This study shows the feasibility of generating human embryonic stem cells from a somatic cell isolated from a living person" (p. 3).

But there are critical medical and health aspects that also cannot be ignored. For example, the May 27, 1999 issue of *Nature* magazine reported on a study of Dolly's chromosomes. Ian Wilmut (who was responsible for cloning Dolly) and his colleagues studied the length of chromosome ends (telomeres) from Dolly and two other sheep produced by the same nuclear-transfer process used to clone Dolly. It generally has been accepted scientifically that telomere deterioration is a reliable indication of reduction in life span; the more rapid

and serious the telomere deterioration, the shorter the expected life span. Wilmut and his coworkers reported a marked deterioration in the telomeres of Dolly's chromosomes compared to those from non-cloned animals, and even suggested that "the most likely explanation" for the deterioration observed in these animals "reflects that of the transferred nucleus. Full restoration of telomere length did not occur **because these animals were produced without germline involvement**" (see Shiels, et al., 1999, 399:317).

In other words, because Dolly was cloned from the mammary gland cell of a six-year-old sheep, in essence her telomeres already were six years old, and therefore deteriorated more rapidly than those of non-cloned animals produced by regular procreative procedures. The scientists involved in this research stressed: "It remains to be seen whether a critical length will be reached during the animal's lifetime." These same scientists admitted: "Telomere-based models...predict that the nuclear-transfer-derived animal 6LL3 [Dolly's numerical designation in the scientists' study–BT/BH] **might well reach a critical telomere length sooner than age-matched controls**" (Shiels, et al., 399:317, emp. added). In simple terms, when the researchers made that statement in 1999, the possibility existed that cloned creatures could turn out to have markedly reduced life spans, compared to those produced via normal, sexual reproduction. Thus, cloned creatures may have markedly reduced life spans compared to those produced via normal, sexual reproduction. [In the April 28, 2000 issue of *Science*, a report was published which suggested that cloned calves actually had **longer** telomeres than normal, and thus might not be prone to an early death. Yet, the author admitted:

> Why these findings are so dramatically different from those on Dolly is not yet clear.... Other scientists are more cautious, noting that aging is extremely complex and is controlled by more than just telomere length.... No one is yet able to explain the difference between Dolly and the cloned calves. It might be due to random variation, species differences, a difference in the cell type, or different methods of nuclear transfer (Vogel, 2000a, 288:586-587).

The jury still is out on the early demise of cloned organisms, but results at this point do not look promising in certain species (see, for example, Humphreys, 2001).]

For example, three pigs that were created using techniques similar to those used to clone Dolly, dropped dead from heart attacks. Jerry Yang, the leader of a research team from the University of Connecticut, dubbed the three pigs' deaths "adult clone sudden death syndrome" (see Pearson, 2003a). Reporting on the unexpected deaths, Helen Pearson commented on the *Nature* Web site: "Of four piglets born, one died within days. The remaining three have now collapsed and expired of heart failure at less than six months of age" (2003a). Pearson went on to say: "The pigs' demise is a stark reminder that cloned animals are far from normal. Many fall ill or die just after birth–Dolly herself passed away at the relatively tender age of 6." Indeed, with animals suddenly dropping dead, now is not a good time to be a clone. Fortunately, many scientists are beginning to agree.

On September 22, 2003, more than 60 science academies from every continent in the world–members of the Interacademy Panel on International Issues (IAP)–issued a statement calling for a ban on human reproductive cloning. IAP members will present the statement to delegates of the United Nations Committee on Cloning, scheduled to meet in New York September 29-October 3, 2003. Their statement begins: "National academies of science from all parts of the world are united in supporting a worldwide ban on reproductive cloning of human beings" (see IAP Statement, 2003, p. 1). The IAP statement continues, noting:

> Scientific research on reproductive cloning in other mammals shows that there is a markedly higher than normal incidence of fetal disorders and loss throughout pregnancy, and of malformation and death among newborns. There is no reason to suppose that the outcome would be different in humans. There would thus be a serious threat to the health of the cloned individual, not just at birth but potentially at all stages of life –without obvious compensating benefit to the individual bearing this threat. Moreover, death of a fetus late in pregnancy could pose a serious threat to the

> health of the woman carrying it. **Even on a purely scientific basis, therefore, it would be quite irresponsible for anyone to attempt human reproductive cloning given our current level of scientific knowledge** (pp. 1-2, emp. added).

The statement concluded by declaring: "**We therefore call on all countries worldwide to ban reproductive cloning of human beings**" (p. 2, emp. added). This announcement only reinforces what others already have noted–that cloned animals are not stable and healthy.

While this is a good step, the IAP statement is far from benign. While the representatives who prepared the statement support a ban on "reproductive" cloning, they support cloning and embryonic stem-cell research for "therapeutic" purposes. Thus, their statement called "for cloning to obtain embryonic stem cells for both research and therapeutic purposes to be excluded from this ban." The last paragraph of the statements noted: "Cloning for research and therapeutic purposes therefore has considerable potential from a scientific perspective, and should be excluded from the ban on human cloning" (see IAP Statement, p. 3).

If it turns out that cloned organisms do indeed suffer from premature mortality, this will have serious implications for human cloning. If (to choose just one example) a 65-year-old man had himself cloned, the clone just might begin life with a 65-year head start toward the grave!

Unfortunately, health concerns plagued Dolly from the very beginning of her unusual life. Early on, researchers were worried that Dolly had a noticeably serious weight problem. And, in January 2002, it was reported that Dolly was suffering from severe early-onset arthritis. At the time, Dr. Wilmut noted: "There is no way of knowing if this is due to cloning or whether it is a coincidence." In that same article, the author noted that the director of an organization known as Compassion in World Farming, Joyce D'Silva, told BBC Radio 5 Live:

> I think of the hundreds and hundreds of other cloned lambs who have been born and had malformed hearts, lungs, or kidneys. They have struggled to survive for a few days and then had their lungs filled with fluid

> and gasped their way to death or had to be put out of their misery by their creators. That is the real story of cloning (see BBC News, 2002).

In an article he wrote about the world's most famous sheep, science writer John Whitfield of *Nature* magazine stated: "Dolly's lung problem was the last in a series of medical problems. Last year [2002], Ian Wilmut, the Roslin researcher who led the team that cloned her, said that had he been a hill farmer and Dolly a regular sheep, **the size of the vet's bill would already have sealed her fate**" (Whitfield, 2003, emp. added).

Dr. Wilmut, however, never had to load his gun. One year after Dolly had been diagnosed with arthritis, on Valentine's Day (February 14), 2003, she had to be euthanized due to a progressive lung disease–an infection seen mainly in older sheep (see "First Cloned Sheep…", 2003). In the end, Dolly's lifespan turned out to be almost exactly half that of a non-cloned sheep.

Dolly's obituary read like a Hollywood headline: "Celebrity Clone Dies of Drug Overdose" (Whitfield, 2003). The "official" obituary noted that she was only six-and-a-half years old, and had suffered "from lung cancer caused by a virus" (Whitfield). A postmortem examination was carried out, and preliminary results revealed that the world-famous sheep also had indeed been suffering from both cancer and advanced arthritis. Dolly's final resting place was at the National Museum of Scotland in Edinburgh, where, according to scientists at the Roslin Institute where Dolly had been kept, she eventually will be put on public display. This chapter in the life of this legendary sheep may be closed, but Dolly's early demise ensures that many more chapters will be written as we try to determine the safety and efficacy of cloning–in both animals and humans. **The point should not be lost that Dolly was created from the cell of a six-year-old sheep, and that she died approximately six years early**.

Dolly's untimely death followed the announcement that Matilda, Australia's first cloned sheep (born April 2000, and the first sheep to be cloned outside of the Roslin Institute–see CBC News, 2003), died. Rob Lewis, the South Australian Research Institute's executive director, said that Matilda seemed

"remarkably healthy" on the day she died. Sadly, Matilda's corpse already was decomposing when it was discovered; thus, researchers cremated it–never identifying the true cause of death. These reports echo previous ones regarding the life expectancy of clones. For instance, on March 9, 2001, three cattle cloned by scientists at California State University at Chico appeared to have been born healthy, but two of the calves died of abrupt immune system failure, and the third was reported to be failing rapidly (see Cooper, 2001). While not widely reported in the news media, such events are becoming quite common in regard to cloned animals, and serve to demonstrate the potential dangers of human cloning. Many of the animals that have been cloned have experienced obvious mutations, while others have died shortly after birth, even though outwardly they appeared to be quite normal (see, for example, Humphreys, 2001). In studies performed on cloned cattle by Cyagra, Inc., a Kansas company that studies the commercial aspects of cloning livestock, the "company has about a 6 percent birth rate; of those calves, about half die soon after they are born" (as quoted in Cooper, 2001).

An unsettling report in the July 6, 2001 issue of *Science* addressed this very point, and documented the fact that while cloned animals may appear normal, and may even behave somewhat normal, the truth is that sometimes these animals are far from normal. The report went on to announce that scientists have found the first evidence that "normal-looking" clones can harbor serious genetic abnormalities. For those researchers interested in pursuing cloning as an alternate method of reproduction, the news from scientists at the Whitehead Institute for Biomedical Research and the University of Hawaii represented a veritable bomb detonated right on their very doorsteps. The first statement in a paper titled "Epigenetic Instability in ES Cells and Cloned Mice" by David Humphreys and colleagues reads as follows: "**Cloning by nuclear transfer is an inefficient process in which most clones die before birth** and survivors often display growth abnormalities" (2001, 293:95, emp. added).

One year later, Tanja Dominko of the Oregon Regional Primate Research Centre, spoke at a conference in Washing-

ton, D.C., where she reported on her work with cloned monkey embryos. She commented that the cloned embryos showed a host of problems, and that even embryos that looked healthy were, to use her words, a "gallery of horrors" This is not exactly the image of cloning that federally funded researchers want the public at large to see.

One thing is certain. Scientists do not want Dolly's death stifling the agenda for human cloning. In fact, two days after Dolly's death, Robin McKie authored a paper titled "Dolly Dies–But Human Cloning will Still Happen." McKie noted: "Human cloning is still on the agenda. Leading scientists yesterday attacked suggestions that the early death of Dolly the Sheep showed that current biotechnology techniques were inefficient and unworkable" (2003). Thus, the push continues for someone to announce to a waiting world–and provide definitive proof–that they have successfully cloned the world's first human.

Reproductive Cloning of Humans

Several individuals, or groups, have been working feverishly to produce the first human clone. And they have not been exactly "quiet" about their efforts. As examples, we would like to introduce you to the following:

Richard Seed

Shortly after Dolly was cloned, Richard Seed (who is not even a life scientist, but instead holds a Ph.D. in physics) proclaimed publicly that he was going to establish a laboratory in Chicago, Illinois, the sole purpose of which was to clone humans. He was one of the first scientists to go public about his interest and support for human cloning. A devout Methodist, Dr. Seed believed human cloning is in accord with God's Word. In an interview, he expressed his desire to clone humans, stating:

> It won't do any good to do these experiments in monkeys. You have to do them in humans. The technological and information benefits from human cloning will be far more significant than the cloning of humans itself. I'm not saying I have any instructions from God to do this, but I am saying that it's the na-

> ture of Protestant thinking. People are dying every day, and they need sympathy…. [I]n the Protestant era, when anyone could read the Bible and think about it, Christians were able to read and think for themselves, without anyone between them and their idea of God. When we attain an extended life span and access to unlimited knowledge, we will become God-like. And that is God's intention (as quoted in Kadrey, 1998).

Federal regulations enacted shortly after Dolly's cloning specifically prohibited the cloning of humans in America–**in laboratories receiving government funds**. Dr. Seed has stated repeatedly that he neither will seek nor accept any such funding; therefore, in his view, the law's prohibitions would not apply to his efforts. However, on March 27 2001, the United States Food and Drug Administration (FDA) mailed Dr. Seed a letter, warning him that any attempt to clone a human might place him in violation of federal regulations governing experimental medical procedures. In a July 9/16, 2001 special double issue of *U.S. News and World Report,* Dr. Seed offered a response to the letter when he said: "I think their purpose was to frighten me, and they did!" (as quoted in Boyce and Kaplan, 2001, 131[2]:21). Since then, little if anything has been heard from Dr. Seed, who quietly dropped out of sight.

Panayiotis Zavos and Severino Antinori

In January 2000, however, Panayiotis Zavos (at that time, of the Kentucky Center for Reproductive Medicine and *In Vitro* Fertilization at the University of Kentucky in Lexington) announced that within eighteen months, he and Italian fertility expert Severino Antinori planned to produce an embryo–derived from human stem cells–for implantation in a surrogate mother (see "Cloning Effort," 2000). Their plans to do just that were well under way. But, in an article titled "The God Game No More" in the same special double issue, *U.S. News & World Report* noted that on March 27, 2001, a formal letter from the United States Food and Drug Administration was hand-delivered to Dr. Zavos, informing him that any attempt on his part to clone a human might place him in violation of FDA regulations regarding experimental medical pro-

cedures. [The FDA claims that it has jurisdiction over human cloning based on the Public Health Service and Food, Drug and Cosmetic Act, and has indicated that it would regulate cloning as if it were a drug–yet another issue that needs to be examined!]

In response, Zavos stated that he and Antinori already had "set up two clandestine labs overseas" (see Boyce and Kaplan, 2001). And, on August 7, 2001, at the National Academy of Sciences Conference on Cloning, Zavos and Antinori announced their intention to impregnate as many as 200 women volunteers with cloned embryos by November of 2001 (see Stolberg, 2001). Dr. Antinori, who operates a fertility clinic in Rome, skyrocketed to notoriety in 1994 when he used *in vitro* fertilization to assist a 63-year-old Italian woman–the oldest woman ever to undergo such a procedure–in becoming pregnant. Because of the uproar that his comments (and his intentions!) regarding cloning caused in his native country of Italy, he moved his research on human cloning to the Papic Clinic in Belgrade in Serbia. On December 18, 2002, in an interview with the Serbian magazine *Nin*, he announced that in January 2003, a surrogate mother would give birth to a child who would be a clone (see "Cloned Baby…," 2002). However, that date has long since come and gone–with no announcement about any cloned baby.

Clonaid, the Raelians, and Brigitte Boisselier

Finally we present Clonaid, a Bahamas-based company that is a fully owned subsidiary of a religious cult known as the "Raelians" (whose headquarters, located in Valcourt, Quebec, Canada, east of Montreal, are designated as–and we are not making this up!–"UFO Land"). Clonaid was established in 1997 by Claude Vorilhon, a flamboyant French racecar driver and former journalist (now known as "Rael the prophet," head of the sect). According to Rael, in 1973, while atop a volcano in France, he met a 4-foot-tall space alien who invited him aboard his ship. There, he was entertained by "voluptuous female robots," and learned that the first humans actually were created (by cloning) 25,000 years ago by space travelers who called themselves "Elohim" (the Hebrew word for

God, which Rael says has been mistranslated, and should mean "those from the sky"). The Raelians suggest that they have between 40,000 and 55,000 members worldwide, most of whom are located in France, Canada, and Japan (although some scholars believe those numbers are somewhat inflated).

There is more to this than first meets the eye, however. The Raelians believe that cloning is the modern-day answer to eternal life. And they do not want each person to be able just to have a "mini-me" of sorts. Their ultimate goal is that people be able to clone themselves, "implant" their brain contents and personalities into the clone, and then use an "accelerated growth process" to allow the clone to grow up to live and work right alongside them. That process then would be repeated over and over again. Think we are making this up, too? Think again. On December 28,2002, Sanjay Gupta, M.D., CNN's medical correspondent, interviewed the CEO of Clonaid, Brigitte Boisselier. Here is a portion of that interview:

> **Dr. Gupta**: I wanted just to comment on a couple of things that you also said before, which is [that] your plan is to not only clone, but to eventually do this thing called growth acceleration, so these clones grow up quickly and start to very quickly be like the person from which they are cloned. In addition to that, you would like to actually imprint thoughts and memories of the donor clone into the recipient clone so the person not only looks like the person, but acts, thinks, and all those sorts of things like the person as well. Your goal is to perpetuate life indefinitely, eternally, as you say. Is that what you're trying to do here?
>
> **Dr. Boisselier**: Well, this is not something we can do right now. I could only today do the belated twin of an individual. We do believe that one day we'll be able to do the accelerated growth process, and we do believe one day we'll be able to download and upload our personality to a new body. This is–this could sound like science fiction, just like cloning sounded like science fiction in 1973 when Rael talked about it. Today it's reality. It's our science of today. The science of the future will lead us to humanity.... And it is a completely different society that is coming, and I'm very happy to make it happen (see "Brigitte Boisselier…," 2002).

Under the direction of Dr. Boisselier (a former French chemist with a Ph.D. who teaches chemistry at Hamilton College in upstate New York), Clonaid announced early in 2001 that it was moving forward with plans to clone the very first human before the end of the year. On March 25, 2001, Dr. Boisselier testified under oath before the Subcommittee of Oversights and Investigations of the United States Congress about the company's intention to clone a human (specifically, a 10-month-old baby boy that had died as the result of a tragic mishap at a hospital). She also discussed the progress that Clonaid was making, and its formal response to critics of human cloning (Boisselier, 2001a). On Clonaid's official Web site, Dr. Boisselier is quoted as saying: "Our first goal at Clonaid is to develop a safe and reliable way of cloning a human being. Who, today, would be scandalized by the idea of bringing back to life a 10-month-old child who died accidentally? The technology allows it, the parents desire it, and I don't see any ethical problems with it" (2001b). According to published reports, more than 50 prospective surrogate mothers already have been chosen to carry cloned fetuses, including Dr. Boisselier's 22-year-old daughter, Marina Cocolios. And, Clonaid admits to having established a secret laboratory in the U.S. for the purpose of cloning humans (see Dixon, 2001). Cost, according to Clonaid's Web site, is $200,000.

A mere two days after her testimony before Congress, Dr. Boisselier received a letter from the FDA, informing her that Clonaid could be in violation of federal regulations by attempting to clone a human. On May 29, 2001, U.S. Representative James Greenwood (D-PA), wrote the FDA to ask the agency to examine more closely Clonaid's intentions. In the special double issue of *U.S. News and World Report* mentioned above, staff writers Nell Boyce and David Kaplan exposed the heretofore private details surrounding the FDA's investigation of Clonaid:

> ...[I]n what appears to be an unprecedented probe into the sect's activities,...Food & Drug Administration agents visited the lab recently and ordered any human cloning experiments to cease. Says one official: "There's a timeout in force...." The crackdown marks

> the first time that investigators have uncovered a secret lab tied to human cloning in the United States, government sources say. Among areas under investigation are possible violations of FDA regulations that govern experimental medical procedures... (2001, 131[2]:21-22).

Following Antinori's lead, Clonaid promptly moved its research efforts out of the country. On Thursday, December 18, 2002, news reports began to circulate, confirming Clonaid's announcement that "within a few days" a cloned baby would be born (see "Quebec Group…," 2002). And the rest, as they say, is history.

On Thursday, December 27, 2002, Dr. Boisselier held a private news conference in a second-floor conference room at the Holiday Inn on Ocean Drive in Hollywood, Florida. Only a select few of the normal news media were invited to attend, among them *The New York Times*, *The Toronto Mail Telegram*, and representatives of Miami's CBS-4 television station. [On the premises, but excluded from the news conference, were *The [Miami] Herald* and *The Los Angeles Times*.]

According to the Reuters news network, Dr. Boisselier's comments were these: "I'm very, very pleased to announce that the first baby clone is born. She was born yesterday [Thursday, December 26, 2002–BT/BH] at 11:55 a.m. [Florida time]. She is fine. We call her Eve between us" (see "Group Claims Creation…," 2002). Boisselier went on to state that the seven-pound baby was born abroad (by Caesarian section) in an undisclosed location, and that she had been cloned from skin cells taken from her 31-year-old mother, due to the fact that the woman's husband was infertile. [Boisselier also noted that Eve was the result of one of ten initial implantations; five babies were aborted spontaneously in the early weeks of pregnancy (see "Raelian Leader: Cloning…," 2002).]

Naturally, there are many within the scientific and medical communities who are extremely skeptical about the truthfulness of these claims. In order to satisfy critics, and provide requisite proof of the baby's "cloned" origin, the Raelians asked physicist and former science editor for ABC television, Dr. Michael Guillen, to head a task force to investigate the

matter. When interviewed, Dr. Guillen (who did not receive any remuneration from Clonaid for his services) remarked: "I have accepted on two conditions: (1) that the invitation be given with no strings attached whatsoever; and (2) that the tests be conducted by a group of independent world-class experts" (see "Raelian Leader Says…," 2002). Standard DNA profiling–the same tests used for forensic tasks like identifying a body–will be employed. In all likelihood, medical technicians will collect DNA samples from mother and daughter by gently scraping the roofs of their mouths. If the baby was indeed a clone of its mother, its DNA would match both the nuclear and mitochondrial DNA of the mother. [It was nuclear DNA from the woman that allegedly was used in the cloning procedure, but cells also contain extranuclear DNA in their mitochondria; both would need to be checked.] In the end, Eve's DNA never was tested, and Dr. Guillen never was able to confirm Clonaid's astounding claims.

At first it was just a theory. Pluck the nucleus from an otherwise healthy egg from an adult mammal, replace it with a healthy, undamaged nucleus from a somatic (body) cell from another mammal of the same type, "trick" the egg (chemically or electrically) into thinking it had been fertilized, implant the zygote into a surrogate mother, and–PRESTO!–a clone is born! Terrific theory.

And even more amazing reality! Thanks to the efforts of Ian Wilmut, we now know that the theory works–not always well, but it does work. As we indicated earlier, so far, mice, cattle, goats, pigs, cats, rabbits, mules, horses, and deer have been cloned. The end result is what is known scientifically as a "delayed genetic twin" (what Dr. Boisselier referred to in her quote above as a "belated" genetic twin). As it turns out, what we recognize as biological "identical twins" are, in fact, more closely related (genetically) than cloned "delayed twin" versions. As Donald M. Bruce put it in a chapter he wrote for the book, *Human Cloning*:

> Moreover, what we call "identical twins" are in fact more similar to each other than Dolly is to her precursor (whose name, interestingly, has never been discussed). Firstly, the nuclear transfer technique has

> combined the cell nucleus of one sheep with the cytoplasm from another. This cytoplasm includes the mitochondria, which have their own DNA (1997, pp. 2-3, parenthetical item in orig.).

In other words, when the nucleus from one animal was transplanted into the egg of another, the egg's own mitochondrial DNA (located in the cytoplasm outside of its own nucleus, which had been removed) still remained intact, and thus was able to mingle with the DNA of the "new" donor nucleus. Thus, all of the DNA did not come from a single cell, as is the case with biologically identical twins.

When Dr. Wilmut published his results in the journal *Nature* on February 27, 1997, the entire scientific world (and even the non-scientific world!) was left practically speechless at the magnitude of his accomplishment. As Audrey Chapman observed in her book, *Unprecedented Choices: Religious Ethics at the Frontiers of Genetic Science*:

> Wilmut claimed that tests done after the birth of the lamb, which had occurred some seven months before the press conference, verified that it was a "delayed genetic twin," that is, a genetically identical copy of the animal that had provided the DNA.... The significance of this event can be gauged from the fact that *Science* magazine recognized this achievement as science's most stunning breakthrough of 1997 (1999, pp, 78,79). [For the *Science* reference, see "Editorial," 1997.]

But it wasn't just the **magnitude** of the event that caught the attention of practically everyone "in the know." The **implications** of the scientific research also caused a stir. As Bruce went on to say:

> It's a very long step from saying "sheep" to imagining the asexual genetic replication of human beings. **Yet that is where we are**. One of the most striking reactions to the work of Dr. Wilmut and his colleagues at Roslin is the way in which the world's media did an instant quantum leap. From an unexpected discovery in mammalian biology–reprogramming the somatic cells of an adult mammal and so creating an entire new animal asexually–**the focus jumped straight to imagining a world peopled with human clones** (1997, p. 2, emp. added).

Or, as bioethicist Leon Kass of the University of Chicago (chairman of President George W. Bush's Council on Biomedical Ethics) wrote:

> The technological stumbling block, overcome by Wilmut and his colleagues, was to find a means of reprogramming the state of the DNA in the donor cells, reversing its differentiated expression and restoring its full totipotency [allowing it to become any other cell–BT/BH], so that it could again direct the entire process of producing a mature organism. Now that this problem has been solved, we should expect a rush to cloning for other animals, especially livestock, in order to propagate in perpetuity the champion meat or milk producers. **Though exactly how soon someone will succeed in cloning a human is anybody's guess, Wilmut's technique, almost certainly applicable to humans, makes attempting the feat an imminent possibility** (2000, pp. 75-76, emp. added).

An imminent possibility indeed! In his 2000 book, *The Impact of the Gene: From Mendel's Peas to Designer Babies*, Colin Tudge wrote:

> The **idea** of the designer baby is now on the agenda of humankind, and until science itself comes to an end or human beings re-evolve along nonintelligent lines, it will remain their forever.… But whether we like it or not, the human clone and the designer baby, the reinvented human being, will stay on humanity's agenda for as long as science itself is practiced (pp. 305,307, emp. in orig.).

As Chapman commented:

> The cloning of three mammalian species [the number that had been cloned when she wrote her book in 1999–BT/BH] suggests that human cloning may also be achievable. Indeed, several scientists heralded these developments with a prediction that **the birth of a cloned person is inevitable, perhaps in the not-too-distant future** (pp. 80-81, emp. added).

That "not-too-distant future" of which Chapman spoke appears to be rapidly encroaching upon us. Oddly, such ideas seem to have caught the American populace somewhat by

surprise. Why should this be the case? Shouldn't we have expected this to occur? Shouldn't we have been "a little more ready" for it than we apparently were? Not necessarily. Allow us to explain.

Almost immediately after the announcement in February 1997 of Dolly's successful birth, then-U.S. President Bill Clinton instructed the National Bioethics Advisory Committee [NBAC–the now-defunct predecessor of President George W. Bush's Council on Biomedical Ethics] to prepare, within ninety days, a report for his administration about the scientific, ethical, and moral implications of human cloning. [The report, available at http://www.georgetown.edu/research/nrcbl/nbac/pubs.html, was released in June 1997, just two weeks after the original deadline. We will discuss later the Commission's recommendations.] What happened upon delivery of the report to the President? For all practical intents and purposes–**absolutely nothing**! As Chapman noted:

> Yet by December, some nine months after Wilmut's announcement, the uproar over cloning had subsided. As one science writer commented, the NBAC report, once eagerly anticipated, when issued was met by near silence. When President Clinton put forward legislation, much along the lines of NBAC recommendations, he couldn't find a legislator to sponsor it.... As Lori Andrews, a law professor and expert on legal issues of reproduction, claimed, the passage from "horrified negation" to cloning, to very slow but steady acceptance, was taking place (Chapman, 1999, p. 87). [NOTE: The documentation concerning Clinton's actions can be found in Silberner, 1998; the reference to Andrews' quote comes from Kolata, 1997.]

What has caused the public's retreat from "horrified negation" at the thought of human cloning, to "slow but steady acceptance"? Leon Kass thinks he knows. With some realism, yet some satire, he lamented:

> Much has happened in the intervening years. It has become harder, not easier, to discern the true meaning of human cloning. We have in some sense been softened up to the idea–through movies, cartoons, jokes and intermittent commentary in the mass me-

> dia, some serious, most lighthearted. We have become accustomed to new practices in human reproduction: not just *in vitro* fertilization, but also embryo manipulation, embryo donation and surrogate pregnancy…. In a world whose once-given natural boundaries are blurred by technological change and whose moral boundaries are seemingly up for grabs, it is much more difficult to make persuasive the still compelling case against cloning human beings…. We are now too sophisticated for such argumentation; we shouldn't be caught in public with a strong moral stance, never mind an absolutist one. We are all, or almost all, modernists now…. Unwilling to acknowledge our debt to the past and unwilling to embrace the uncertainties and the limitations of the future, we have a false relation to both: cloning personifies our desire to fully control the future, while being subject to no controls ourselves. Enchanted and enslaved by the glamour of technology, we have lost our awe and wonder before the deep mysteries of nature and of life (2000, pp. 70,71,72,73).

So why the rush to clone humans? Why are people like Richard Seed, Panayiotis Zavos, Severino Antinori, and Brigitte Boisselier so feverishly intent on reproductive cloning? To be sure, there is a myriad of reasons: to help couples have a child of their own that they otherwise might not be able to have; to help couples replace a child they have lost to death; to guarantee a kind of physical, if not spiritual, immortality; etc.

But there may well be other reasons as well. Many scientists live with what is known as the "technological imperative": Whatever **can** be done, **must** be done. The fact that we now have the technology to allow us to clone humans is reason enough to do it—or so some would have us believe. Kass commented:

> We Americans have lived by, and prospered under, a rosy optimism about scientific and technological progress. The technological imperative—if it can be done, it must be done—has probably served us well, though we should admit that there is no accurate method for weighing benefits and harms….

But that was not all that Dr. Kass had to say on the matter. He then went on to remark: "Here we surely should not be willing to risk everything in the naïve hope that, should things go wrong, we can later set them right" (p. 105). Colin Tudge addressed the same point when he noted:

> Some have suggested that these new technologies raise no "new" ethical issues, a point that largely depends on what is meant by **new**. They certainly raise the ethical ante. After all, we cannot be held morally responsible for events that we cannot control, but we are answerable for those that we do control…. [T]he process of genetic recombination during the formation of eggs and sperm ensures that the genetic details of our offspring are not ours to specify. But if we clone children, or engineer their genes, then we are **prescribing** their genome. Our responsibility, then, for all that befalls them, far outstrips that of any parent. Noblesse oblige [French, literally translated as "nobility obligates," meaning that responsible behavior is required–BT/BH]. It is too casual by far to say there are no new issues. We must look deeper (2000, pp. 307,308, emp. in orig.).

The Expert Witnesses

Indeed, we must "look deeper"–and for good reason. There are many who already have seen the "handwriting on the wall" about the dangers inherent in human cloning.

Colin Tudge

Colin Tudge, who is a research fellow at the Centre for Philosophy at the London School of Economics, and one of Great Britain's leading science writers, warned:

> The new technologies, taken to extremes, threaten the idea of humanity. We now need to ask as a matter of urgency who we really are and what we really value about ourselves. It could all be changed, after all–**we ourselves could be changed–perhaps simply by commercial forces that we have allowed to drift beyond our control. If that is not serious, it is hard to see what is** (2000, p. 253, emp. added).

No doubt, some who are involved in the "rush to clone" are being consumed by what Tudge referred to as "commercial" pressures, with their ever-present "market forces." After all, if Ian Wilmut is in line for a Nobel Prize for his contributions to the science of cloning (and who among us doubts that he is?), then what accolades and riches await the first scientists who can announce that **they** have cloned the **first human**?

Barbara Rothman

Barbara Rothman, professor of sociology at the City University of New York, authored a chapter for the book, *Clones and Clones: Facts and Fantasies about Human Cloning*, edited by Martha Nussbaum and Cass Sunstein. In that chapter, she discussed the "success" of human reproductive technologies–and their "complications."

> I am completely convinced that market forces are an evil in human procreation. That leaves me in a funny kind of place I often am with the new technologies of procreation. Thank goodness they don't work terribly well. **The only thing that could make them worse would be if they got better**.... For that first time, any success will probably be success enough. Later though, if we begin to make cloning routine, offer it as a service at the growing number of fertility clinics, the expectations will be more specific and at the same time more generalized.... **With people, the accounting gets a lot more complicated**, in both senses. Errors are not to be written off, and our expectations are rarely so narrowly confined (1998, pp. 280,283, emp. added).

Indeed, with people, "the accounting" **does** get a lot more complicated. Think about **why** this is the case. The simple fact is–all the disclaimers of evolutionists notwithstanding–**people are not animals**!

Sir John Polkinghorne

The eminent British physicist, Sir John Polkinghorne, also has weighed in.

> There are still unresolved questions about how long such a clone will live and how healthy it will prove to be. If animal experiments of this kind go seriously wrong, it is always possible to halt them by the humane slaughter of the beast concerned.
>
> An attempt to use a similar procedure to produce a cloned human person would undoubtedly also require a large number of trials before success was achieved and would involve similar uncertainties about long-term consequences. In contrast to the work that led to the birth of the first IVF baby, the procedures would be the result of radical human manipulation and not simply the facilitating of a natural process. Putting it bluntly, it would inevitably require the production of "experimental human beings." **This, in itself, is morally unacceptable**…. **These procedures** might have as their intended end a desirable purpose, such as the birth of a healthy baby who might otherwise suffer from a severe mitochondrial disorder, **but the manner in which this had become feasible, through a sequence of experiments of this kind, would have been ethically tainted** (1997, p. 41, emp. added).

Ian Wilmut

Ian Wilmut is the mild-mannered Scot who started all of this. It therefore seems appropriate to inquire as to what his views on these matters might be. Wilmut has been described as "a regular guy [who], although not a believer in God himself, believes in ethics" (Pence, 1998, p. 9). Interestingly, in spite of his non-belief in God, Dr. Wilmut was invited to serve as a member of the Church of Scotland's Committee on Science and Technology, which ended up drafting a policy statement that raised serious ethical and theological objections to human cloning. When asked about his position on the feasibility, and ethical nature, of such a procedure, Wilmut responded: "There is no reason in principle why you couldn't do it…[but] all of us would find that offensive" (as quoted in Callahan, 1997). Or, as Dr. Wilmut went on to say:

> Animal cloning is inefficient and is likely to remain so for the foreseeable future. Cloning results in gesta-

> tional or neonatal developmental failures. At best, a few percent of the nuclear transfer embryos survive to birth and, of those, many die within the perinatal period. **There is no reason to believe that the outcomes of attempted human cloning will be any different**.... Newborn clones often display respiratory distress and circulatory problems, the most common causes of neonatal death. Even apparently healthy survivors may suffer from immune dysfunction, or kidney or brain malformation, which can contribute to death later (Jaenisch and Wilmut, 2001, 291:2552, emp. added).

David Stevens

But **why** would "all of us" find the cloning of a human "offensive"? David Stevens, M.D., executive director of the 17,000-member Christian Medical Association, explained as follows:

> Sensible people all over the country are horrified that anyone would attempt to clone a human being, given the high probability of deaths and gruesome birth defects. It's likewise morally reprehensible to mandate the destruction of human embryos who are cloned for the sole purpose of experimentation. The only difference between research and reproductive cloning is that in the latter, one of the people created may survive.
>
> With the high rate of death and deformity experienced in animal cloning presumably applied to humans as well, **even to experiment with human cloning shows a horrible disregard for the value of human life**. It's one thing to deal with naturally occurring birth defects, but quite another for scientists to actually **cause** those defects through cloning…. **The basic moral question is should we allow scientists to destroy dozens of individuals to give parents the child they want?** (as quoted in "Christian Doctors…," 2002, emp. added).

Or, as Tudge remarked: "Cloning might make people happy, but it is **still** wrong…. The resulting happiness or otherwise of the participants is not the only issue…. **[M]ere human happiness is not the only criterion to be taken into account**" (2000, pp. 321-322, first emp. in orig., last emp. added).

Furthermore, even those who are advocates of human cloning have admitted that the "potential legitimate uses appear few, and do not promise substantial benefits…. **[I]t does risk some significant individual or social harms**" (Brock, 1998, p. 162, emp. added). And that is a mild understatement!

Scott Rae

Scott Rae (whose Ph.D. from the University of Southern California was in medical ethics) wrote in his book, *Moral Choices:*

> **Cloning adult human beings at this point cannot be achieved without severe risk to the embryo and perhaps to the woman who carries the cloned person**…. That makes the process problematic per se, irrespective of the uses of the cloned person (2000, p. 179, emp. added).

Leon Kass

Shortly before he accepted the position of chairman of the President's Council on Biomedical Ethics, Leon Kass, M.D., Ph.D., addressed the "offensive" nature of human cloning.

> …[T]he ethical judgment on cloning can no longer be reduced to a matter of motives and intentions, rights and freedoms, benefits and harms, or even means and ends. **It must be regarded as a matter of meaning**: Is cloning a fulfillment of human begetting and belonging? Or is cloning rather, as I contend, their pollution and perversion? To pollution and perversion, the fitting response can only be horror and revulsion; and conversely, generalized horror and revulsion are prima facie evidence of foulness and violation. The burden of moral argument must fall entirely on those who want to declare the widespread repugnances of humankind to be mere timidity or superstition (2000, p. 82, emp. added).

Kass went on to say:

> …**[A]ny attempt to clone a human being would constitute an unethical experiment on the resulting child-to-be**. As the animals experiments (frog and sheep) indicate, there are grave risks of mishaps and deformities. Moreover, because of what cloning

> means, one cannot presume a future cloned child's consent to be a clone, even a healthy one. Thus, **ethically speaking, we cannot even get to know whether or not human cloning is feasible** (p. 88, emp. added).

It obviously was not by accident that Dr. Kass titled the article from which the above quotations were taken: "The Wisdom of Repugnance: Why We Should Ban the Cloning of Humans." In that article, he also wrote:

> Revulsion is not an argument; and some of yesterday's repugnances are today calmly accepted–though, one must add, not always for the better. In crucial cases, however, repugnance is the emotional expression of deep wisdom, beyond reason's power fully to articulate it. Can anyone really give an argument fully adequate to the horror which is father-daughter incest (even with consent), or having sex with animals, or mutilating a corpse, or eating human flesh, or even (just!) raping or murdering another human being? Would anybody's failure to give full rational justification for his or her revulsion at these practices make that revulsion ethically suspect? Not at all….
>
> **The repugnance at human cloning belongs in this category**. 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 rightly hold dear…. **Shallow are the souls that have forgotten how to shudder** (p. 79, emp. added).

Quite frequently it is suggested that America has become a nation that has "forgotten how to blush." Have we also "forgotten how to shudder"? The mere thought of **our** future potential offspring being subjected to the type of experimentation and danger associated with human cloning should indeed send chill bumps down our spines and fill us with horror–a horror so debilitating that we find the mere thought (much less the action!) of human cloning to be **repugnant**! Dr. Wilmut was right. All of us should find the cloning of humans "offensive."

Mark Ridley

Is it likely that human cloning ever will become widespread? Could most, or even all, human reproduction become clonal? British writer Mark Ridley, in his 2001 book, *The Cooperative Gene*, addressed this question.

> At this stage, the Darwinian answer has to be: **probably not. We need sex**. We may need it to clear our harmful mutations. **A sub-branch of human beings who went in for cloning reproduction would also be signing their progeny up for a mutational meltdown**. **They would undergo rapid genetic decay, as mutations accumulated faster than they could be eliminated**. I do not know how many generations it would be before every offspring was so loaded with genetic defects that it would be dead; the details would depend on the exact cloning procedure, but **cloning could not last long**.... Any one individual might be successfully cloned: the offspring might have ten to twenty bad genes, but survive them. But the process is unsustainable, and cloning could be at most only an occasional, minority habit.
>
> ...[A] sexual form of lift will reproduce at only half the rate of an equivalent clonal form. The halved reproductive rate of sexual forms is probably made up for by a difference in quality: the average sexual offspring is probably twice as good as an equivalent cloned offspring. We can expect that a cloned human (or sheep) will on average have half or less the quality of a sexually reproduced offspring. A halving in quality is serious: being cloned is probably analogous to losing an arm or a leg.... Cloning could be, in a delayed-action way, rather like volunteering for the surgical excision of your heart during the pre-Harvey era when the function of the heart was unknown. The surgical technology may be space-age, using the best composite material knives, but **the basic problem lies in messing with a design feature of our bodies when we do not understand the design principles** (pp. 253-254,255,256, emp. added; NOTE: His reference to the "pre-Harvey era" is to British physician Sir William Harvey who studied extensively the human circulatory system).

But it is not just with the "finished product" where serious problems could (and eventually would) occur. Trouble would begin much earlier–even as early as selecting the nucleus from the somatic cell to be employed in the cloning process.

Richard Lewontin

Harvard geneticist Richard Lewontin discussed this point in an article titled "The Confusion Over Cloning."

> After an egg is fertilized in the usual course of events by a sperm, cell division begins to produce an embryo, and the chromosomes, which were in a resting state in the original sperm and egg, are induced to replicate new copies by signals from the complex machinery of the cell division. The division of the cells and the replication of more chromosome copies are in perfect synchrony so every new cell gets a complete exact set of chromosomes just like the fertilized egg. When clonal reproduction is performed, however, the events are quite different. The nucleus containing the egg's chromosomes are removed and the egg cell is fused with a cell containing a nucleus from the donor that already contains a full duplicate set of chromosomes. These chromosomes are not necessarily in the resting state and so they may divide out of synchrony with the embryonic cells. The result will be extra and missing chromosomes so that the embryo will be abnormal and will usually, but not necessarily, die.
>
> **The whole trick of successful cloning is to make sure that the chromosomes of the donor are in the right state. However, no one knows how to make sure**. Dr. Wilmut and his colleagues know the trick in principle, but they produced only one successful Dolly out of 277 tries. The other 276 embryos died at various stages of development. It seems pretty obvious that the reason the Scottish laboratory did not announce the existence of Dolly until she was a full-grown adult sheep is that they were worried that her postnatal development might go awry. Of course, the technique will get better, **but people are not sheep and there is no way to make cloning work reliably in people except to experiment on people**....

> Suppose we have a high success rate of bringing cloned human embryos to term. **What kinds of developmental abnormalities would be acceptable? Acceptable to whom?** (2000, pp. 165,166, emp. added).

Can science, at least potentially, produce human clones? It appears that the answer would be "yes." But while science, per se, may be able to determine the **mechanism**, it is in no position to determine the **ethics** of such a procedure.

Jonathan Marks

University of North Carolina anthropologist Jonathan Marks wrote in his book, *What It Means to be 98% Chimpanzee*:

> Cloning thus technologically impinges on a crucial human right, that of self-discovery. The right to an ancestry, to a lineage, and to an independent identity in relation to your ancestors and relatives. That can't be taken for granted.
>
> When science begins to impinge on people's ideas about **who** they are and **what** they are, it encroaches on humanistic concerns and issues. The issue of cloning has little to do with spare body parts in the closet, or an army of Jeffrey Dahmers, and everything to do with having a feeling of confidence in where you came from, how you fit in, and what you can strive for in your life. Science can participate constructively, but scientists have to realize that the hard part isn't the technical part; it's the social and cultural part…. **[T]his is a path that shouldn't be trodden** (2002, p. 225, first emp. in orig., last emp. added).

The problem is that in some cases (including, certainly, the cloning of humans), our scientific capabilities have outpaced our moral sensibilities. As Marks went on to note:

> Science gives us authoritative ideas about kinship, which force us to reconceptualize our place in the order of things, which is by that very fact disorienting. But it doesn't stick around to explain it to us, to reintegrate us, to give new meaning to our existence…. **It just walks away from the wreckage. And the question of who and what you are is not trivial** (p. 222, emp. added).

No, indeed: who and what we are, is **not** trivial. The question becomes: Should we allow science simply to "walk away from the wreckage" of human cloning?

"There Ought to be a Law..."

No doubt the reader will want to know: "Is human cloning legal in the first place? Aren't there laws to prohibit this from taking place?"

In the United States as a whole, legally speaking, there is very little to stop scientists–rogue or respectable–from cloning humans, since there is no specific law that could prohibit such experimentation. [As of the writing of this book, the United States House of Representatives had successfully passed its own version of a law prohibiting human cloning, but the Senate had failed to ratify it, or to offer a similar version of it.] The U.S. Food and Drug Administration [FDA] maintains that it must approve beforehand any experiments performed on human beings. In January 1998, the FDA announced that it had jurisdiction over cloning, and implied that, currently, it would not be willing to provide authorization to proceed with any such experiments. That jurisdictional claim is based on the FDA's interpretation of the Public Health Service and Food, Drug, and Cosmetic Act.

In January 2002, the United States National Academy of Sciences recommended a ban on human cloning. As this book went to press, however, only six states–California, Iowa, Louisiana, Michigan, Rhode Island, and Virginia–had in place bans on reproductive human cloning. Legislative acts and/or guidelines to ban such cloning are pending in dozens of nations around the world. Several countries, including Britain, Israel, Japan, and Germany, already have banned cloning.

France and Germany have proposed a **worldwide** ban on cloning. The United Nations General Assembly voted to draft a treaty after Severino Antinori announced that he planned to become the first scientist to clone a human. But the drive to produce a ban got bogged down in a U.N. committee as the United States pushed for an even tougher treaty that also would

ban experimental cloning for medical purposes. In November 2002 (after the United States' proposal had gained the support of more than thirty countries), the U.N. committee debating the potential ban postponed for a year any vote on which specific plan to support (see "Chirac Slams…," 2002). Hiroshi Nakajima, M.D., director general of the World Health Organization [WHO], stated:

> WHO considers the use of cloning for the replication of human individuals to be ethically unacceptable as it would violate some of the basic principles which govern medically assisted procreation. These include respect for the dignity of the human being and protection of the security of human genetic material (see *Resolution*…, 1997; this statement was repeated in a resolution of the Fiftieth World Health Assembly).

Frederico Mayor, the head of the United Nations Educational, Scientific, and Cultural Organization [UNESCO], was even more sweeping when he said: "Human beings must not be cloned under any circumstances" (see *Protocol to the*…, 1997). Perhaps Donald Bruce put it best when he said:

> **The nature of cloning is such that the clone is created for the primary benefit not of the individual but of some third party, as means to an end. This represents unacceptable human abuse and such a potential for exploitation that it should be outlawed worldwide** in the form of an international treaty by which it would be classified as a crime against humanity (1997, p. 3, emp. added).

On September 22, 2003, more than 60 science academies from every continent in the world–members of the Interacademy Panel on International Issues (IAP)–issued a statement calling for a ban on human reproductive cloning. IAP members will present the statement to delegates of the United Nations Committee on Cloning, scheduled to meet in New York September 29-October 3, 2003. Their statement begins: "National academies of science from all parts of the world are united in supporting a worldwide ban on reproductive cloning of human beings" (see IAP Statement, 2003, p. 1). The IAP statement continues, noting:

> Scientific research on reproductive cloning in other mammals shows that there is a markedly higher than normal incidence of fetal disorders and loss throughout pregnancy, and of malformation and death among newborns. There is no reason to suppose that the outcome would be different in humans. There would thus be a serious threat to the health of the cloned individual, not just at birth but potentially at all stages of life –without obvious compensating benefit to the individual bearing this threat. Moreover, death of a fetus late in pregnancy could pose a serious threat to the health of the woman carrying it. **Even on a purely scientific basis, therefore, it would be quite irresponsible for anyone to attempt human reproductive cloning given our current level of scientific knowledge** (p. 1-2, emp. added).

The statement concluded by declaring: "**We therefore call on all countries worldwide to ban reproductive cloning of human beings**" (p. 2, emp. added). This announcement only reinforces what others have already noted–that cloned animals are not stable and healthy. [While this is a good step, the IAP statement is far from benign. While the representatives who prepared the statement support a ban on "reproductive" cloning, they support cloning and embryonic stem-cell research for "therapeutic" purposes. Thus, their statement called "for cloning to obtain embryonic stem cells for both research and therapeutic purposes to be excluded from this ban." The last paragraph of the statements noted: "Cloning for research and therapeutic purposes therefore has considerable potential from a scientific perspective, and should be excluded from the ban on human cloning" (see IAP Statement, p. 3).] As the situation stands now, at least in some countries, human cloning is perfectly legal.

The Implications and Safety of Reproductive Human Cloning

Human cloning may or may not be "do-able," and it may be "legal," but is it **moral** and **ethical**? In his televised interview with Brigitte Boisselier, CNN's medical correspondent, Sanjay Gupta, made this comment to the woman who sup-

posedly was responsible for bringing the first human clone into the world: "Just because you **can** do something doesn't mean than you **should** do something" (see "Brigitte Boisselier…," 2002, emp. added). That, of course, brings us back to the legitimacy of the "technological imperative" discussed earlier. Some in science are firm in their belief that "if we **can** do it, we **must** do it." But "must" we? And more important, **should** we?

The fact that we can clone mice, cattle, goats, pigs, cats, rabbits, mules, horses, and deer does not inherently mean that we should clone humans. As Polkinghorne put it: "The mere fact of the permissibility of animal cloning in certain circumstances can, therefore, carry no immediately transferable implication for the **moral permissibility of deliberately cloned human beings**" (1997, p. 37). In short, as we observed previously, **people are not animals!**

In our series of articles on "Human Cloning and Stem-Cell Research: Science's 'Slippery Slope' " that appeared in the August-October 2001 issues of *Reason & Revelation* (see Thompson and Harrub, 2001), we dealt with three especially crucial matters concerning the ethical (or unethical, as the case may be) nature of human cloning. Two had to do with experimental controls that are required by law (at least within the United States). First, we addressed the issue of whether or not cloning was to the ultimate benefit of the subject being cloned. Second, we dealt with the issue of "informed consent," which requires that the subject upon whom the experiment is being performed must be able to agree to the conditions of the experiment. Third, we addressed the biblical ethics of such procedures. Suffice it to say, cloning could meet neither legal requirement. Nor was it a biblically acceptable method of human reproduction.

Here, we want to address two additional, but related, points regarding the ethics and morality of human cloning: (1) what are the cultural and/or societal implications of human cloning; and (2) is cloning safe enough–now and in the long run–to be used on humans?

The Implications of Reproductive Human Cloning

In discussing the ethical issues surrounding procedures such as these, the implications of the various technologies must be examined and acknowledged. For example, if cloning were possible:

1. It could be used to provide children for unmarried people.
2. Parents could pre-select the sex (and numerous other attributes) of their child(ren).
3. Women's liberation would be complete, since no male would be needed. The old Cockney saying, "It takes a man to make a girl," no longer would be true.
4. Large batches of human clones could be made for statistical studies.
5. Clones could be produced in order to harvest "spare parts" (e.g., bone marrow, hearts, etc.) for transplants.
6. People who were enamored of their own importance could ensure that exact genetic replicas of themselves were brought into existence via cloning–by tens or hundreds if they so desired.

These are serious matters indeed. If we scrutinize carefully the alleged benefits that some suggest might be derived from human cloning, surely there is much less here than at first meets the eye. We believe that Gunther Stent was right when he suggested that the idea of cloning human beings is "morally and aesthetically completely unacceptable." Producing people in "herds" in order to harvest spare parts, for use in laboratory statistical studies like so many guinea pigs, or merely to satisfy personal egos in a vain attempt to guarantee physical immortality is abhorrent. Twenty-five years ago, David Lygre wrote: "The current risks of abnormality and our reverence for human life should rule these experiments out" (1979, p. 44). Indeed they should. Nothing has changed in this regard in the twenty years since that assessment was made.

Furthermore, consider some of the important cultural and/or societal implications of reproductive human cloning. David Byers, in a fascinating article titled "An Absence of Love," addressed one of the well-concealed dangers–from the vantage point of human dignity–of cloning.

> Human cloning would represent a radical shift in the ties that bind us. **For the first time, we would have children with only one biological parent, and that parent would have contributed nothing more than a cell nucleus to the offspring**. Moreover, all their siblings, if they had any, would be not only identical twins but also twins of their parent…. **The traditional family founded upon sexual love and reproduction is the only basis human society has ever known**. Cloning has the potential to upset this "natural" pyramid, disrupting physical, psychological, and social relationships in entirely unpredictable ways. When Pandora opened her famous box, the one thing remaining after all the evil spirits had flown out was Hope, cowering under the lid. **Only a society with an iron-clad faith in progress would lay the ax of technology to its own roots** (1997, p. 74, emp. added).

It is not a small thing to have–for the first time ever–children born from only **one** biological parent. Nor is it a small thing, whether one is speaking of individuals or of societies, to have children who are the identical genetic twins, not only of their parent (notice the singular), but also of their siblings. No wonder Byers lamented: "The first human clone, if there is one, will surely be treated as a freak. Considering the media attention the news of Dolly has received, the glare of the spotlight will fall much more brightly on that unfortunate person" (p. 73).

Dolly was undoubtedly not just the most famous **sheep** in the world, but the most famous **animal**. Her name has been written in history, not because of something she did, but because of the manner in which she came into this world. Suppose that Brigitte Boisselier had been correct, and Clonaid had indeed cloned the first human child–little "Eve." We know the kind (and amount!) of publicity that Dolly received. But, in the end, it probably bothered her not at all because–she was a sheep. Eve (or any other human clone) would be a **person**–a person who would grow into adolescence and adulthood. Imagine the kind and amounts of publicity she (or any clone like her) would receive. Imagine the glare of the spotlight in which a clone would live for the rest of his or her life.

Human dignity is **not** an insignificant thing. Every culture on Earth values it. It is, in fact, one of the things that, in so defining a manner, separates us from the animal kingdom. Yet, according to some, if human dignity gets in the way of the technological imperative, then it is human dignity that must be sacrificed. When bioethicist Ruth Macklin testified before the National Bioethics Advisory Commission in 1997, she told the Commission's members: "If objectors to cloning can identify no greater harm than a supposed affront to the dignity of the human species, that is a flimsy basis on which to erect barriers to scientific research and its applications" (as quoted in *Cloning Human Beings*, 1997, p. 71).

First, let it be noted (as we will show below in the section on the safety of human cloning), it hardly is the case that "objectors to cloning can identify no greater harm than a supposed affront to the dignity of the human species." It is not "just" human **dignity** that is at stake; it also is human **life**!

Second, as Jorge Garcia said in response to Macklin's comment: "**I argue that conducting and applying (supposedly) scientific research is a pretty flimsy excuse for affronting human dignity**" (2000, p. 95, emp. added, parenthetical item in orig.). Bravo! We could not have said it better ourselves. Somehow–in the rush to "do it because we can"–science has trampled human dignity. The tail is wagging the dog. Science, we must remember, is the servant, not the master. **Whatever** is done in the name of science is done **by** humans, and should be **for the benefit** of humans. If this is not the case, upon what grounds, then, did a startled and angry world conduct the Nuremberg trials, and thereby sentence to life imprisonment or death Nazi war criminals for their "evil science" of eugenics, euthanasia, and genocide? Human dignity **does** count!

The Safety of Human Cloning

Yes, dignity does count. But so does the safety of humans involved in scientific experiments. And no amount of rhetoric or scientific prestige jargon ever will change the simple fact that **human cloning is a dangerous and deadly business**.

This is not a matter of dispute. **Everyone** in the scientific and ethical communities knows it, and publicly admits it. In fact, it surely must be one of the most disconcerting facts in the current cloning controversy that an experimental procedure–nuclear somatic transfer–that is barely five to six years old, **is being carried out on humans, in spite of the fact that it has yet to be perfected even in animals, and is known to be not only inefficient, but also deadly**! The harmony of the combined testimony to the truthfulness of this assessment speaks loudly about the unethical nature of such experimentation on humans. Consider the following.

When the National Bioethics Advisory Council [NBAC] submitted its final report to then-President Bill Clinton in June 1997, it was accompanied by a cover letter from Harold Shapiro, chairman of the Commission and President of Princeton University. On page one of his letter, dated June 9, Dr. Shapiro wrote:

> It seems clear to all of us, however, **given the current stage of science in this area, that any attempt to clone human beings via somatic cell nuclear transfer techniques is uncertain in its prospects, is unacceptably dangerous to the fetus and, therefore, morally unacceptable**. At present, moral consensus on this issue should be easily achieved (see *Cloning Human Beings*, 1997, emp. added).

The Commission's report went on to say:

> There is one basis of opposition to somatic cell nuclear transfer cloning on which almost everyone can agree. For reasons outlined in Chapter Two, **there is virtually universal concern regarding the current safety of attempting to use this technique in human beings**. Even if there were a compelling case in favor of creating a child in this manner, it would have to yield to one fundamental principle of both medical ethics and political philosophy–the injunction, as it is stated in the Hippocratic canon, to "first do no harm." In addition, the avoidance of physical and psychological harm was established as a standard for research in the Nuremberg Code, 1946-49. **At this time, the significant risks to the fetus and physical well being of a child created by somatic cell nuclear transplantation cloning outweigh arguably beneficial uses of the technique.**

> It is important to recognize that the technique that produced Dolly the sheep was successful in only 1 of 277 attempts. **If attempted in humans, it would pose the risk of hormonal manipulation in the egg donor; multiple miscarriages in the birth mother; and possibly severe developmental abnormalities in any resulting child**. Clearly the burden of proof to justify such an experimental and potentially dangerous technique falls on those who would carry out the experiment. Standard practice in biomedical science and clinical care would never allow the use of a medical drug or device on a human being on the basis of such a preliminary study and without much additional animal research. Moreover, when risks are taken with an innovative therapy, the justification lies in the prospect of treating an illness in a patient, whereas, here no patient is at risk until the innovation is employed. Thus, **no conscientious physician or Institutional Review Board should approve attempts to use somatic cell nuclear transfer to create a child at this time. For these reasons, prohibitions are warranted on all attempts to produce children through nuclear transfer from a somatic cell at this time**.

The NBAC report contained six chapters. In chapter six, the Commission listed five distinct categories of recommendations:

> 1. The Commission concludes that at this time **it is morally unacceptable** for anyone in the public or private sector, whether in a research or clinical setting, **to attempt to create a child using somatic cell nuclear transfer**. **Indeed, the Commission believes it would violate important ethical obligations were clinicians or researchers to attempt to create a child using these particular technologies, which are likely to involve unacceptable risks to the fetus and/or potential child**. Moreover, in addition to safety concerns, many other serious ethical concerns have been identified, which require much more widespread and careful public deliberation before this technology may be used The Commission, therefore, recommends the following for immediate action.

A continuation of the current moratorium on the use of federal funding in support of any attempt to create a child by somatic cell nuclear transfer.

An immediate request to all firms, clinicians, investigators, and professional societies in the private and nonfederally funded sectors to comply voluntarily with the intent of the federal moratorium. Professional and scientific societies should make clear that any attempt to create a child by somatic cell nuclear transfer and implantation into a woman's body would at this time be an irresponsible, unethical, and unprofessional act.

2. Federal legislation should be enacted to prohibit anyone from attempting, whether in a research or clinical setting, to create a child through somatic cell nuclear transfer.

3. Any regulatory or legislative actions undertaken to effect the foregoing prohibition on creating a child by somatic cell nuclear transfer should be carefully written so as not to interfere with other important scientific research....

4. ...[W]e recommend that the federal government, and all interested and concerned parties, encourage widespread and continuing deliberation on these issues in order to further our understanding of the ethical and social implications of this technology and to enable society to produce appropriate long-term policies regarding this technology should the time come when present concerns about safety have been addressed.

5. Finally...the Commission recommends that Federal departments concerned with science should cooperate in seeking out and supporting opportunities to provide information and education to the public in the area of genetics, and on other developments in the biomedical sciences, especially where these affect important cultural practices, values, and beliefs (see *Cloning Human Beings*..., 1997, pp. 63-64,108-110, emp. added).

The report of the National Bioethics Advisory Commission, which was extensive, discussed several "domains" in regard to human cloning, not the least of which was the safety of the procedure itself. As evolutionary geneticist Richard Lewontin observed:

> The serious ethical problems raised by the prospect of human cloning lie in the fourth domain considered by the bioethics commission, that of safety.... It seems pretty obvious that the reason the Scottish laboratory did not announce the existence of Dolly until she was a full-grown sheep is that they were worried that her postnatal development would go awry.... Ninety percent of the loss of the experimental sheep embryos was at the so-called "morula" stage, hardly more than a ball of cells. Of the twenty-nine embryos implanted in maternal uteruses, only one showed up as a fetus after fifty days *in utero*, and that lamb was finally born as Dolly. Suppose we have a high success rate of bringing cloned human embryos to term. What kinds of development abnormalities would be acceptable? Acceptable to whom? (2000, pp. 166,167).

These hardly are insignificant or trivial concerns. And they cannot simply be ignored. The NBAC report on human cloning was published and made public in 1997. More than half a decade has now passed. Has anything changed in regard to the safety of the procedures employed in human cloning, or the risks to the child that is the intended result of such experimentation? Read the following assessments and draw your own conclusion. **[Notice the dates on the quotes as they move from the NBAC report in 1997, up to the present time.]**

> **At this moment in time, animal tests have not shown that NST is safe enough to try in humans**, and extensive animal testing should be done over the next few years. That means that, before we attempt NST in humans, we will need to be able to routinely produce healthy offspring by NST in lambs, cattle, and especially, non-human primates (Pence, 1998, p. 132, emp. added).

There is no doubt that attempts to clone a human being at the present time would carry unacceptable risks

to the clone…. One risk to the clone is the failure to implant, grow, and develop successfully, but this would involve the embryo's death or destruction long before most people or the law consider it to be a person with moral or legal protections of its life. Other risks to the clone are that the procedure in some way goes wrong, or unanticipated harms come to the clone; for example, Harold Varmus, director of the National Institutes of Health, raised the concern that a cell many years old from which a person is cloned could have accumulated genetic mutations during its years in another adult that could give the resulting clone a predisposition to cancer or other diseases of aging (Brock, 1998, pp. 157-158, emp. added).

> A number of ethical problems are raised with the possibility of human cloning. First, a number of ethicists have pointed out that right now any thought of cloning humans would be premature due to the safety factors. There are just too many unknowns still, and **experimentation would result in a large number of dead or defective embryos**. **Recognizing that these are persons from the moment of conception means we would be submitting them to dangerous experimental treatment, killing many of them and causing defects that would either result in abortion or the birth of defective children**…. **Cloning is presently too dangerous** and, in fact, it is difficult to believe we will ever get to the level where we can be sure the first time we try cloning it will be successful. The benefits don't outweigh the harms (Foreman, 1999, p. 278, emp. added).
>
> Of course, the technique will get better, but people are not sheep and there is no way to make cloning work reliably in people except to experiment on people.... **Even if the methods could be made eventually to work as well in humans as in sheep, how many human embryos are to be sacrificed, and at what stage of their development?** (Lewontin, 2000, pp. 165-166, emp. added).
>
> Let it be acknowledged immediately that **at present** the technique of human cloning is not well developed enough to be safely used in humans for reproduction… (Gillon, 2001, p. 196, emp. in orig.).

> Animal cloning is inefficient and is likely to remain so for the foreseeable future. Cloning results in gestational or neonatal developmental failures. At best, a few percent of the nuclear transfer embryos survive to birth and, of those, many die within the perinatal period. **There is no reason to believe that the outcomes of attempted human cloning will be any different** (Jaenisch and Wilmut 2001, 291:2552, emp. added).
>
> Regardless of what the future holds for the science of cloning, **experts say the present does not hold enough information or skill for the process to be used reliably and safely in humans**. "All the people who've cloned mice and so on would tell you that right now **this is so inefficient and the chances of abnormalities so high that they would not, for safety reasons, propose that human cloning be undertaken**–let alone the ethical concerns," says Janet Rossant, a senior investigator at the Samuel Lunenfeld Research Institute of Mount Sinai Hospital in Toronto. "I think it's very unlikely that anyone is going to have success at this on the short term." But **more often than not, the process does not work**. In fact, it's been estimated that as many as 97 per cent of cloning attempts fail. "The reason for this we don't fully understand, but what we know is getting the DNA to get properly reprogrammed–putting it back in the eggs–seems to be harder than we thought," Rossant says (see "Experts Doubt…," 2002).

Alan Colman, one of the scientists involved in cloning Dolly, put it like this: "I think it highlights more than ever the foolishness of those who want to legalise reproductive cloning. In the case of humans, it would scandalous to go ahead, given our knowledge about the long-term effects of cloning" ("Dolly's Death…," 2003).

The Smoking Gun–Why Human Cloning is Unsafe

In 2000, Jorge Garcia authored a chapter titled "Human Cloning: Never and Why Not" for the book, *Human Cloning: Science, Ethics, and Public Policy*, edited by Barbara MacKinnon. In that chapter, he wrote: "I have said that my interest here is

to affirm the view that human cloning is not permissible morally (my "never") and to begin exploring some reasons for which it is not (my "why not"). **If it is wrong, it is wrong for reasons**" (p. 89, parenthetical items in orig., emp. added). He is right. If cloning is wrong, it is "wrong for reasons." We contend unequivocally that cloning **is** wrong, and that there **are** reasons **why** it is wrong.

1. There is a strong possibility that the "parental imprinting"–which is necessary for the cloned cell's chromosomes to function properly as it later reproduces–does not occur correctly during the cloning process. This, in fact, was one of the chief objections proposed by the NBAC report in June 1997.

> Third, will the phenomenon of genetic imprinting affect the ability of nuclei from later stages to reprogram development? In mammals imprinting refers to the fact that the **genes inherited on the chromosomes from the father (paternal genes) and those from the mother (maternal genes) are not equivalent in their effects on the developing embryo**. Some heritable imprint is established on the chromosomes during the development of the egg and the sperm such that certain genes are expressed only when inherited from the father or mother. Imprinting explains why parthenogenetic embryos, with only maternally inherited genes, and androgenetic embryos, with only paternally inherited genes, fail to complete development. **Nuclei transferred from diploid cells, whether embryonic or adult, should contain maternal *and* paternal copies of the genome**, and thus not have an imbalance between the maternally and paternally derived genes.
>
> The successful generation of an adult sheep from a somatic cell nucleus suggests that the imprint can be stable, but **it is possible that some instability of the imprint, particularly in cells in culture, could limit the efficiency of nuclear transfer from somatic cells. It is known that disturbances in imprinting lead to growth abnormalities in mice and are associated with cancer and rare genetic conditions in children** (1997, p. 23, italics and parenthetical items in orig., emp. added).

Geneticists acknowledge these problems. Harvard's Lewontin admitted:

> The serious ethical problems raised by the prospect of human cloning lie in the fourth domain considered by the bioethics commission, that of safety. **Apparently, these problems arise because cloned embryos may not have a proper set of chromosomes**. Normally, a sexually reproduced organism contains in all its cells two sets of chromosomes, one received from its mother through the egg and one from the father through the sperm. Each of these sets contains a complete set of the different kinds of genes necessary for normal development and adult function. Even though each set has a complete repertoire of genes, for reasons that are not well understood we must have two sets and only two sets to complete normal development. If one of the chromosomes should accidentally be present in only one copy or in three, development will be severely impaired (2000, p. 164, emp. added).

In a study reported in the July 6, 2001 issue of *Science*, researchers found that the **techniques** themselves were not the cause of the problems they were discovering in their cloned animals. Instead, the difficulties arose from the fact that the actual donor cells appeared to be extremely unstable in culture. During their growth and division phases, these cells began losing important segments of DNA that instruct particular genes to "turn on" or "turn off." While the effects of these deletions were not visible outwardly, tests in which gene expression was measured showed an entirely different story.

David Humphreys and coworkers used embryonic stem cells to provide the genetic material that was placed into egg cells. The nucleus from these embryonic stem cells was transferred to mice eggs and then placed into surrogate mothers to be carried to term. The researchers found that the DNA in mice born as a result of this procedure exhibited irregular gene expression–in other words, some of their DNA was missing. In order to confirm their suspicions that the technique itself was not at fault, the scientists then implanted other egg cells using stem cells from the same culture. As they suspected,

the technique worked flawlessly. It was the stem cells themselves that were unstable. In discussing their results, Humphreys and his colleagues wrote: "Our results indicate that even apparently healthy cloned animals can have gene expression abnormalities that are not severe enough to impede development to birth but that may cause subtle physiological abnormalities which could be difficult to detect" (2001, 293:97).

And news that initially seems to be "good," frequently turns out to be "bad"–very, very bad. And it sometimes seems to get progressively worse with each passing experiment. Consider the case of cloned rhesus monkeys. The headline said it all: "American Scientists Develop Technique for Cloning Monkeys" (see Choudhary, 1997). One week after Ian Wilmut's announcement that he had successfully cloned a sheep named Dolly, scientists in Oregon reported that they had successfully cloned rhesus monkeys. Three years later, BBC News gave an update on this same group of researchers in an article titled "Scientists 'Clone' Monkey" (see Whitehouse, 2000).

But, as the old saying goes, that was then; this is now. Most researchers have dismissed these headlines and announcements as unfounded, due to some fairly noteworthy "technicalities" and "difficulties." Truth be told, the Oregon Regional Primate Research Centre had succeeded at cloning monkeys only from embryos, not from adult animals. In the most recent case, they simply took an embryo that was at the eight-cell stage and split it into four genetically identical, two-cell embryos–in other words, little more than "artificial twinning" (Whitehouse, 2000). While such technicalities may seem insignificant at first glance, in light of recent announcements, the fact that monkeys **never** have been cloned from adult cells becomes extremely significant, especially in regard to potential future human cloning experiments.

It appears that while researchers can successfully clone sheep, goats, mice, cows, rabbits, mules, horses, and deer, primates and humans may prove to be beyond their reach. Gerald Schatten, of the University of Pittsburgh School of Medicine, stated it is almost as if someone "**drew a sharp line between old-world primates–including people–and**

other animals, saying 'I'll let you clone cattle mice sheep even rabbits and cats, but monkeys and humans require something more'" (as quoted in Vogel, 2003a, 300:225, emp. added). In fact, scientists in the United States have reported that hundreds of attempts to clone monkeys have all ended in failure. Dr. Schatten and colleagues noted: "Although rhesus embryos begin development after embryonic cell nuclear transfer (ECNT), there has only been one report of rhesus births after ECNT, and that report has not been replicated" (Simerly et al., 2003, 300:297, parenthetical item in orig.). That one birth was a female monkey named Tetra.

Some might argue that researchers are simply giving up too soon—after all it took 277 failed attempts before Dolly was successfully implanted. However, Dr. Schatten and his colleagues used 724 eggs from rhesus monkeys, and their efforts resulted in only 33 embryos—with not a single viable pregnancy. And these are the results from only one lab. For several years, scientists all across the globe have been busily trying to clone both monkeys and humans. Schatten's group has shifted its focus to what might be the cause of this "sharp line" that seems to be preventing humans from cloning primates. Researchers know that something "critical" is "left out" or missing during the initial stage where the DNA is stripped from the original cell. Dr. Schatten and his colleagues believe that "something" is motor proteins. Motor proteins play a critical role in properly organizing DNA before a cell divides and grows. If the DNA is unable to duplicate itself perfectly before the cell divides, normal growth cannot occur.

As Vogel reported, a look at unfertilized rhesus eggs provided a key in pointing researchers toward an answer. Schatten and his colleagues found that "spindle proteins are concentrated near the chromosomes of unfertilized egg cells—the same chromosomes that are **removed** during the first step of nuclear transfer" (300:225, emp. added). In other mammals (i.e., non-primates), these proteins appear to be scattered throughout the egg; thus, when the egg's chromosomes are removed, enough are left for cell division to proceed.

If this hurdle weren't enough, biologist Rudolf Jaenisch of the Whitehead Institute in Cambridge, Massachusetts, and his colleagues found additional evidence of developmental problems for cloned animals. He reported in the April 15, 2003 issue of *Development* that genes important to early development frequently fail to be activated in mice embryos cloned from adult cells. Without these genes being turned on, the cloned embryos never get enough stem cells to grow on. These researchers compared gene activity from mice cloned from adult cells to those cloned from immature cells (pluripotent stem cells). The results from their experiment were easily observed, as the mice cloned from immature cells had higher survival rates and were far hardier than those from aged adult cells. As Robert Cooke noted:

> Apparently, in the death of cloned embryos, important genes remain in their adult form–that is, they are shut down…. [E]ven if the genes are reprogrammed correctly, the rearrangement of chromosomes during cell division can still go haywire. In all mammal cases–natural or cloned–each new embryo must be a product of stem cells that have grown and differentiated to become all the various kinds of tissue the body needs. And during this process, if too few stem cells are made, or not enough of the right kinds of stem cells are made, the developmental program gets derailed (2003).

On March 9, 2001, three cattle (Martie, Natalie, and Emily) cloned by scientists at California State University at Chico appeared to have been born healthy, but on day 12 Natalie died, and on day 15 Emily succumbed as well–both from abrupt immune system failure. Martie was reported to be failing rapidly. Project director Cindy Daley said that things "looked normal" until that Wednesday evening when she went to check on, and feed, the animals (see Cooper, 2001). As we noted earlier while such events are not widely reported in the news media, they are becoming quite common in regard to cloned animals, many of which have experienced obvious mutations, while others have died shortly after birth, even though outwardly they appeared to be quite normal (see, for example, Humphreys, 2001). As one scientist, Rebecca

Krisher, assistant professor of animal reproduction at Purdue University, put it: "Almost all of these animals, if born on a farm without a vet hospital, probably would not survive" (as quoted in Cooper, 2001). In studies performed on cloned cattle by Cyagra, a Kansas company that studies commercial aspects of cloning livestock, "the company has about a 6 percent birth rate; of those calves, about half die soon after they are born" (as quoted in Cooper, 2001).

While scientists may eventually resolve the numerous problems surrounding cloning via nuclear transfer, it is difficult to imagine that there will be a "quick fix" for **all** of the problems that are associated with the cloning process in general. Such biological roadblocks could significantly slow, or even halt, the production of human clones. As Schatten noted: "This reinforces the fact that the charlatans who claim to have cloned humans have never understood enough cell or developmental biology" to succeed (300:227). Indeed it does.

2. In animal experiments, the percentages of live clones that actually survive until birth are extremely small, and those that do survive often are abnormal in a variety of ways. As the NBAC report noted: "…[O]nly 29 of 277 (11 percent) of successful fusions between adult mammary gland nuclei and enucleated oocytes developed in the blastocyst stage, and only 1 of 29 (3 percent) blastocysts transferred developed into a live lamb" (1997, p. 22, parenthetical items in orig.). In the chapter he wrote on "Human Reproductive Cloning" for *The Cloning Sourcebook*, Raanan Gillon stated:

> Cloning by nuclear substitution has only just begun in mammals, with Dolly the sheep being one successful outcome out of 277 attempts to produce such a clone. **Imagine that being done in human beings and the harms to the women producing the eggs and undergoing the unsuccessful implantations**… (2001, p. 195, emp. added).

In their study published in *Science*, Dr. Humphreys and his colleagues admitted that few animals were born alive, and that those that survived frequently died from their abnormalities.

> **…only a few percent of nuclear transfer embryos develop to term. Even those clones that survive to term frequently die** of respiratory and circulatory problems and show increased placental and birth weights, often referred to as "large offspring syndrome" (293:95, emp. added).

At a 1997 conference on mammalian cloning, Ian Wilmut himself stressed both of these points. First, he observed, current techniques are very inefficient. For example, he started with 277 sheep embryos, and ended up with only one live lamb. Second, the techniques frequently produce animals that are monstrously large and that cannot be born by normal means (the "large offspring syndrome" mentioned above). Janet Rossant, a senior investigator at the Samuel Lunenfeld Research Institute of Mount Sinai Hospital in Toronto (and who also teaches in the University of Toronto's department of medical genetics and microbiology), when interviewed on this subject, said:

> All the people who've cloned mice and so on would tell you that right now this is so inefficient and the chances of abnormalities so high that they would not, for safety reasons, propose that human cloning be undertaken–let alone the ethical concern (see "Cloning Still an Inexact…," 2002).

One of us [BT] taught in the College of Veterinary Medicine at Texas A&M University for a number of years. Scientists there announced in 2002 that they had logged another "cloning first"–a cat, aptly named "cc" (for "carbon copy"), which was the only live kitten produced from **87** cloned embryos (see Shin, et al., 2002). In fact, the number of embryos it takes to bring to birth a single cloned animal are startling (see Table 1 on the next page). When you stop to consider the huge number of embryos that perish at various stages of development, you begin to realize the undeniable fact that human cloning will carry with it an unconscionable cost in human life.

In animal cloning, the efficiency has been extremely poor. Mark Westhusin, a veterinarian at Texas A&M who has cloned both cattle and cats, commented: "There are just not enough animal studies that have been completed to verify the safety

Animal	Number of embryos needed to produce one clone
Cat	87
Cattle	10
Goat	112
Horse	841
Human	???
Mouse	942
Mule	334
Pig	110
Sheep	277
Rabbit	1084

Table 1 – Numbers of embryos required to achieve one live clone birth. Figures represent results from the first research laboratory that was successful in cloning a particular mammal. [Numbers do not include those embryos from other labs, or the total number of eggs that never reached the blastocyst stage.]

of it." Then, in regard to the possibility of scientists attempting human cloning, he added: "I think they're taking a big risk in terms of health hazards to the child" (as quoted in "The First Human Clone," 2002). As Dr. Rossant went on to note:

> [F]or the starting number of eggs, the resulting number of live births is very, very low. And even when successful, the animals are not usually very normal. Some look relatively normal but many have abnormalities. Nearly every cloned animal in any species has something called large offspring syndrome. The babies that are born are very big. So this is a real problem (see "Cloning Still an Inexact…," 2002).

The Genetic Science Learning Center at the Eccles Institute of Human Genetics at the University of Utah had this to say regarding the efficiency of cloning.

> Cloning animals through somatic cell nuclear transfer is simply inefficient. The success rate ranges from 0.1 percent to 3 percent, which means that for every 1000 tries, only one to 30 clones are made. Or you can look at it as 970 to 999 failures in 1000 tries. That's a lot of effort with only a speck of a return! (see Genetic Science Learning Center)

All of this confirms what many of us in science already suspected–that reproductive cloning not only is inefficient, but also may be extremely unsafe.

But there is more. Just six months after the Humphreys report was released, a report appeared in the December 15, 2001 issue of *New Scientist*, discussing the work of Tanja Dominko who, at the time, worked for the Oregon Regional Primate Research Centre. An extremely high percentage of monkeys cloned by the Primate Centre appeared to be in good physical condition, but turned out to have what Dominko called an internal "gallery of horrors." Dominio examined 265 cloned rhesus macaque embryos that had been produced via the nuclear somatic transfer process. Although upon initial examination the embryos looked healthy enough, "the cells in the vast majority of Dominko's embryos did not form distinct nuclei containing all the chromosomes. Instead, the chromosomes were scattered unevenly throughout the cells" (Westphal, 2001, 172[2321]:14). A "gallery of horrors" indeed! Dominko surmised that the trauma of removing the nucleus from the egg might be what triggers the defects. As the report in *New Scientist* went on to say: "Eggs whose nuclei are removed and then put back inside show the same abnormalities, as well as evidence of programmed cell suicide" (Westphal, 2001). Abnormal cell nuclei and "programmed cell suicide"–neither is a pleasant thought when it comes to **human** cloning.

Earlier, we introduced a portion of a quote about the safety of cloning from an article ("Don't Clone Humans!," March 30, 2001 issue of *Science*) by Rudolf Jaenisch (one of the co-authors involved in the Humphreys study on cloned mice) and Ian Wilmut (who cloned Dolly). Here is that quote once again, but this time with the conclusion of the authors included.

> Animal cloning is inefficient and is likely to remain so for the foreseeable future. Cloning results in gestational or neonatal developmental failures. At best, a few percent of the nuclear transfer embryos survive to birth and, of those, many die within the perinatal period. There is no reason to believe that the outcomes of attempted human cloning will be any different.... **Newborn clones often display respiratory dis-**

> **tress and circulatory problems, the most common causes of neonatal death. Even apparently healthy survivors may suffer from immune dysfunction, or kidney or brain malformation, which can contribute to death later** (2001, 291:2552, emp. added).

Jaenisch and Wilmut specifically addressed the claims of human cloning when they wrote:

> **We believe attempts to clone human beings** at a time when the scientific issues of nuclear cloning have not been clarified **are dangerous and irresponsible.** All the data collected subsequently reinforce this point of view.... If human cloning is attempted, **those embryos that do not die early may live to become abnormal children and adults;** both are troubling outcomes (291:2552, emp. added).

In an August 20/August 27, 2001 special double issue of *U.S. News and World Report,* the magazine's well-known editor at large, David Gergen, wrote under the title of "Trouble in Paradise":

> It took 277 embryos to make one Dolly, they point out, and that was for a simple sheep. Think how many more will be required to make a human and how many deformed fetuses may result. Will we see mass abortions? Miscarriages? Human suffering? Even a monster in a laboratory?... [I]t is troubling enough that Dolly grazes nearby. If we now turn loose her human cousins, how can we possibly keep nature's balance? (131[7]:80).

In this controversy, "keeping nature's balance" apparently is on the minds of a lot of people–scientists and non-scientists alike. In the same issue of *U.S. News* in which Gergen's article appeared, the editors also chimed in with an editorial of their own titled "Send in the Clones?," in which they wrote:

> **Stem-cell research, cloning, and genetic engineering**–the new frontiers of science–**are creating a landscape of slippery slopes** where politics, religion, science, and hope collide. The pace of discovery is so rapid that we can't even resolve one ethical debate before another rears its head....

> So far, **mainstream scientists have opposed reproductive cloning because it's just not safe**. Sudden abortions, stillbirths, and gross birth defects are among the seemingly unexplainable and initially undetectable problems that arise (see "Send in the Clones," 2001, 131[7]:12, emp. added).

In mid-2003, science writer Helen Pearson penned an article for *Nature* magazine's Web site. Titled "Adult Clones in Sudden Death Shock," it explained how three pigs, cloned using techniques similar to those used to create Dolly, had suddenly dropped dead from heart attacks. Jerry Yang, the leader of a research team from the University of Connecticut, dubbed the three pigs' deaths "adult clone sudden death syndrome," (see Pearson, 2003a). Reporting on the unexpected deaths, Pearson commented: "Of four piglets born, one died within days. The remaining three have now collapsed and expired of heart failure at less than six months of age" (2003a). Pearson continued: "The pigs' demise is a stark reminder that cloned animals are far from normal. Many fall ill or die just after birth–Dolly herself passed away at the relatively tender age of 6." Indeed, with animals suddenly dropping dead, now is not a good time to be a clone. And it certainly is not a good time (as if there **were** a good time!) to attempt **human** cloning.

Additional evidence substantiating the truthfulness of such a statement arrived in the form of a study reported in September 2003 by James Grifo and his colleagues at New York University's School of Medicine (see Zhang, et al., 2003). During the week of October 6-10, 2003, the 59th annual meeting of the American Society for Reproductive Medicine took place in the convention center in San Antonio, Texas. Doctors from a variety of fields descended on the city in order to discover the latest information on reproductive technologies. One abstract presented during the conference–from a paper that generated a great deal of interest (and controversy!)–was by Grifo and his coworkers. These scientists, working with colleagues at Sun Yat Sen University Medical Science in China, created the first human pregnancy using techniques related to cloning. [The procedure was carried out in China, in an effort to

avoid laws and regulations regarding human experimentation.] As Helen Pearson reported for *Nature* magazine's Web site: "The team fertilized eggs from two women in test tubes. They then sucked out the nucleus of one egg and injected it into the other, which they had stripped of its own nucleus. The idea is that the second egg will better direct the growth of an embryo" (2003b).

After creating seven "reconstructed" zygotes, the team implanted five of those into a 30-year-old woman who already had undergone two failed attempts at *in vitro* fertilization. Researchers reported a successful triplet pregnancy, and even were able to detect fetal heartbeats. At 33 days, a "fetal reduction to a twin pregnancy was performed" (see Zhang, et al.). One of the two remaining babies was lost after 24 weeks, due to "premature rupture of membranes," and was pronounced dead as a result of "respiratory distress" (Zhang, et al.). The final remaining infant died at 29 weeks after suffering from a cord prolapse.

This reproductive technique–nuclear somatic transfer–is perilously close to human reproductive cloning. As Pearson noted: "The effects of inheriting DNA from two mothers is unknown. Proteins made from the two sets of genes may be incompatible, perhaps even stopping the embryo's cells working" (2003b). In light of this evidence, and the unfortunate deaths of the children that resulted from the experiment, it is as unbelievable as it is terrifying that Grifo and his colleagues would dare to conclude: "Viable human pregnancies with normal karyotype [the chromosomal characteristics of an individual–BT/BH] can be achieved through nuclear transfer." How tragic that we already have lost three innocent lives because scientists are resolved to further "improve" this technique. One cannot help but wonder: how many more humans will have to die before we realize human cloning is morally and ethically reprehensible?

Scientists are being "egged on" by those who are overly anxious to learn–regardless of the cost in human lives–exactly what might happen when scientists attempt to clone humans. As *Skeptic* editor Michael Shermer lamented:

> The mass hysteria and moral panic surrounding cloning is nothing more than the historically common rejection of new technologies, coupled with the additional angst produced when medical advances fly too close to religion's sun.... So that is what it really comes down to: the fear that science is unduly infringing on religion's turf.
>
> Why not lift the ban on all research into cloning–including humans–and see what happens? Let's run the social experiment and analyze the data.... In the borderlands between science and pseudoscience, the best method to determine which fuzzy category a claim belongs is to test it. Why not do that here? (2001, pp. 75-77).

Why not? Keep reading. Believe it or not, things have gotten even spookier since the technology that made Dolly possible arrived on the scene. In the May 22, 1998 issue of *Science*, scientists at a Worcester, Massachusetts, company, Advanced Cell Technology, reported that they had created a "transgenic" (across species lines) **bovine-human hybrid** embryo that consisted of a **human** somatic cell's nucleus inside a **cow's** egg. The researchers actually took a cell from Dr. Jose Cibelli, the lead scientist in the study, removed its nuclear-based genetic material, and placed it into a cow's egg from which the nucleus had been removed. Once inside the bovine egg, the contents of the human cell activated and the egg began to divide normally until it had reached the 32-cell stage (see Cibelli, et al., 1998). One year later, *New Scientist* published a report about a Japanese researcher from Tokyo University of Agriculture and Technology, Setsuo Iwasaki, who removed the chromosomes from 27 cows' eggs and implanted the eggs with nuclei from human somatic cells. His stated goal was to isolate embryonic stem cells, which would have meant culturing the hybrid embryos for a minimum of five days until they formed a hollow ball known as a blastocyst. But, Iwasaki reported, most of the embryos did not develop, and none went through more than three cycles of division (see Hadfield, 1999).

But the news does not stop at human/bovine hybrids. In 2000, scientists reported that they had been successful in at-

tempts to clone pigs (Onishi, et al., 2000; Polejaeva, et al., 2000), and that same year, researchers reported transgenic cloning experiments, combining pig oocytes and human somatic cells. According to the March 13, 2001 issue of the *New Zealand Herald*, Australian scientists at a Melbourne company, Stem Cell Sciences, reportedly had produced a cloned human embryo in 1999 by combining an empty **pig** egg with a **human** somatic cell (see "Human-Pig Embryo Accusation Provokes Debate," 2000). Similar experiments were carried out by an American company, BioTransplant. In both cases, the resulting human cloned embryo was allowed to divide to a 32-cell stage before being destroyed. Apparently, Australia has been home to somewhat secretive human cloning experiments for several years. Based on the fact that approximately 1% of the DNA in the human/porcine hybrid would have been donated by the pig cells' mitochondria (the "energy factories" of the cell, which contain their own extranuclear DNA), the Australian government has vehemently rejected the idea that such a hybrid could be referred to legitimately as a "human" clone, and therefore has denied most emphatically that **human** cloning has taken place in "the land down under" (a matter of semantics, to be sure). And so, laboratories around the world have come to realize that an organism containing 99% human genes and 1% animal genes allows them to claim, "technically," that they are not cloning humans. This technicality, then, allows their research to continue, even though many countries worldwide (including 29 in Europe alone—see Willing, 2001) have adopted a ban on non-therapeutic human cloning. In an editorial in the July 19, 2001 issue of *Nature* titled "The Meaning of Life," the editor commented on this "technicality" concerning embryonic stem [ES] cells when he wrote:

> Advanced Cell Technology (ACT) of Worcester, Massachusetts says it is trying to generate human embryos by cloning, and then harvest ES cells from them. The company hopes to sidestep moral objections, as fertilization is not involved. Indeed, the chair of ACT's ethical advisory board argues that an embryo created in this way is not a bona fide embryo, and sug-

> gests the term "ovumsum." The procedure that ACT is experimenting with, known as therapeutic cloning, might one day prove useful in generating ES cells that are genetically matched to patients requiring tissue grafts. **But to suggest that it does not involve the creation of embryos is misleading** (see "The Meaning of Life," 2001, 412:255, emp. added).

Misleading indeed! When even the editors of major science journals recognize that some of this research is "misleading" (read that as "morally objectionable"), surely it is time to reassess the slippery slope on which science finds itself. If it becomes possible to create a hybrid "cross" between a human and an animal, then such technology could be used to grow "things" that possess human characteristics, yet that are not considered "fully human." These "almost-but-not-quite-human" creatures then could be employed as "workhorses" to carry out tasks that humans no longer wish to perform–like picking cotton, working in harsh factory conditions, doing dull, repetitive jobs, etc. With current patenting laws allowing scientists exclusive rights to newly created life forms, researchers, backed by any number of deep-pocketed financiers, could be well on their way not just to fame, but to fortune as well.

3. As we mentioned briefly earlier, in cloned animals, scientists have witnessed both physiological problems and premature aging–both of which could very well occur in human clones. Dolly provided the perfect example. Researchers at the Roslin Institute in Scotland, where she was cloned, revealed in 2002 that she suffered from severe arthritis. They conceded that the premature onset of this ailment might have been a product of the fact Dolly was cloned. According to Jon Hill, a veterinarian at Texas A&M who has cloned cattle, even those clones that **appear** normal at birth often develop problems afterward. "Their livers, their lungs, their heart, their blood vessels are often abnormal after birth," Dr. Hill said (see "Human Cloning: 'One Shouldn't…,'" 2002). Robert Lanza, M.D., the head of medical and scientific development at the private genetics research firm, Advanced Cell Technologies, remarked:

> …[A]s these animals age in life, it is going to turn out that we are going to start seeing problems. For instance, we have started to see a tumor in one of the animals after several years, and another animal has developed grand mal seizures and periodically drops to the ground, so again although a baby may be born healthy, there is certainly a very distinct possibility that problems could occur later…. I do not think that there is a reputable scientist on this planet who would advocate using this technology to generate a human child as was just announced (see "Dr. Robert Lanza…," 2002).

Rudolf Jaenisch, a biologist at MIT's Whitehead Institute for Biological Research (which clones mice), said that even if a human clone did appear healthy initially, he or she might not remain so once aging begins. And, worse still, the clone might age prematurely. Why so?

In its report to the President, the National Bioethics Advisory Commission addressed the problem of premature aging in cloned organisms.

> [W]ill cellular aging affect the ability of somatic cell nuclei to program normal development? As somatic cells divide they progressively age and there is normally a defined number of cell divisions that they can undergo before senescence. Part of this aging process involves the progressive shortening of the ends of the chromosomes, the telomeres, and other genetic changes. Germ cells (eggs and sperm) evade telomere shortening by expressing an enzyme, telomerase, that can keep telomeres full length (*Cloning Human Beings*, 1997, pp. 23-24).

In his fascinating book, *Genome: Autobiography of a Species in 23 Chapters*, Matt Ridley of Great Britain explained how all of this works.

> Each chromosome is just a giant, supercoiled, foot-long DNA molecule, so it can all be copied except the very tip of each end. And at the end of the chromosome there occurs a repeated stretch of meaningless "text": the "word" TTAGGG repeated again and again about two thousand times. This stretch of terminal tedium is known as a telomere. Its presence enables

the DNA-copying devices to get started without cutting short any sense-containing "text." Like an aglet, the little plastic bit on the end of a shoelace, it stops the end of the chromosome from fraying.

But every time the chromosome is copied, a little bit of the telomere is left off. After a few hundred copyings, the chromosome is getting so short at the end that meaningful genes are in danger of being left off. In your body the telomeres are shortening at the rate of about thirty-one "letters" a year–more in some tissues. That is why cells grow old and cease to thrive beyond a certain age. It may be why bodies, too, grow old–though there is fierce disagreement on this point. In an eighty-year-old person, telomeres are on average about five-eights as long as they were at birth.

The reason that genes do not get left off in egg cells and sperm cells, the direct ancestors of the next generation, is the presence of telomerase, whose job is to repair the frayed ends of chromosomes, re-lengthening the telomeres….

Telomerase seems to behave like the elixir of eternal life for cells…. In normal human development, the genes that make telomerase are switched off in all but a few tissues of the developing embryo. The effect of this switching off of telomerase has been likened to the setting of a stopwatch. From that moment the telomeres count the number of divisions in each cell line and at a certain point they reach their limit and call a halt. Germ cells never start the stopwatch–they never switch off the telomerase genes…. **The lack of telomerase seems to be the principal reason that cells grow old and die, but is it the principal reason bodies grow old and die? There is some good evidence in favour**: cells in the walls of arteries generally have shorter telomeres than cells in the walls of veins. This reflects the harder lives of arterial walls, which are subject to more stress and strain because arterial blood is under higher pressure. They have to expand and contract with every pulse beat, so they suffer more damage and need more repair. Repair involves cell copying, which uses up the ends of telomeres. The cells start to age, which is why we die from hardened arteries, not from hardened veins (1999, pp. 197,199-200, emp. added).

As one author put it: "Telomeres (the ends of the chromosomes) shorten as mammals age; if this is passed on by nuclear transfer, it could affect the genome of the child and shorten the expected life of the child" (Pence, 1998, p. 131, parenthetical item in orig.). Ian Wilmut recognized the importance of this point when he was asked at a scientific conference in 1997 if he knew whether Dolly's cells were aging prematurely. Since Dolly was cloned from a mammary-gland cell from a **six-year-old** sheep, are Dolly's cells really six years old already? Was Dolly simply an "old" sheep in a "young" sheep's clothing? A reporter at the conference observed that when Wilmut was asked whether Dolly should be considered seven months old (which is how old she was at the time of the press conference), or six years old (as a genetic replica of a six-year-old sheep), "Dr. Wilmut's clear blue eyes clouded for a moment. 'I can't answer that,' he said. 'We just don't know' " (as quoted in Specter and Kolata, 1997).

When Dolly had to be euthanized due to early-onset arthritis and advanced lung disease, we suspect that Dr. Wilmut finally knew the answer to the reporter's question. But by then, it was too late for Dolly, who had been sent off to be stuffed and mounted.

4. The current evidence suggests there is a good chance that reproductive cloning may increase expressed genetic mutations in humans. Once again, the NBAC report on *Cloning Human Beings* weighed in.

> [W]ill the mutations that accumulate in somatic cells affect nuclear transfer efficiency and lead to cancer and other diseases in the offspring? As cells divide and organisms age, mistakes and alterations (mutations) in the DNA will inevitably occur and will accumulate with time. If these mistakes occur in the sperm or the egg, the mutation will be inherited in the offspring. Normally mutations that occur in somatic cells affect only that cell and its descendants, which are ultimately dispensable. Nevertheless, such mutations are not necessarily harmless. **Sporadic somatic mutations in a variety of genes can predispose a cell to become cancerous. Transfer of a nucleus from a somatic cell carrying such a mutation into an**

> **egg would transform a sporadic somatic mutation into a germline mutation that is transmitted to all of the cells of the body. If this mutation were present in all cells, it may lead to a genetic disease or cancer**. The risks of such events occurring following nuclear transfer are difficult to estimate (1997, p. 24, emp. added).

Difficult to estimate indeed! We absolutely must not overlook the fact that "the cloned individual, moreover, will be saddled with a genotype that has already lived…. [G]enotype matters plenty. That, after all, is the only reason to clone, whether human beings or sheep" (Kass, 2000, pp. 89-90). Scientists, physicians, and researchers struggle daily to locate the causes of genetic mutations and to eliminate them from the gene pool. Currently, there are over 1,600 known genetic mutations within the human genome, none of which is beneficial (and most of which are harmful or lethal). Do we really want to use a procreative procedure that **increases** mutations responsible for disorders such as phenylketonuria (a disease among newborns that can be fatal), achondroplasia (a type of dwarfism), etc.? Hardly!

If this were any other area of medical science in which humans were involved, scientists would be urging caution and more animal experimentation. Yet because of the "commercial pressures," "market forces," "rush to fame," and "cultural reduction in respect for human life" that are involved, caution and further experimentation have been tossed aside. To what end? Colin Tudge lamented:

> **But the chief player in all this is the baby itself. If the baby were to be deformed or otherwise incapacitated, then obviously the procedure is unjustified**. We must assume, though, that cloning would not be attempted at all–in animals or in humans–unless there was a reasonable chance of success. So what is a "reasonable" chance in the context of a human baby? Late abortions, deformities, and neonatal deaths of the kind that occurred in the attempts to clone sheep at Roslin would clearly be unacceptable. So would we suggest that a one in a hundred chance of disaster was acceptable? Or one in a thousand? In practice, it

> is foolish simply to pluck figures out of the air. We might rather observe that **natural** births, generated by the time-honored sexual means, **sometimes** end in disaster. So perhaps we might suggest that cloning would be acceptable provided the risk (of late abortion, deformity, neonatal death, or some later disaster) was no greater than in natural births. That would be a harsh criterion indeed, however, and impossible to judge until a great many babies have been cloned and statistics were available (2000, p. 320, first emp. added, last emp. in orig.).

Is that the answer, then? Do we simply push steadily forward to "clone a great many babies" so that "statistics are available"? In comparing what he called the "chance birth" of identical twins (i.e., by natural means) to **cloned** children, Harvard's Lewontin correctly commented: "We have no responsibility for the **chance** birth of genetically identical individuals, but their **deliberate manufacture** puts us in the Creation business, which, like extravagant sex, is both seductive and frightening" (2000, p. 156, emp. added). The question is, is it "frightening" enough to make us stop, ponder what we are doing, and then ultimately resist attempts to clone **human beings**?

Where do We Go from Here?

Princeton molecular geneticist Lee Silver would like us to believe that the "abnormalities" that scientists are seeing in reproductive cloning are not so bad after all. The same year that Dolly's arrival was announced (1997), Silver authored his groundbreaking book, *Remaking Eden: Cloning and Beyond in a Brave New World,* in which–in a brazen attempt to defend human cloning–he wrote (incredibly!): "If safety is judged by the proportion of those lambs born who were in good health [that would be a grand total of **one**–Dolly–BT/BH], then the record is perfect (albeit a rather small sample size)" (p. 103, parenthetical comment in orig.). A small sample size indeed–**one**! Who does Dr. Silver think he is kidding? Were any other "scholar" to make such a ridiculous claim based on a statistical set of one (is there even really such a thing?), he would be

ridiculed unmercifully in the halls of science–by his own colleagues! In fact, as two scientists wrote in a letter to *Science* in regard to Dolly, one successful attempt out of 277 "is an anecdote, not a result" (Sgaramella and Zinder, 1997, 279:635). Is it any wonder that most Americans oppose human cloning (see "Send in the Clones," 131[7]:12), when such irresponsible pronouncements are forthcoming from scientists?

Ah, but what a difference four years–and statistical sets larger than one–can make! As we noted earlier, reproductive experts have cloned at least several mammals. Yet even those scientists directly involved in the research are critical of current methods and their end results. Harry Griffin is assistant director of Scotland's Roslin Institute, where Ian Wilmut successfully cloned Dolly. In an interview on January 30, 2001, he told BBC News Online:

> The success rate with animal cloning is about one to two per cent in the published results, and I think lower than that on average. I don't know anyone working in this area who thinks the rate will easily be improved. There are many cases where the cloned animal dies late in pregnancy or soon after birth. **The chances of success are so low it would be irresponsible to encourage people to think there's a real prospect. The risks are too great for the woman, and of course for the child. It would be wholly irresponsible to try to clone a human being, given the present state of the technology** (as quoted in Kirby, 2001, emp. added).

Unfortunately, maverick scientists like Richard Seed, Panayiotis Zavos, Severino Antinori, and Brigitte Boisselier are not deterred. Nor are they alone. It appears that there are those "waiting in the wings" for just the right moment to announce their own plans for the cloning of humans. In a disturbing article titled "Today the Sheep...Tomorrow the Shepherd?," *Newsweek* staff writer Kenneth Woodward remarked: "Science has a way of outdistancing all ethical restraints. **In science, the one rule is that what can be done will be done**" (1997, 129[10]:60, emp. added). That "one rule," as we noted previously, is known among scientists as the "technological imperative." And it rules supreme in many areas of science. The

famed *Star Trek* mantra–"to boldly go where no one has gone before"–has taken on an entirely new meaning in light of current reproductive technology. Pierre Baldi even went so far as to suggest:

> In my judgment, we do not have much to fear about cloning in the short term, and we have plenty of time to think about its consequences if we begin now. It will take quite some time and debate before the first laws are passed authorizing human cloning, and it may take some time to achieve the level of technical proficiency required for its legal practice. It will take decades for the first human clone to become an adult, and for us to begin to sort out the effects of nature and nurture (2001, p. 145).

Baldi did admit, however: "Before human clones are produced, we should ask ourselves whether it is ethical for human beings to precisely determine the genome of another human being" (p. 144). Determining (actually "**pre**determining" would be a more accurate term) the genome of another human being is indeed no small matter. *Newsweek's* Woodward observed: "Perhaps the message of Dolly is that society should reconsider its casual slide toward assuming mastery over human life. Do we really want to play God?" (129[10]: 60).

Bioethicist Leon Kass wisely observed: "Sometimes we establish bad precedents, and discover that they were bad only when we follow their inexorable logic to places we never meant to go" (2000, p. 100). Do we really want to take the route of human cloning? Medical ethicist Paul Ramsey once suggested that we cannot even develop the kinds of reproductive technologies being discussed here "without conducting unethical experiments upon the unborn who must be the mishaps (the dead and retarded ones) through whom we learn how" (1970, p. 113, parenthetical item in orig.). Sometimes, we must learn to say "no!" As Dr. Kass concluded: "The good things that men **do** can be made complete only by the things they **refuse to do**" (p. 106, emp. added). If there is anything that deserves to fall into the category of things that men should "refuse to do," surely it is the cloning of humans.

And that, in fact, is the very view that President George W. Bush's Council on Biomedical Ethics took. In its 350-page report, presented to President Bush on July 10, 2002, the following statements appeared.

> **The Council holds unanimously that cloning-to-reproduce-children is unethical, ought not to be attempted, and should be indefinitely banned by federal law**, regardless of who performs the act or whether federal funds are involved.
>
> The moral case against cloning-for-biomedical-research acknowledges the possibility–though purely speculative at the moment–that medical benefits might come from this particular avenue of experimentation. But **we believe it is morally wrong to exploit and destroy developing human life, even for good reasons**, and that it is unwise to open the door to the many undesirable consequences that are likely to result from this research. We find it disquieting, even ignoble, to treat what are in fact seeds of the next generation as mere raw material for satisfying the needs of our own.
>
> *Moral status of the cloned embryo.* **We hold that the case for treating the early-stage embryo as simply the moral equivalent of all other human cells is simply mistaken**: it denies the continuous history of human individuals from the embryonic to fetal to infant stages of existence; it misunderstands the meaning of potentiality; and it ignores the hazardous moral precedent that the routinized creation, use, and destruction of nascent human life would establish (see *Human Cloning*, 2002, pp. XXVI,LIII-LIV, italics in orig., emp. added).

How refreshing it is to see some common sense in a very "uncommon" controversy. When asked, the "man and woman on the street" generally are quick to say–by an overwhelming majority–that they think human cloning is unwise and unethical, and should be banned by the government. Apparently, the biomedical and ethical scholars appointed by the president to "think through" this quagmire of scientific and moral difficulties, are in agreement. Jorge Garcia, whom we quoted above, observed that if human cloning is wrong, it

is "wrong for reasons." In their exhaustive report on human cloning, the intellectuals who compose the president's Council on Biomedical Ethics provided 350 soul-stirring pages of such reasons.

But if only one sentence of the entire report sticks in our collective minds, it should be this: **Cloning-to-reproce-children is unethical [and] ought not to be attempted**. How much clearer could it be? Or, as Rudolph Jaenisch, one of the primary researchers in cloning, observed when asked about the birth of the first human clone: "To clone a human being is essentially using humans as guinea pigs, and **one shouldn't do this**" (see "Human Cloning: 'One Shouldn't…," 2002, emp. added). No, one should not! It is wrong morally, ethically, and spiritually. [Those interested in further information on the biblical ramifications of cloning may wish to examine the following materials: (1) *Cloning: Miracle or Menace?*, by Lane P. Lester and James C. Hefley (1980); (2) *Manipulating Life: Where Does It Stop?*, by Duane T. Gish and Clifford Wilson (1981); (3) *Genetic Engineering*, by J. Kerby Anderson (1982); and (4) *Human Cloning*, by Lane P. Lester and James C. Hefley (1998).]

Is Cloning Ethical?

It is one thing to try–and fail–277 times using sheep cells in an attempt at cloning. Sheep are animals that do not possess souls and that are not made in the "image and likeness of God" (Genesis 1:26-27). But it is quite another thing to try–even once–and fail in an attempt to clone a human. **Embryos are living human beings!** A laboratory littered with dead and dying sheep embryos is one thing; a laboratory littered with dead and dying human embryos is quite another. With cloning–if the success rates of the Scottish scientists (and others who have followed them) are taken at face value–the failure rate will be staggering

The specter of numerous laboratories around the country filled with maimed, malformed, malingering human embryos that grow into "abnormal children and adults" is not exactly the image of cloning that most people envision when they

think of cloning. Yet according to those researchers who are on the cutting edge of the technology, that may be exactly what we will see if we tread on this slippery slope in our attempts to "play God."

In an article summarizing the August 2001 National Academy of Sciences Conference on Cloning in Washington, D.C. for *Time* magazine, Michael Lemonick discussed some of the potential consequences of "playing God" via reproductive cloning.

> Most of the scientists who gathered in Washington earlier this month to talk about human cloning agreed that cloning an entire human being–besides being morally questionable–was fraught with technical obstacles. After all, research into animal cloning has already shown that **for every apparent success** like Dolly the sheep, **there are hundreds of failures, including many badly deformed creatures that were usually miscarried** (2001, 158[8]:56, emp. added).

Having discussed just such horrendous possibilities in his book, *The Impact of the Gene*, it was hardly with a cavalier attitude that science writer Colin Tudge admitted:

> But whether we like it or not, the human clone and the designer baby, the reinvented human being, will stay on humanity's agenda for as long as science itself is practiced. With such power before us, we have to ask as a matter of urgency, what is **right** for us to do. Some have suggested that these new technologies raise no "new" ethical issues, a point that largely depends on what is meant by **new**. They certainly raise the ethical ante. After all, we cannot be held morally responsible for events that we cannot control, but we are answerable for those that we do control. In the normal course of events, we cannot control the genetic makeup of our offspring. We do have **some** influence, because we choose our mates carefully, but the process of genetic recombination during the formation of eggs and sperm ensures that the genetic details of our offspring are not ours to specify. But if we clone children, or engineer their genes, then we are **prescribing** their genome. Our responsibility,

> then, for all that befalls them, far outstrips that of any parent. Noblesse oblige. It is too casual by far to say there are no new issues. We must look deeper (2000, pp. 307-308, emp. in orig.).

Indeed, we **must** "look deeper"—for several reasons. We must force ourselves to realize that once the genie is out of the bottle, we will not be able to put it back. Science never goes backwards. **Never**! In his book, *Designing Babies*, Roger Gosden addressed this point when he wrote:

> The march of scientific knowledge pauses from time to time, awaiting the discovery of a new theory, technique, or instrument, **but it never retreats**. **Its discoveries can never be destroyed** like a canvas that offends or a music score that grates. Hence the fear that an uncomfortable fact discovered today is bound to be applied sooner or later, possibly for ill (1999, p. 17, emp. added).

Do we honestly believe that we can "clone now, but remedy the consequences later"—and somehow do it with impunity? As long ago as 1967, in an editorial in *Science*, Marshall Nirenberg of the National Institutes of Health cautioned:

> Man may be able to program his own cells with synthetic information long before he will be able to assess adequately the long-term consequences of such alterations, long before he will be able to formulate goals, and long before he can resolve the ethical and moral problems which will be raised (as quoted in Walters and Palmer, 1997, p. 141).

Or, as Leon Kass put it: "Here we surely should not be willing to risk everything in the naïve hope that, should things go wrong, we can later set them right" (2000, p. 105). Evolutionist and Nobel laureate George Wald of Harvard decried the fact that

> DNA technology faces our society with problems unprecedented not only in the history of science, but of life on the Earth. It places in human hands the capacity to redesign living organisms.... It is all too big and is happening too fast. So this, the central problem, remains almost unconsidered. **It presents probably the largest ethical problem that science has ever had to face.** Our morality up to now has been to go ahead without restriction to learn all that we can about

> nature. Restructuring nature was not part of the bargain. For going ahead in this direction may be not only unwise, but dangerous (1979, pp. 127-128, emp. added).

Any way you slice it, human reproductive cloning is not only unwise and dangerous, but patently unethical as well. Ask any knowledgeable ethicist, Christian or otherwise, and he or she will confirm that two important principles come into play in experimentation on human beings.

Is the Experiment to the Subject's Benefit?

The first principle is that basic medical ethics requires the experiment be to the subject's benefit. Even avid cloning proponent Lee Silver was forced to admit:

> A basic principle of medical ethics is that doctors should not perform any procedure on human subjects if the risk of harm is greater than the benefit that might be achieved. In the case of cloning, this principle would oblige physicians to refrain from practicing the technology unless they were sure that the risk of birth defects was no greater than that associated with naturally conceived children (1997, p. 103).

Is the risk greater? In the chapter he authored on "Cloning Human Beings: An Assessment of the Ethical Issues Pro and Con" for the book, *Clones and Clones*, Dan Brock answered that question in a very clear fashion: "**There is no doubt that attempts to clone a human being at the present time would carry unacceptable risks to the clone**" (1998, p. 157). How true! As things stand now, laboratory procedures for cloning humans scarcely would benefit the cloned embryos. Ian Wilmut and his colleagues attempted 277 fusions between donor cells and unfertilized eggs. Only 29 of those fused cells became embryos and were introduced into (13) ewes. Of those 29, only one became pregnant and gave birth to Dolly. What if the same failure rate held true for the cloning of humans? Or, for the sake of argument, suppose that somehow the failure rate could be cut in half (in other words, out of 29 human embryos, "only" 15 died during the process)? Would that then be ethically and morally acceptable? It would not! With human cloning–if the 1-2% success

rate of scientists' efforts today is any indication–the failure rate could be staggering. Producing human embryos–with the full knowledge in advance that many more of them will die than will live–is absolutely unacceptable.

Interestingly, at times atheists and theists alike acknowledge the major thrust of such arguments. Evolutionist Richard Lewontin, for example, admitted:

> Of course, the technique will get better, but people are not sheep and there is no way to make cloning work reliably in people except to experiment on people.... Even if the methods could be made eventually to work as well in humans as in sheep, how many human embryos are to be sacrificed, and at what stage of their development? (2000, pp. 165-166).

Sir John Polkinghorne, in an article on "Cloning and the Moral Imperative," wrote:

> An attempt to use a similar procedure to produce a cloned human person would undoubtedly also require a large number of trials before success was achieved and would involve similar uncertainties about long-term consequences. In contrast to the work that led to the birth of the first IVF baby, the procedures would be the result of radical human manipulation and not simply the facilitating of a natural process. Putting it bluntly, it would inevitably require the production of "experimental human beings." **This, in itself, is morally unacceptable**. If the profound respect due to an unimplanted embryo requires that experimentation cease at 14 days [as required by British law in Polkinghorne's home country–BT/BH], how would a much more extended series of experiments *in utero* be ethically justifiable? These procedures might have as their intended end a desirable purpose, such as the birth of a healthy baby who might otherwise suffer from a severe mitochondrial disorder, but the manner in which this had become feasible, through a sequence of experiments of this kind, would have been ethically tainted. The end would no more justify the means than it would, say, in the case of a fetus conceived naturally but with the intention of providing suitable material for the treatment of Parkinsonism in a close relative.... **Not everything that can be done should be done** (1997, pp. 41,42, emp. added).

In addition, there is more to this matter than merely "perfecting" the cloning method itself. As a case in point, consider the scenario that evolutionist Mark Ridley presented in his 2001 volume, *The Cooperative Gene:*

> But could human cloning ever become widespread: could most, or even all, human reproduction become clonal? At this stage, the Darwinian answer has to be: probably not. We need sex. We may need it to clear our harmful mutations. **A sub-branch of human beings who went in for clonal reproduction would also be signing their progeny up for a mutational meltdown**. They would undergo rapid genetic decay, as mutations accumulated faster than they could be eliminated. I do not know how many generations it would be before every offspring was so loaded with genetic defects that it would be dead; the details would depend on the exact cloning procedure, but cloning could not last long on an evolutionary timescale... **My forecast is that the clone would be sick, and destined to collapse under the burden of its own copying errors** (pp. 253,354, emp. added).

Is it to the clone's benefit to be born "abnormal" thanks to a "mutational meltdown" that has the potential to make it into a monster with gross birth defects? To ask is to answer. Truth be told, the scientific facts surrounding cloning do not paint a pretty picture. Rather than being viewed as a "miracle of life," it may well be that cloning should be portrayed instead as a death sentence.

Has the Subject Given "Informed Consent"?

There is a second equally important medical principle involved in the potential cloning of people. In any experiment performed on a human, the subject must know the risks beforehand and give "informed consent." [Note the important difference here between an "experiment" and a routine medical procedure (such as surgery).] One of the saddest events ever recorded in American medical history provides an excellent case study in this regard. During the forty years between 1932 and 1972, the United States Public Health Service sanctioned the so-called "Tuskegee Experiments" in which

399 poor men from Macon County, Alabama, who were known to have syphilis were studied to determine the effects of this debilitating condition. The government doctors in charge of the study never told the participants that they were infected with this disease (the men were told they had "bad blood," and that they could be cured if they entered the research program voluntarily). Even though the doctors knew that the disease was fatal if left untreated, and even though antibiotics were available that could have saved the lives of the 399 Alabamians, those men were denied access to such antibiotics. Nor did the scientists involved ever obtain "informed consent" from the men for their experiments, as required by United States law.

Instead, they were patronized, prodded, and poked in what can only be called one of the most shameful medical experiments ever perpetrated on Americans by Americans. As a result, almost all of the men died a cruel, agonizing death—with their tormenters recording every moment for posterity in the name of "scientific research." What was the rationale offered in later years for the experiments, once the scheme finally was uncovered? Those responsible claimed that they wanted to provide knowledge of the disease in the hope that it might prevent the physical degradation and death so often associated with syphilis victims. And, of course, they wanted to secure information that could be used to slow, or halt, the "moral degradation" associated with contracting a venereal disease in the first place. Laudable goals, to be sure; **but the end results did not justify the means through which they were accomplished!**

Perhaps it was a case such as the Tuskegee experiments that was on the mind of Lori Andrews when she commented in her book, *Future Perfect:*

> **[U]nder the medical model, little attention is actually paid to informed consent**. This is thought to be tolerable since people seek medical services when they already have a health problem and physicians are presumed to be acting in the patient's best interest by providing services.... Unlike other areas of law, where the standards of behavior are externally im-

> posed, in medicine the standard of care is set by the profession itself.... **Currently, most genetic services are regulated by the medical model. Under it, physicians are the source of information about genetic tests** (2001, pp. 23,24, emp. added).

The sad fact that some researchers within the scientific/medical community today do not adhere to the ethical standard of informed consent is no justification for **not** obeying the law, however. Two wrongs do not make a right.

In the case of human cloning, however, the tiny embryo being produced (and that more often than not is likely to die) could not provide informed consent, even if the researchers involved in the experiments actually decided to obey the law. As Kass noted:

> ...[A]ny attempt to clone a human being would constitute an unethical experiment upon the resulting child-to-be. As the animal experiments (frog and sheep) indicate, there are grave risks of mishaps and deformities. Moreover, because of what cloning means, **one cannot presume a future cloned child's consent to be a clone, even a healthy one**. Thus, ethically speaking we cannot even get to know whether or not human cloning is feasible (2000, p. 88, emp. added).

Dr. Kass' point is well made. Even if we could perfect the technology (a big "if," to be sure!), that still would not alleviate the problem of informed consent.

At every turn, then, the problem of the ethics of cloning rears its head. Little wonder Rob DeSalle and David Lindley admitted: "We hardly dare to think of the ethical difficulties such achievements would bring in their wake" (1998, p. 104). And yet we **must** think on these matters! As Pierre Baldi correctly observed:

> Many bioethics texts share the same conservative punchline: we ought to be extremely careful and proceed very slowly with biotechnology, because we must preserve our notion of humanity and of who we are (2001, p. 136).

Interestingly, President Bush echoed that same phrase—"proceed very slowly"—in his August 9, 2001 speech to the Ameri-

can people on human cloning and stem-cell research. In fact, the feature article in the August 20, 2001 issue of *Time* was titled "We Must Proceed with Great Care" (see Gibbs and Duffy, 2001)—which was a direct quote from the President's televised speech when he said that after many months of deliberation, "I have decided that we must proceed with great care" (Bush, 2001).

President Bush was absolutely correct to urge "great care." As Gina Kolata pointed out in her book, *Clone:* "If we really want to stop human cloning, it might be argued that **any** forays in this direction are tentative steps down a slippery slope" (1998, p. 234, emp. added). That "slippery slope" has been the topic of much discussion since Dolly's arrival. Roger Gosden observed: "Probably no subject in medical science receives more critical attention from both government and the press than reproductive biology and genetics" (1999, p. 17). And with good reason! As Kass has reminded us:

> Changes are now being considered that would improve the very germplasm, the permanent heredity, of these "created" clones. Traits thus made inherent would be potentially transferrable to every succeeding generation. This goes beyond fantasizing about Bionic Man to conjuring up the dream of Designer Man.... **We have here a perfect example of the logic of the slippery slope,** and the slippery way in which it already works in this area... We should allow all cloning research on animals to go forward, **but the only safe trench that we can dig across the slippery slope, I suspect, is to insist on the inviolable distinction between animal and human cloning** (2000, pp. 128,96,103, emp. added).

We could not agree more!

Often, it is the case that with increased knowledge comes increased power. And with increased power comes the potential for misuse or abuse of that power. The question, "**will** we be able to clone humans?" is not the same question as "**should** we clone humans?" The first is a question to be answered by an appeal to science; the second is a question to be answered by an appeal to the Word of God.

Oddly, at times those who do not believe in God or His Word as an objective moral standard seem to understand the ethical/moral issues better than some Bible believers. For example, long before the technology was available that could lead to human cloning, evolutionist Gunther Stent of the University of Southern California stated: "The idea of cloning humans is morally and aesthetically completely unacceptable" (as quoted in Howard and Rifkin, 1977, pp. 125-126). Compare that with the comment of Christian ethicist Randy Harris of David Lipscomb University: "Although there has been a good deal of rhetoric on the evils that are just ahead, I have yet to hear a cogent ethical argument as to why even the cloning of a human would be wrong" (1997, p. 16). As we have shown here, there are, in fact, several "cogent ethical arguments" that can, and should, be made against the cloning of humans. We hardly can do better than to quote once again from the June 1997 report of the National Bioethical Advisory Commission, whose members concluded:

> Any attempt to clone human beings via somatic cell nuclear transfer techniques is uncertain in its prospects, **is unacceptably dangerous to the fetus and, therefore, morally unacceptable**…. It is morally unacceptable for anyone in the public or private sector, whether in a research or clinical setting, to attempt to create a child using somatic cell nuclear transfer. Indeed, the Commission believes **it would violate important ethical obligations were clinicians or researchers to attempt to create a child using these particular technologies, which are likely to involve unacceptable risks to the fetus and/or potential child** (emp. added).

Once again, we could not agree more!

Would a Cloned Human Possess a Soul?

If (and this is a big "if") scientists are successful in cloning healthy humans, the most pressing question then becomes: Will the people so produced possess a soul? Much of the debate occurring today (especially in religious circles) centers on this question. For example, three staff writers for *U.S. News*

& World Report posed the question, "Would a cloned person have its own soul?," and answered it as follows: "Most theologians agree with scientists that a human clone and its DNA donor would be separate and distinct persons. That means each would have his or her own body, mind, and soul" (Herbert, et al., 1997, p. 63).

In addressing what at the time was the unlikely possibility of the cloning of humans, Duane Gish and Clifford Wilson asked: "What do we say, then? Would a clone be truly human? The answer is that, indeed, he would be human, for its life came from human life even though in a manner different than is usually the case" (1981, p. 174). In addition, they noted, the cloned human "is already alive, responsible to God for his actions, needing to preserve his own body against sickness, to see that he is properly fed, and all the rest. Each clone would have its own individual responsibility, its own soul" (p. 172).

We concur with such an assessment. In James 2:26, James made this observation: "the body apart from the spirit is dead." The point, of course, was that when the spirit departs the body, death results. But there is an obvious, and important, corollary to that statement. If the body is alive, it must be the case that the spirit is present. This is a biblical principle that cannot, and must not, be ignored–especially in light of the present controversy. The simple fact of the matter is that **if** (again, a very big "if") scientists succeed in cloning living humans, those clones would possess a soul.

But only God can instill a soul. It is He Who "giveth to all life, and breath, and all things" (Acts 17:25). It is only "in Him" that "we live, and move, and have our being" (Acts 17:28). The real issue is not whether man is intelligent enough to clone a human, but whether or not–should that eventually happen–God will choose to instill the lifeless creature in the laboratory with a soul. This is a question no one but God can answer.

Artificial Insemination

If a married couple desires to have children, their inability to conceive and give birth to those children can be seen only

in its narrow context as that couple's personal disaster. While the rest of planet Earth is in the midst of a population boom, such a scenario hardly can be looked at by these potential parents as any kind of "blessing." Rather, such a situation generally is viewed as both an obstacle and a burden. Therefore, everything that can be done, will be done to help such couples have the children they so desperately desire.

Many women have taken fertility drugs with success. Other couples, still unable to bear children, have adopted otherwise homeless children–to the benefit of everyone involved. Still others have opened their homes to foster children who have taken the place of their own children. However, due to the effectiveness of contraceptive measures, a tremendous increase in the number of abortions, and the increasing desire on the part of many unwed mothers to keep their children, fewer children are available for adoption.

When infertility drugs are ineffective, when there are no adoptive children to be had, and when foster children either do not satisfy the emotional needs or are unavailable, what options are open to a married couple desiring children? It seems there are only two: (a) remain childless; or (b) resort to "artificial" means. It is to these artificial means that we now would like to direct your attention.

Most couples who contemplate artificial insemination (commonly known by the acronym AI) do so because the husband either is infertile or subfertile, although there are other reasons for choosing AI. Whenever there is a fertility problem, the cause may be traced to the male in about 10-15% of the cases, due to: (a) inadequate sperm numbers; (b) faulty sperm; (c) poor ejaculation; or (d) inability to perform the sex act itself (impotency).

Artificial insemination is not tomorrow's dream; rather, it is used quite frequently today. It is, as a popular science magazine put it, "one answer to childlessness" (Stossel, 1980). Many people, however, do not realize that there are various types of AI. These need to be discussed, because some are unacceptable to the faithful child of God.

AIH designation given to artificial insemination performed using only the husband's sperm

AID designation given to artificial insemination performed using only donor sperm

AIDH designation given to artificial insemination performed using sperm from both husband and donor

Here is an instance where it is unwise to reach hasty conclusions. The use of artificial insemination procedures does not **always** have to be opposed, since in certain instances AI can occur using the husband's sperm and the wife's egg. If, for example, the sperm count is low, sperm cells can be collected over a period of several weeks and frozen until needed. They then can be thawed, centrifuged, and inserted into the wife's womb. If the procedure is successful, the result is a child formed from the sperm and egg of its biological parents. Christians may support such artificial procedures when performed to assist normal procreation, since such procedures are little more than a "technological crutch" for couples suffering a breakdown in their own reproductive biology. This is simply medical science aiding in the correction of a physiological problem. There are no biblical injunctions against such, or any biblical principle that would be violated by such.

However, AI also can be used in such a way as to destroy the God-ordained biological basis for the human family and parenthood. It now is possible to mix sperm and egg from **any** two people, and it even is possible to put the fertilized embryo into **any** normal womb and thus have **any** final set of parents (or, for that matter, any single person) gain custody of what will be the newborn infant. In the end, parenthood may have nothing whatsoever to do with biological relationship. Further, as Nancy Pearcey has suggested:

> By using both abortion and artificial reproduction, we are building a technology of reproduction around the parents' wishes. To put it bluntly, if you don't want the child growing within you, you can destroy it through abortion–and if you do want a child you can get one to order through a trip to the laboratory. There is an erosion of respect for existing life as a gift of God

> wherever we find it. We can now hire life and death at the parents' wishes (1985, p. 6).

Thus, in some instances, there can be serious implications regarding the use of artificial insemination. Consider, for example, the following:

1. Women could bear children for unmarried men.
2. Women could bear children for other couples (surrogate motherhood).
3. Women could bear children for homosexual men.
4. Women who are lesbians could have children without a male partner. ["An estimated 10,000 children are being raised by lesbians who conceived them through artificial insemination" (Turque, 1992, p. 39).]
5. The sex of the child could be pre-selected, since methods now are available to concentrate the Y-chromosome-bearing sperm (necessary for the production of male children). [See Kalb, 2004, for a discussion of the increasing use of a technique known as "preimplantation genetic diagnosis" (PDG) that allows couples to pre-select the sex of their children.]
6. Possibilities exist for those donating sperm to pass on unwanted traits.
7. Emotional aspects are involved. The wife, for example, might feel an "attachment" to the donor if donor sperm are used.
8. Legal and/or moral problems often result. Who is the legitimate father if donor sperm are used? Is the child legitimate?

J. Kerby Anderson has lamented that "somewhere in the process, a child has ceased to be a gift of God (cf. Psalm 127:3) and has become a commercial item" (1982, p. 41). Parents choosing donors from photographs of attractive young men or women become consumers, "alternately selecting and rejecting various possible variations in children" (Restak, 1975, p. 78).

The use of donor sperm, donor eggs, or "surrogate mothers" stands in stark contradiction to God's plan for the home. While it is true that there are numerous physical aspects of marriage and the home, **the ultimate thrust of the home is spiritual**. It was designed as an earthly arrangement to enhance our heavenward journey. (Perhaps it is the home's spiritual nature that has invoked the vicious attacks of atheism in recent years.) The benefits of the family unit are many: (1) The home provides for intimate companionship; generally, it is not good to be alone (Genesis 2:18), and man and woman complement one another (1 Corinthians 11:11-12). (2) Within the confines of the monogamous home, Jehovah has provided a moral means of satisfying sexual appetites (Proverbs 5:15ff.; 1 Corinthians 7:2). (3) The family is designed to stabilize social relationships and promote community and international solidarity. No society can survive if the home is destroyed. (4) The family unit is the avenue by which children may be brought into the world legitimately. Moses recorded: "And the man knew Eve **his wife**; and she conceived" (Genesis 4:1, emp. added). According to divine design, marriage precedes the bearing of children (1 Timothy 5:14), whereas today, frequently this order is reversed, or the marriage part is ignored altogether. (5) The family unit was planned to provide an atmosphere of love and trust (cf. Proverbs 15:17; Proverbs 17:1) that would create an ideal environment for spiritual growth. This is why the home absolutely must be a moral and religious training center (cf. Deuteronomy 6:4-9; Ephesians 6:1-4). To ignore this truth is to miss the real meaning of the divinely planned family. All philosophical, social, or scientific attempts to circumvent the home–God's family arrangement–are wrong and must be resisted.

Inordinate practices such as the use of donor sperm, donor eggs, or surrogate mothers ignore the true function of human reproduction. The world often forgets that childbearing never was intended to be an end within itself; it is but a part of a larger plan. Parental responsibility commences at conception and does not end until the child is reared to a level of independent maturity. A greater part of that rearing is training of the child for God's service. How could any Christian sur-

render his or her reproductive powers to another person, thus ignoring the divine responsibilities connected therewith? Or, how could one ask another to do the same premeditatedly? Yet, if such acts are moral, what would prevent a single woman from having herself impregnated artificially, thereby avoiding the "inconvenience" (as some would view it) of marriage? Jack Evans has remarked:

> ...God has given His spiritual law to govern the physical law of sex and reproduction. His spiritual law says the oneness of the flesh can be approved only by Him in the marriage of the male and female who are producing another part of their flesh (Hebrews 13:4; I Corinthians 6:16; 7:1-5). Thus, the Bible teaches that the male and female producing the offspring of the one flesh, according to spiritual law, must be married to each other. Paul substantiates this when he says, "I will therefore that the younger women marry, bear children..." (I Timothy 5:14, KJV). It is obvious that marriage precedes bearing children. Thus, if the female bearing the child is not married to–is not one flesh with–the male in the reproduction process, they violate God's spiritual law. God never designed woman to be merely a baby bearing machine. He designed her to be wife, baby bearer and mother all in one. God never designed man to be a mere stud. Man was planned to be husband, progenitor and father all in one (1987, 129:358).

Any action that strikes at the heart of Jehovah's divine plan and purpose for the home must be avoided and opposed.

In Vitro Fertilization

On November 5, 1990, *Time* magazine published an article titled "A Revolution in Making Babies." The author, Philip Elmer-Dewitt, observed that in the past

> ...there was only one way to make a baby, at least for humans. Either it worked or it didn't, and if it didn't, there was little anyone could do about it. All that has changed dramatically. The growing problem of infertility–exacerbated by a generation of would-be parents who put off having babies until their 30s and 40s–and the early successes of *in vitro* ("test tube")

> fertilization have laid the groundwork for a revolution in reproductive technology. Hardly a week goes by without news of a breakthrough to help nature take its course (1990, p. 76).

In his article, Mr. Elmer-Dewitt addressed some of these breakthroughs which, he said, "...seem to multiply faster than test-tube babies. Most are variations on the pioneering procedure known as *in vitro* fertilization" (1990, p. 76). What is *in vitro* fertilization [IVF]? How does it work? And what should be a Christian's response to it?

The method known as artificial insemination (discussed in the previous section) is not used as often as some other methods of artificial reproduction, due in part to the fact that AI generally is useful only when dealing with male reproductive problems. Women, however, often have more fertility problems than men, due to the fact that their reproductive system is so much more complex than the male's. When the woman is having reproductive problems, AI is not likely to help the situation (although there may be exceptions).

The process of fertilization and subsequent implantation of the human egg is so complicated that it is amazing that there are not more problems than there are. With *in vitro* (from the Latin meaning "in glass") fertilization, the problems that do arise are becoming increasingly manageable. Normally ovaries are stingy with their eggs, releasing only one egg approximately every twenty-eight days. But an injection of the proper hormones can cause "superovulation" (also known as "hyperovulation")—the release of multiple eggs. To collect the eggs for use in IVF procedures, approximately thirty-two hours after the hormone injection an incision is made in the female's abdomen and the ovaries are examined with a laparoscope (a telescope-like device with internal lighting capabilities). When a "blister" is noticed to have occurred on the ovary, a suction needle is inserted to remove the eggs stored in the blister. The eggs are placed in a special growth medium for several hours, and then into a suspension of sperm. Within a few hours, fertilization will have occurred.

All of this may sound fairly simple, but it is not. Sperm, for example, must undergo a process called "capacitation" be-

fore they can fertilize an egg. Normally this process occurs in the uterus, but in IVF, it must be accomplished artificially. Once fertilized, the egg develops for several days outside the body. Implantation of the embryo is critical, since timing is so important. The embryo must be at a certain stage (usually 2-2½ days old), and the uterus must be ready. At the appropriate time, the fertilized egg is inserted into the uterus through a long, soft, plastic tube.

In vitro fertilizations have been accomplished in rats, dogs, cats, mice, and even man. As far back as the 1940s, scientists have experimented with the fertilization of human eggs outside the womb. In those days, the embryos lived only a short time. In 1959, Daniele Petrucci, a research biologist with the University of Bologna in Italy, announced he had fertilized a human egg that grew outside the body for fifty-nine days. He claimed that "a heartbeat was discernible," but he destroyed it because "it became deformed and enlarged–a monstrosity" (see Grossman, 1971, p. 43; Lygre, 1979, p. 24). In 1966, Russian scientists announced to an unsuspecting world that they had succeeded in keeping more than 250 human embryos alive in a laboratory setting for periods of up to six months (Lygre, 1979, p. 24). In July 1974, Douglas Bevis of the University of Leeds in England announced that he had succeeded in producing three infants through IVF. However, he never produced the children or families to prove his claim, and therefore the scientific community remained skeptical (see Howard and Rifkin, 1977, p. 109). Then, on July 25, 1978, John and Lesley Brown of Great Britain gave birth to their daughter, Louise–the result of *in vitro* fertilization performed by Patrick Steptoe, a gynecologist in Oldham, England, and Robert Edwards, a physiologist from Cambridge University (Gwynne, 1978).

Suddenly, IVF in humans no longer was the stuff of science fiction. To date, well over 20,000 babies have been produced through this procedure, representing a lot of "progress" in a relatively short time (Elmer-Dewitt, 1990, p. 76). The Bourn Hall Clinic in Cambridgeshire, England, founded by Drs. Steptoe and Edwards, produced 1,295 children in its first ten years–"almost a tenth of the world's test-tube ba-

bies" ("Test-Tube...," 1989, p. 77). And tens of thousands more have been produced since in countries around the world. In fact, the CDC reported that in 1999 alone, 86,822 cycles of assisted reproductive technology (which includes IVF, GIFT, and ZIFT) resulted in 21,501 live births (see CDC–*National Summary*, 1999).

Clinics specializing in IVF procedures are springing up all around the world. According to data released in 2001 by the Centers for Disease Control, at that time the United States had over 384 such clinics. Two years later, in 2003, that number stood at 430 (Hoffman, et al., 2003). One of the best-known of those clinics is operated by physicians Howard and Georgeanna Jones in Norfolk, Virginia. Billed as the "nation's premier test-tube baby program," the Jones' clinic specializes in performing *in vitro* fertilization procedures (Gold, 1985). Of interest, however, are statistics indicating that, at one point in time, nearly half of the IVF centers in America never had produced a single baby (Scott, 1988, p. 17). Because there have been few regulatory laws on the books dealing with these rapidly increasing reproductive technologies (thus little government involvement), accurate data on the actual successes (or failures) of clinics specializing in IVF are hard to come by. However, data released in 1988 indicated that the chance of becoming pregnant after a successful *in vitro* procedure was 17%, but because of the high risk of miscarriage or stillbirth, the chance of actually having a baby dropped to only 11% (Scott, 1988, p. 17). Five years later, the success rate remained about the same. In the United States it was 14%, and in Great Britain 12½% (Winston and Handyside, 1993, 260:932). As Elmer-Dewitt noted, "But even at well-run clinics, the original IVF fails 75% to 85% of the time" (1990, p. 76). [NOTE: Numbers above need to be updated.]

The costs of these procedures are considerable. The price for a single attempt, regardless of its success or failure, varies from $7,000 to $15,000, depending on the clinic, complications involved in the procedure, and other factors. In his book, *Biotechnology and the Assault on Personhood*, Donald DeMarco documented the cost factors associated with IVF attempts, including some potential parents who have spent over $40,000.

He also noted that there are additional "costs" not always considered, and that they are not always financial in nature (1991, pp. 119-132). As a result, efforts are under way to improve the success rates of *in vitro* fertilizations using a variety of methods such as cryopreservation (freezing of the embryos prior to use) and a number of others (see Elmer-Dewitt, 1990, p. 76; Winston and Handyside, 1993).

When topics such as those being discussed here (i.e., reproduction and the right to bear a child) are under consideration, emotions not only are involved, but also run high. And therein lies part of the problem. Two specific examples may be cited. Pat Anthony was a 48-year-old grandmother from Transvaal, South Africa. Her married daughter, Karen, 25, was unable to have any more children due to the fact that she almost bled to death during her first delivery and had to have her uterus removed. Through IVF procedures, eggs from Karen's still-functioning ovaries were fertilized by her husband Alcino's sperm. But the historic part of the story is that the fertilized eggs were implanted in Karen's **mother**, Pat. In other words, Pat would be the first woman ever to give birth to her own grandchild! On October 14, 1987 Pat did just that, except it wasn't a grand**child** but grand**children**–three to be exact. David (5 lbs., 8 ozs.), Jose (4 lbs., 15 ozs.), and Paula (3 lbs., 9 ozs.) were born by caesarean section and made not only the evening news, but history (Levin, 1987, p. 40). Now Karen and Alcino Ferreira-Jorge had the children they so desperately desired. The cover of the October 19, 1987 issue of *People* magazine heralded the event with the bright yellow wording, "A Mother's Love," referring to the love that Pat had for her daughter–a love so deep that she was willing to bear the children her daughter Karen could not (Levin, 1987).

Almost four years later, *People* would scoop another exclusive–the first grandmother in America to do what Pat Anthony had done in South Africa. Arlett Schweitzer, 42, of Aberdeen, South Dakota, agreed to have herself impregnated via IVF procedures with eggs from her daughter Christa that had been fertilized by Christa's husband, Kevin. Two of the four eggs were implanted successfully in Arlett's uterus, producing twins for Christa and Kevin Uchytil.

Real tearjerkers, these dramas. They make great copy, not to mention blaring headlines. And the first thing that most people think when they read such emotion-packed stories is, "How wonderful that these people finally have the children they wanted for so long!" As Christa Uchytil said, "My animals, my home, my husband, that's my life. Now I'll have babies, too. It will be perfect" (as quoted in Plummer and Nelson, 1991, p. 40).

But is it "perfect"? Previously, we discussed the fact that, generally speaking, technologies are neither good nor bad in and of themselves. Rather, it is the **use** of them that determines their moral implications. There are some scientists and ethicists, however, who argue that certain reproductive technologies are **intrinsically** evil–for the simple reason that they cannot be carried out without violating ethical principles.

Doctors actually pursue what might be called accurately a "survival-of-the-fittest" procedure wherein they examine the fertilized eggs, purposely and carefully select those that appear the healthiest, and then implant several of them into the woman's uterus. Once that has been accomplished and the gestation process is under way in the womb, a new technology known as transabdominal selective reduction allows doctors to further examine the zygotes and surgically destroy those that are deemed "inferior" (see Calhoun, 1990). Thus, two of Darwinian evolution's most important concepts–selection and survival of the fittest–are brought to bear in this unique reproductive procedure. But what happens to the other fertilized eggs that are "unfit" to survive, and thus unused in this particular process? They quite literally are washed down the drain of the nearest sink!

Furthermore, as we mentioned earlier, basic medical ethics requires that the experiment be to the subject's benefit. It hardly is to the embryos' benefit to be washed down the drain and drowned in the early hours of life! Nor is it to the embryos' benefit to be implanted into a womb, only to see their potential life snuffed out through "transabdominal selective reduction" or a miscarriage (estimates are that 60% or more of artificially implanted embryos miscarry; Winston and Handyside, 1993, 260:932).

Are these tiny embryos human? If one of them were traveling down a woman's Fallopian tube or implanted in her uterus instead of floating in a Petri dish, it would be considered unquestionably human. Yet somehow because it now is capable of being manipulated outside the womb its "humanness" ceases? How so? Ethicist Allen Verhey has commented:

> Even if one did not hold that the human being's history begins with conception, respect for human life is nevertheless violated here...because here human life is created in order to be destroyed. Here the procedure demands from the very beginning the intention to kill those intentionally fertilized but not chosen (1978, p. 16).

Medical ethics also requires that in any experiment, the subject must know the risks involved and give "informed consent." In the case of IVF, however, the tiny embryos created (and often subsequently destroyed) in a laboratory do not know the risks involved and cannot give informed consent. Many people are unaware that while **multiple** eggs are extracted and fertilized, **only a few** are selected for implantation. In its 2001 *National Summary*, the Centers for Disease Control reported that 77,102 cycles of artificial reproductive fertilization occurred in the United States (see CDC–*National Summary*, 2001). On average, 5-12 eggs were fertilized in order to facilitate embryonic transfer, although it is not uncommon for some individuals to have at their disposal 20 or more embryos after artificial reproductive procedures. The CDC reported that on average, physicians implanted only 3 embryos into women hoping to become pregnant. This would result in a minimum of 2-9 embryos being unused and therefore frozen, which means that each year in the United States alone we are plunging somewhere between 123,300-493,200 embryos into the freezing depths of liquid-nitrogen canisters. At that rate, it will take only a few years to reach the 1 million mark.

To put all of this in perspective, think about what happened at 8:15 a.m. on August 6, 1945, when a twenty-kiloton atomic bomb nicknamed "Little Boy" was dropped from the Enola Gay, a Boeing-29 bomber, onto the town of Hiroshima, Ja-

pan. Described by many as the most horrific weapon ever used on humans, the bomb exploded with a blast stronger than any hurricane, giving off deadly rays of heat and blinding light. Those who did not perish from the initial blast were left to face a new and deadly danger–radiation. Invisible to the naked eye, waves of deadly radiation penetrated the bodies of all those in Hiroshima–from housewives carting groceries home, to shop owners, to governmental officials. As a result, it has been estimated that the initial blast from that bomb killed 80,000 people with an additional 20,000-50,000 perishing in the first few weeks that followed. By any account, the loss of human life in that southern Japanese community was ghastly.

Now, consider multiplying the deaths and loss that occurred at Hiroshima by a factor of three or four. How unspeakable would it be to sit by idly during "non-war" times and watch four bombs detonate over four cities, each resulting in 100,000 fatalities? The numbers would be staggering, and would incite rage in the hearts of many. Yet, that number is exactly how many frozen embryos were counted during a nationwide survey of American fertility clinics. *Washington Post* reporter Rick Weiss subtitled his report: "The first count found far more than many had thought. Conservatives and scientists are upset" (2003b). Upset indeed! While these 400,000 precious souls may not enjoy the freedoms of walking, talking, and working in our society, it does very little to change the fact that they are very much **human** embryos.

David Hoffman and colleagues, in association with the Society for Assisted Reproductive Technology, carried out the national count. They reported that their objective was "to determine the number of embryos stored at assisted reproductive technology [ART] clinics in the United States and their current disposition" (Hoffman, et al., 2003, 79:1063). The researchers surveyed all medical practices providing *in vitro* fertilization in the United States. They noted:

> The SART-RAND [SART–Society for Assisted Reproductive Technology; and RAND–a contraction of the term research and development–BT/BH] team surveyed all 430 ART practices in the United States. Of

> these practices, 340 returned surveys for analysis. The data from these surveys were merged with data taken from the 1999 SART dataset, which contains information about practice size and success rates. Responding clinics reported a total of 396,526 embryos in storage as of April 11, 2002. The vast majority were targeted for patient use. Small numbers of embryos were available for research, donation, destruction, quality assurance, or other uses (p. 1063).

The fertility industry is booming. And sadly, only now are we slowing down enough to realize the catastrophic consequences. Those embryos that are "targeted for patient use" are being held for possible use by couples who already have undergone a fertility cycle–and many never will be used (thus, they are considered as "unneeded"). Not wanting to make the wrong decision, couples choose not to make **any** decision. So they continue paying $1,500 per year until they can figure out exactly what to do with their nascent human life. Thus, fertility clinics are bulging with 400,000 frozen embryos, running out of storage room, and all the while praying they do not experience an accidental meltdown.

When Rick Weiss wrote that both conservatives and scientists are upset, he was right–but not for the same reason. Conservatives realize that most of those human lives will one day be thawed out and "conveniently" discarded. Researchers, on the other hand, want the chance to utilize those 400,000 lives in stem cell experiments. Under the banner of "potential life-saving benefits" these scientists are urging that clinics be allowed to make "unwanted" embryos available for research. However, they realize that President Bush's August 9, 2001 ruling on stem-cell research prohibits federally funded research from using human embryos.

Previous estimates ranged anywhere from tens of thousands up to 200,000. We now know–of the 430 clinics surveyed, 340 admitted to housing almost 400,000 human embryos. The only thing that seems to be slowing these clinics down is lack of storage space. Of course, that problem will be overcome fairly easily as cryogenic centers continue to raise their storage fees, causing more and more couples to choose a "thaw

and discard" solution. With assisted reproductive technologies racing to increase their success rates, we will likely hit the one million mark in the very near future–all of this because we sat "idly by" and allowed researchers to go on advocating that embryos are not human life.

In addressing a Senate Judiciary Subcommittee on April 23-24, 1981, Richard V. Jaynes stated: "To say that the beginning of human life cannot be determined scientifically is utterly ridiculous" (see East, 1981). Those hearings were carried out to determine the question of when human life begins. Accompanying Dr. Jaynes that day was a group of internationally known geneticists and biologists who conclusively reiterated that life begins at conception–and they told their story with a profound absence of opposing testimony. One of those giving testimony during that hearing was Landrum Shettles, often called the "father of *in vitro* fertilization." Dr. Shettles noted: "Conception confers life and makes that life one of a kind" (East, 1981). Interesting words from a man who helped fill *in vitro* fertilization clinics with embryos–embryos that already have been fertilized and thus, in all aspects are human.

Cytoplasmic Transfer and *In Vitro* Fertilization

Supply and demand–it is the backbone of our modern-day economy. When the people demand something, industries supply that product, and in turn reap financial rewards. But what happens when that demand is no longer for a manufactured product, but instead is a human being? What happens when infertile couples begin demanding new treatments in order to aid them in their quest for a newborn? Oftentimes, scientific discoveries proceed at such a rapid pace that it is only after new technologies become available that we fully understand the physiological consequences of our actions. Such is the case with donor cytoplasmic transfer. Since its introduction in 1996, many infertile couples have benefited from this new technique, and numerous babies have been produced as a result. However, recently doctors have discovered that this technique inadvertently introduces new genes and thus may lead to chromosomal abnormalities.

With many infertile couples, the wife is able to produce eggs, but sadly they are unhealthy and often cannot withstand the manipulations required in fertility procedures. Fertility clinics are filled with the pleas of young parents who desperately want children possessing their own genes. One solution to that problem has been cytoplasmic transfer. Cytoplasmic transfer involves injecting a bit of cytoplasm from a healthy donor egg into the egg of an infertile woman before the egg is fertilized. Cytoplasm is a jelly-like substance that surrounds the nucleus of the cell and contains several components. One component that resides in the cytoplasm is the mitochondria (often referred to as the "powerhouses" of the cell–remember your high school biology class?). Mitochondria provide energy to the cell to fuel its many functions. Thus, unhealthy eggs are infused with a shot of healthy cytoplasm. Women who produce eggs that are considered to be "poor quality" can undergo cytoplasmic transfer, which allows them the opportunity to have their own "genetic" children by boosting the health of their eggs. (A convenient way to visualize this is to think of the original mother's egg as a wilted flower and the donor cytoplasm as Miracle Grow®). By not involving donor egg or donor sperm, cytoplasmic transfer involves no compromise in the biblical standard for marriage and reproduction that God set forth in His Word. However, while the technique would probably ease some distress for infertile couples, a closer examination reveals some serious side effects.

In May 2001, biologists at the Institute for Reproductive Medicine and Science of St. Barnabas Medical Center in Livingston, New Jersey, reported that three of the 16 babies born through cytoplasmic transfer at their center carried mitochondrial DNA from the **donor** cytoplasm (see Martindale, 2002). That is, they possessed DNA from both the mothers and the donors. The babies reportedly are doing fine now, but scientists are concerned about incompatibilities between the recipient's nuclear genome and the donor's mitochondrial genome. Additionally, since the mixture of mitochondrial genes is passed down from the mother's side, the altered genetic blueprint of such female babies could affect future generations. Clearly, this is not something that can be remedied eas-

ily with a pill or special diet. This genetic material is now firmly rooted in these children, and developmental problems could result later in life for these individuals.

In addition, among the 18 conceptions that were aided by cytoplasmic transfer at St. Barnabas, two resulted in Turner's syndrome (a defect that occurs when one of a girl's two X chromosomes is missing)—a disorder that often results in premature death. These two cases that occurred using cytoplasmic transfer demonstrate a six-fold increase over the natural rate, causing some experts to speculate on the safety of the fertility technique itself. While fertility clinics offer cautious optimism concerning this new technique, Christians should regard it as "science run amok." Clearly, "demand" has outpaced scientific knowledge and safety in this particular procedure. Due to the genetic dangers involved, cytoplasmic transfer is an irresponsible choice for couples that want to have children and adhere to the precepts in God's Word.

The Implications of *In Vitro* Fertilization

Further, the question needs to be asked: What are the potential applications and implications of IVF? While some may be acceptable, others most certainly are not. Consider the following.

1. Previously infertile women might become fertile via IVF.
2. Women who desired to have children, but whose health would not permit routine pregnancy, could donate their eggs but have them placed, after fertilization, into a surrogate mother who was healthy.
3. Older women who wanted to avoid such risks as Down's syndrome could accept a fertilized egg from another woman donor, then carry it to term on their own.
4. Women who are recognized as potential carriers of certain genetic disorders could have fertilized donor eggs implanted in their wombs, thus avoiding the possibility of the genetic disease being expressed in the child.
5. Women could "rent" their wombs, as they become surrogate mothers.

Surrogate Motherhood

Examine with us for a moment that last item–surrogacy. Think back to an earlier time in American history, when blood seeped from scab-covered wounds left by the heavy chains that once bound the woman's feet. Her joints ached and burned from the long walk that brought her to this endless farmland. From the first glimmer of morning light until the Sun dipped below the horizon, this woman was kept busy obeying the commands of a person to whom she referred simply as "Master." But the most heart-rending concern at the forefront of her mind was the secret that she had kept for many weeks–her unborn child. Soon, her body would begin to show the physical signs of pregnancy, and she knew that at some point, her master would realize her condition. Her heart broke at the thought of someone else owning her child, and yet she knew it was inevitable. After carrying the child for nine months, the day would come when she would deliver it, and it would become someone else's property.

Scenes such as this one were repeated countless times in America prior to the Civil War. Today, we cannot imagine what those grief-stricken women went through behind all those tears, as they turned over their children, knowing they might never see them again. And yet, even now laws are being introduced in states all across America that once again are making this emotional separation a legal reality. Surrogacy is a common practice in the United States in the twenty-first century. Years ago, the idea of allowing a stranger to carry and deliver a child, only to then give it up, was unknown. Most people stilled believed the words of the psalmist, who wrote: "Lo, children are a heritage of the Lord: and the fruit of the womb is his reward" (Psalm 127:3). That "fruit of the womb" was cherished; thus, very few women ever considered giving up a child who had begun a life in their own womb.

The words "surrogate mother" were met with gasps and repulsive looks of shock. However, in today's politically correct climate, those words have taken on a completely new light–that of a compassionate act of altruism. Research indicates that most individuals who serve as surrogate mothers

do so in order to give the gift of life, receive compensation, or purge guilty feelings from having given up a previous child for adoption or having had an earlier abortion (Timnick, 1981, p. 1). However, after going through the process, America's first surrogate mother, Elizabeth Kane (a pseudonym) stated:

> I now believe that surrogate motherhood is nothing more than the transference of pain from one woman to another. One woman is in anguish because she cannot become a mother, and another woman may suffer for the rest of her life because she cannot know the child she bore for someone else (1988, p. 275).

In her autobiography, Kane discussed in painful detail the gut-wrenching emotions entailed in surrogacy. As she reflected on the events from her own experience, it is interesting to note a comment she made just three short months into her pregnancy. Following an ultrasound procedure, she noted: "Yet the one thing I could not, or would not, discuss with Kent [her husband–BT/BH] was a thought so distracting that I pushed it aside each time it started to wriggle into my mind. I had fallen in love with my baby that afternoon" (pp. 174-175). This was the baby whom she one day would be forced to turn over to a woman who held no genetic ties to the infant. How can a judicial system determine "fair" outcomes for cases in which infertile couples desperately desire children, yet where surrogates find themselves bonding with the life growing in their wombs?

The desire to reproduce has been described as one of the strongest human drives (Paulson, 1995, p. 226). In fact, physician Richard Paulson suggested that "it is arguable whether the drive to reproduce is secondary to the drive to survive, since it is the essence of life to reproduce" (p. 226). It is because of this drive that so many people are turning to artificial reproductive technology (ART). However, the **desire** for children does not give anyone permission to supersede God's laws. Therefore, any and all ethical decisions regarding artificial reproductive techniques must be examined in light of God's Word. In trying to defend the ever-changing technology in the reproductive field, Dr. Paulson commented:

> The Bible and other major religious writings forming the foundations of major religious groups were written at a time when assisted reproduction was beyond the scope of imagination. Therefore, **there is no explicit prohibition against the use of ART for the purpose of reproduction** (p. 227, emp. added).

Is that true? Are we allowed to do **anything we want** in regard to artificial reproduction, just because the Bible does not contain the words *in vitro* fertilization or surrogate gestation? What should the Christian's response be to this new, ever-changing medical technology? "Well," someone might say with a simple wisp of the hand, "the Bible has the answer." Indeed, the Bible **always** has the answer. It is an eternally applicable source of Truth to which we always may turn. Isaiah 40:8 states: "The grass withereth, the flower fadeth: but the word of our God shall stand for ever."

But if you were to turn to a concordance in an attempt to find passages that deal with such things as oocyte donation, gestational surrogacy, or *in vitro* fertilization, to what passages in the Bible would you turn? Dr. Paulson is correct when he says that these words are not mentioned specifically in the Bible. So the question then becomes, how do we know what God wants us to do in matters such as these? The answer is this: We must dig deeply into God's Word–in greater earnest than we have ever dug before–in order to find those eternal principles that are applicable to whatever decisions we must make in this life. We never will know what God wants us to do until we have searched for the principles in God's Word that will guide our decisions in this arena.

Distraught couples arrive at ART clinics with a burning desire to be parents and to have children. Thus, this branch of medicine has set sail on a course intended to make every infertile couple happy, no matter what emotion, physiological, or financial costs are involved. Only in hindsight do individuals come to realize that this attitude has completely jettisoned our moral framework–leaving desperate parents to contemplate whether they chose an altruistic and loving act in bringing a new child into this world, or whether they bargained

with the devil as their emotional and spiritual framework crumbles around them. Is an eternal soul worth this "deal with the devil?"

(1) The History of Surrogacy

In the past fifty years, options for couples with fertility problems have increased to the point that this escalating field has taken on an almost "science fiction" persona (Moe, 1998). While fertility treatments can correct some of the causes of infertility–either through surgery or medications (Weiger, Auxier, and Frye, 2000)–they also pose ethical dilemmas never before faced. To compound the problem, women today tend to wait longer to have children than they did in the past. The quality of a woman's eggs deteriorates as she ages–contributing to the condition of infertility. According to recent research, female fertility peaks by age 25, and falls throughout the remainder of a woman's reproductive life (Dutton, 1997). Historically, infertile couples living only one or two generations ago would remain childless or they could adopt. Today, however, infertile couples can choose the use of a variety of assisted reproductive technology methods. Surrogacy is just one of those new options.

In recent years, there has been a revival of interest in the procedure of using a surrogate mother to help infertile couples have a child. In the 1980s, usually the surrogate mother provided her own eggs for artificial insemination using the sperm from the prospective father (Dutton, 1997). Thus, there was a genetic link to the husband, but not to his wife. After the child was born, the wife would adopt the child, and the surrogate (and her husband, if she was married) relinquished parental rights to the child (Fischer and Gillman, 1991). This method commonly is viewed as traditional surrogacy.

By the 1990s, *in vitro* fertilization (IVF) made it possible for egg and semen to be obtained from the commissioning couple (or from anonymous donors), and the resultant embryo then could be implanted into the surrogate mother (Brinsden, 1999). There are also newer procedures (that we will discuss at a later point) such as GIFT (gamete intrafallopian transfer) or ZIFT (zygote intrafallopian transfer) in which the transfer

is performed at an earlier stage (Moe, 1998). In these cases, the surrogate only performs the function of gestation for the couple, without possessing a genetic link to the child. While a court order may be used to identify the legal parents, adoption usually is unnecessary in most states (Dutton, 1997). This method is called gestational surrogacy or host surrogacy, and is gaining in popularity since it allows both parents the ability to contribute to the genetic make-up of the child. The surrogate mother typically receives a fee of $10,000-$20,000 (or more) for the delivery of the child (Schwartz, 2000), and once the baby has been born, the surrogate relinquishes all parental responsibilities to the genetic parents. Couples desiring this new procedure normally can expect to pay about $40,000 or more for legal, medical, psychological, and program services fees (Dutton, 1997)–but that price tag does not include the emotional price that comes along with surrogacy.

(2) A Biblical Example of Surrogacy and the Anguish It Caused

In trying to defend the practice of surrogacy, and in an effort to gather support, some individuals point to the Bible as if it granted them permission for this procedure. Using Abraham and Sarah as models for infertility, many clinics and infertility Web sites point out that the history of surrogate parenting goes all the way back to the days of Abraham. In Genesis 16, we learn that Sarah was barren–having produced no children with Abraham. After the Lord made a covenant with Abraham, Sarah wanted to ensure that he had a child to continue his lineage. As such, she gave her handmaid, Hagar, to her husband so that he might conceive a child with her. That relationship did result in a son, Ishmael, for Abraham, but the story does not end there. We learn in verse 4 that as soon as Hagar conceived this child, she was despised by Sarah. In fact, the text goes on to inform us that Sarah's emotional state caused her to "deal hardly" with Hagar, causing her to flee from Sarah. What became of Ishmael? Was he the father of the Jewish race? No, that honor belonged to Isaac, the child whom Sarah eventually would carry. In Genesis 21, we learn that God told Abraham to take Ishmael and his mother and

put them on the edge of the wilderness and send them away from his presence forever. Prior to their exodus, we read that this decision was very grievous in Abraham's sight because of his son (21:11). This man clearly did not want to cast out his own flesh and blood, yet this is exactly what resulted in this biblical example of surrogacy.

While we do not find any biblical passages that state, "You shall not participate in surrogate parenthood," we know what the principle of surrogacy entails. At every turn surrogacy circumvents God's law regarding reproduction. In 1 Timothy 5:14, Paul wrote: "I will therefore that the younger women marry, bear children, guide the house." What is the divinely approved order here? One is to marry, then bear children. With surrogacy you do not need marriage. In fact, a woman does not even need a husband. She could simply walk into the local sperm bank to be able to fertilize one of her eggs. This procedure, however, introduces at least one additional person into the covenant marriage relationship that God established. In traditional surrogacy, a husband's sperm is used to fertilize the egg of another women who is not his wife. Does the fact that a couple obtains the child they want, alter the fact that a man's sperm cells are placed into another woman's body and used to fertilize an egg that was not his wife's?

In cases of *in vitro* fertilization where a husband and wife's gametes are used, consider what happens to the "leftovers." Doctors routinely take 5-12 eggs from the female. Of those, approximately 10-12 will be fertilized. Normally, 3 or more are implanted in the surrogate in order to increase odds of impregnation. This leaves around half of the fertilized embryos as "leftovers." What happens to them? Are those fertilized embryos merely blobs of tissue–or are they individual humans? We know that God views life as having begun before the child actually is born. The prophet Isaiah confirmed it this way: "Hearken ye people from afar; The Lord hath called me from the womb; from the bowels of my mother hath he made mention of my name.... And now saith the Lord that formed me from the womb to be his servant" (Isaiah 49: 1,5). Jehovah not only viewed Isaiah as a person prior to his

birth, but also called him by name. Genesis 4:1 says: "Adam knew Eve his wife; and she conceived, and bore Cain, and said, "I have gotten a man from the Lord.'" Some forty times, the Scriptures make reference to women conceiving. Is it merely by accident that the inspired writers of this great book recorded that special moment when the sperm and egg come together? What, then, of those leftovers? Are they to be frozen for future use? Or perhaps simply washed down the drain?

The desire to reproduce and rear children often overshadows God's divine plan. Infertile couples who are unable to bear children, assure friends and relatives that God does not want them to be unhappy. Thus, the quest for children begins. Have we forgotten that the Bible clearly speaks of infertile individuals? Does the fact that some people are unable to bear children change their relationship with God? Are they not still able to serve faithfully? Recall that King David married Michal (daughter of King Saul). And yet the Bible informs us that Michal never bore children (2 Samuel 6:23). Some women of the Bible are described as barren, but this did not keep them from obediently serving the Lord. Just after the Hebrew writer wrote that "marriage is honorable in all, and the bed undefiled: but whoremongers and adulterers God will judge" (13:4), he admonished us to "be content with such things as you have, for he hath said, 'I will never leave thee, nor forsake thee.'" God has not forgotten or turned His back on Christians who are unable to bear children. But they will be held responsible for their actions. We need to fully understand that surrogacy (and some other artificial reproductive techniques) violate(s) God's law regarding marriage and reproduction. One man, one woman, for life with one exception–that is God's divinely designed plan.

(3) The Faustian Bargain of Surrogacy

Consider the following hypothetical situation: A married couple tries unsuccessfully for years to have children. Medical testing determines that both the male and female have physiological conditions that prevent them from producing normal sperm and eggs. The woman also suffers from ana-

tomical abnormalities, which means that her uterus never will serve as a safe haven for a growing embryo. Thus, after considering the options, the couple elects to have donor sperm and egg fertilized *in vitro*, and then placed into a surrogate mother.

The fertilization procedure and the embryo placement go extremely well, and after a few tense weeks, this couple finally hears the words they have been waiting on for years! They finally are going to be parents! But things take an abrupt change toward the end of the pregnancy as the stress and strain of many years of infertility reach a pinnacle, causing the husband to file for divorce. The man then claims that there were no children born to the marriage, and that he is not responsible (financially or otherwise) for the child born to the surrogate.

Consider yourself the judge who must hear this case. Who are the real parents of this child? If you consider solely the genetics, neither the couple nor the surrogate has any responsibility. If you consider who carried the child to term, then the woman who had no intent in keeping this infant is suddenly "stuck" with a child she did not intend to rear. While appearing "hypothetical" and far-fetched, this real case involving the Buzzanca family was brought to trial in a California lower court, which was responsible for determining the lawful parents of the child (see Vorzimer, et al., 1998). Prior to appeals and additional trials, **the court first concluded that the child had no lawful parents**! The child (a healthy girl named Jaycee) was born into this world without anyone. She would be three years old before the courts finally handed down a verdict on exactly who maintained status as her legal parents. Think just how far we have come from God's initial command to "be fruitful and multiply" (Genesis 1:28) when we resort to fertility practices where children can be brought into this world without a "legal" parent?

But this one case only touches the hem of the proverbial garment. Consider the consequences of the fertility scandal that occurred in May 1995 at the University of California, Irvine (UCI), Center for Reproductive Health. According to

the front page of the *Orange County Register*, Drs. Asch and Balmeceda, world-renowned physicians and experts in the field of infertility, were accused of stealing eggs and embryos, and deliberately switching eggs and embryos between patients. As court proceedings continued, it became clear that these doctors stole eggs and embryos from fertility patients and sold them to unsuspecting infertile couples. The result was genetic chaos. In some cases, fertility patients who were going through series after series of drugs and surgeries without success discovered that their genetic child was born to another couple. Who, then, is the "real" parent? And should the court require the children returned to their genetic parents, even after living for months (or even years in many cases) with other parents?

In what frequently is viewed as the greatest act of love–carrying a child for another couple unable to conceive children–the ethical dilemmas encountered are endless. What happens if prenatal testing determines the child has a genetic disorder? Who determines the fate of a child, should the surrogate mother experience deep venous thrombosis or pulmonary embolisms? What happens if a medical complication (such as pre-eclampsia) occurs during the pregnancy? What recourse do infertile couples have with a surrogate mother who begins to mistreat the developing baby by using tobacco, alcohol, or drugs? What happens if the commiserating parents get divorced or die before the child is born? These complicated scenarios could fill a legal library (and likely will, as more and more of these situations become realities), but they rarely are discussed within the solemn walls of infertility clinics. What at first glance appears to be an act of pure selflessness is, in reality, a compromise of God's divine edict. And we are only now beginning to get a glimpse of the chaos this compromise creates.

(4) Current Law

Gestational surrogacy and surrogate agreements vary from state to state. In fact, many states have not settled on all of the issues, and thus some judges find themselves making rulings without any precedent. For instance, under Ohio law, "when

a child is delivered by a gestational surrogate who has been impregnated through the process of *in vitro* fertilization, the natural parents of the child are identified by a determination as to which individuals have provided the genetic imprint or the genes for that child" (Dobbins, 1996). This ruling seems to be the direction in which most courts are leaning to determine parenthood. However, what happens in cases like the Buzzanca case in which none of the parties involved was a genetic parent?

Consider also what happens when the surrogate does not want to relinquish rights to the infertile couple. Mary Beth Whitehead, the surrogate mother of the now-famous "Baby M.," made history when she decided to keep the baby after she was born. The father, William Stern, had contracted with the mother, Mary Beth Whitehead, to bear him a child through artificial insemination (thus the embryo was created using Mary Beth's egg, and William Stern's sperm cells). The contract provided that Mrs. Whitehead would receive a fee of $10,000 upon terminating her parental rights and giving up the child to him.

After the birth of the child, however, Mrs. Whitehead had a change of heart and informed the Sterns that she had decided to keep the child. On March 31, 1987, Judge Harvey R. Sorkow of the New Jersey Superior Court awarded custody of "Baby M." to the child's biological father, and stripped her surrogate mother of all parental rights. In making this decision, Sorkow declared legal the practice of surrogate motherhood and of surrogacy contracts. The Whiteheads appealed the decision, asking the court to determine "surrogacy contracts" unenforceable and void (Annas, 1988, p. 21). Since then, the New Jersey Supreme Court has reversed Sorkow's decision, declaring surrogacy contracts in violation of New Jersey adoption law, and thus invalid and unenforceable. One of the problems in enforcing surrogate contracts is that, in essence, the child is considered property. Thus, the battle has begun in many states as to whether surrogate contracts are truly enforceable. Is the child a human being with certain rights, or is it property that was "signed over" by a contract? Add to this

mire the complexity of money–because it is against the law to sell babies in this country–and you can begin to understand why these laws are changing and evolving as new cases are presented.

Gestational surrogacy presents, for the first time, an opportunity for more than one woman to accurately claim a physical parental relationship to the same child–one providing an egg, and one nurturing the child in her womb. In *Johnson v. Calvert*, the California Supreme Court faced such an issue when it decided the legal maternity of a baby born to a gestational surrogate (see Johnson v. Calvert, 1993). In this case, a husband and wife brought suit, seeking declaration that they were the legal parents of a child born to a surrogate mother. However, despite having donated the egg and having made a contractual agreement for the "intended parents" to have legal custody of the child, the surrogate attempted to file her own action to be declared the mother of the child. The court concluded that the "intended parents" were the child's legal parents, and that California law recognized only one natural mother, despite advances in reproductive technology rendering a different outcome biologically possible.

The Supreme Court in *Johnson v. Calvert* relied, in pertinent part, on the Uniform Parentage Act (in *West's Ann. Cal. Family Code Secs.* 7600 *et seq.*), which "facially" applies to any parentage determination. Pursuant to the Uniform Parentage Act, the Court recognized that while both genetic consanguinity and giving birth are a means of establishing a mother/child relationship, a situation may arise where the two means do not coincide in one woman. In this instance, the Court asserted, the woman who intends to bring about the birth of the child whom she intends to rear as her own, is the "natural mother." But this one simple legal "Act" is hardly a cure-all for the plethora of ethical issues caused from surrogacy.

When does a woman become a mother–while she is pregnant, or after she has delivered a baby? What of the bodily experience of pregnancy? Does a woman's participation in pregnancy–the act of carrying the fetus in her uterus–have any bearing on who the "true" or "natural" mother is? And

what happens when the "genetics" of the child comes from donors? Allowing surrogacy to continue, not only forces us to face these questions, but also to provide some type of answer. Clearly, we as a society have stepped outside of God's original plan for marriage and reproduction. Christians not only must avoid surrogacy, but also should define and discuss it in biblical terms: sin. God set forth a pattern, and any action contrary to that pattern is sin.

Conclusion

Statistics indicate that approximately fifteen percent of American couples are infertile (defined as being unable to bear children after one year of trying). Many of these find the adoption process protracted and arduous. As such, thousands are turning to artificial reproductive techniques in the hope that they may fulfill their desire to be parents. God set forth a divine plan for marriage and reproduction that was to take place only between husband and wife. Surrogacy supersedes God's law–and as such, faithful Christians should not accept it. Christians must understand that their number one priority in life is still to remain faithful and serve Almighty God. Infertility does not change this.

While new reproductive technological breakthroughs are reported every year, Christians must remain vigilant in seeking to please God, not themselves. The reproductive field has provided numerous new ways to bear children. However, just because the technology exists, does not make it acceptable. We must learn to question a judicial system that allows a natural mother to sign away a child she has not yet conceived–in exchange for $20,000. We must oppose a system in which donor egg and sperm can create a child who has **no genetic parent**, thus causing the courts to conclude there is **no legal parent**. Is our posterity nothing more than a commodity to be sold in exchange for services rendered? As Christians, we must remain determined to adhere to the unchanging message of God's Word.

In recent years, additional IVF procedures have been developed. In one procedure known as gamete intra-fallopian tube transfer (GIFT), the eggs and sperm together are placed

into the woman's fallopian tube(s) in the hope that conception will occur. The GIFT procedure requires that a woman have at least one normal fallopian tube, and, unlike a true IVF procedure, permits fertilization to occur inside the fallopian tubes, instead of in an incubator outside the body. Except for women with two damaged fallopian tubes, women who are candidates for IVF also are candidates for GIFT, which generally has a somewhat higher success rate (25-35% in some cases).

However, the GIFT procedure does have certain disadvantages when compared with routine IVF procedures. For example, at present most GIFT procedures require laparoscopy in order to transfer the eggs and sperm into the fallopian tubes, which makes them more complicated than an IVF embryo transfer through the vagina and cervix into the uterus. Newer developments allow for placement of the gametes into the fallopian tube(s) using a tiny catheter threaded through the cervix and uterus, but this technique is more difficult to perform successfully than the procedure that allows direct visualization via a laparoscope. [One of the newest techniques centers on "embryo glue"–a procedure that literally glues the embryo to the uterine wall; see "What is Embryo Glue?," 2004.] And, if GIFT fails, there is no way of knowing whether the eggs were fertilized–something that is readily apparent in regular IVF transfers.

Another procedure, known as zygote intra-fallopian transfer (ZIFT), actually is a combination of IVF and GIFT. The sperm and egg are mixed in a culture dish outside the womb, but one day later the developing zygote is placed into the fallopian tube prior to becoming a full-fledged embryo. This procedure is considered especially useful in cases where the husband is subfertile, since sperm may be collected over a period of time, frozen until needed, then thawed and used in a ZIFT procedure. It does suffer, however, from the same drawbacks as GIFT procedures.

Is the Christian opposed to married couples having children? Certainly not. Is the Christian opposed to using legitimate means to help childless couples have the children they

so desperately want? Certainly not. Christians, however, **are** opposed to the wholesale production and subsequent slaughter of innocent human embryos in the search for the "fittest" that is deemed good enough to be given a chance at survival.

The question sometimes is asked as to whether one day it will be possible to develop IVF procedures that allow removal of only one or two eggs from a woman's ovary, with the subsequent fertilization and implantation of all those eggs so they (potentially) can grow to term. This, it is argued, would avoid destruction of the remaining embryos, and thus would be a method not necessarily deemed unethical, immoral, or unscriptural. Research in this area is continuing. The outlook, however, is bleak because "the quality of both the embryo and the uterine environment affects success. Individual human embryos only have a poor chance of development to fetal stages" (Winston and Handyside, 1993, 260:932). At costs ranging from $7,000 to $15,000 for a single attempt, every effort will be made to ensure success. The obvious way to increase the chance for success is to fertilize and implant many eggs, not just one or two. But therein lies part of the problem. While multiple eggs may be implanted, numerous eggs still remain unused (and subsequently are destroyed).

One research lab in Massachusetts has put an entirely new twist on the universal form of sexual reproduction. George Daly, and his colleagues from the Whitehead Institute for Biomedical Research, successfully fertilized mouse eggs with sperm grown from stem cells. These sperm cells did not come from an adult male mouse, but rather were grown from embryonic stem cells (Geijsen, et al., 2003). Commenting on the newly created sperm cells, Daley noted: "They look like normal sperm but without the tail" (Pilcher, 2003). These lab-grown reproductive cells were created using stem cells derived from male mouse embryos. The embryos were allowed to grow to a specific stage, at which point the sperm-like cells were teased out.

Some are hailing this new development as an alternative treatment for infertility. Yet, as Helen Pilcher reported, only "one in five of the resulting embryos began to develop nor-

mally" (2003). Azim Surani of the University of Cambridge in England, who studies sex-cell development, cautioned that the "method's low success rate may indicate a problem" (Pilcher, 2003). We certainly would hope that a one-in-five success rate would be considered somewhat indicative of a problem! Pilcher noted: "Normally, as sperm and eggs develop, their genetic material is reprogrammed. This switches on the correct genes so that fertilization can proceed. This process may have gone awry in the mouse sperm, Surani speculates–similar problems are thought to occur during animal cloning." While some may tend to view this as an acceptable alternative, techniques that bypass natural and biological processes are often later deemed impractical and even harmful.

So what will happen as researchers move toward working with humans? We can be assured that human sperm will be much more difficult to create than mouse sperm–but that is not likely to stop investigators from trying. This bold new technology will require researchers to make their stem cells using therapeutic cloning. To do so, DNA from an adult cell would be inserted into an egg that had been emptied of its DNA, and stem cells then would be isolated from the resulting early embryo. Once the stem cells had been teased out, they would be cultured to form these sperm.

While all of this may sound like an easy process, it is not. For instance, look at all of the problems researchers have with reproductive cloning (see Harrub, 2003a). Experiments utilizing adult genetic material are risky, warns Hans Schöler of the University of Pennsylvania in Philadelphia. In 2003, Schöler was the first to produce lab-grown eggs. He observed: "The DNA in our body is of low quality" (as quoted in Pilcher, 2003). He contends that any disease-causing mutation that occurred during aging would be passed on to the offspring.

In September 2003, Japanese researchers were the first to report that embryonic stem cells could form *in vitro* into germ cells (Toyooka, et al., 2003). This study was the first to show that such sperm actually are fertile. In October 2003, at the 59th annual meeting of the American Society for Reproductive Medicine, James Grifo and colleagues at Sun Yat Sen Uni-

versity Medical Science in China created the first human pregnancy using techniques related to cloning (see Harrub, 2003b). Researchers are insistent on "pushing the envelope," and yet success rates continue to be dismal at best. Has anyone stopped to consider that we are spending literally millions of dollars (and endangering the lives of potential fetuses) to create a technique that bypasses sexual reproduction–something that routinely works to create healthy offspring? Unfortunately, the cries of the human embryos that are being sacrificed fall on the deaf ears of those who now believe they are more than capable of creating and manipulating life.

Contrary to the unproven and unscientific assertions of evolutionists, man did not evolve from lifeless, primordial matter. Rather, as the Bible clearly teaches, "Jehovah God formed man of the dust of the ground, and breathed into his nostrils the breath of life; and man became a living soul" (Genesis 2:7). It is God who "giveth life, and breath, and all things" (Acts 17:25). Human life, as a gift from God, is sacred. Yet there is a growing tendency to ignore this divine principle and to view human life as that which may be destroyed capriciously. Should Christians make this an issue of ethical concern? Or shall we, to use Leon Kass' words, "leave it so that discarding laboratory-grown embryos is a matter solely between a doctor and his plumber" (as quoted in Restak, 1975, p. 65)?

Man is the offspring of God (Acts 17:28-29). Intellectually and morally, humankind was created in the image of the Godhead (Genesis 1:26-27; cf. Ephesians 4:24 and Colossians 3:10). Mankind, as designed by God, was thus "fearfully and wonderfully made" (Psalm 139:14; cf. Psalm 94:9). As he originally came forth from the Creator as one of the "wondrous works of him who is perfect in knowledge" (Job 37:16), he was, together with the rest of creation, "very good" (Genesis 1:31). Some today speak with great fervor about the "technological imperative" We mentioned earlier–whatever **can** be done **should** be done! Against this kind of unscriptural thinking the faithful Christian must press the ethics of the Bible. Regardless of what we are being told by some (like human-

ists), the end does not always justify the means. Ethics is not situational, but rather is bound by the absolute standard presented in the Word of God.

No one should be made to feel ashamed because of an inability to produce children. There are times when problems occur that are no one's "fault." Blame cannot (and should not) be assumed or assigned, for that only adds additional feelings of unnecessary guilt. Some physical problems cannot be overcome by ethically acceptable methods. Christians should realize that IVF procedures are expensive, have low success rates, and generally produce a situation where fertilized human embryos are created in greater numbers than can be used. Thus, those that are not "fit to survive" are destroyed–a clear violation of the principles in Scripture regarding life as a gift from God.

Furthermore, while biblical teaching on the ethics of such matters is being studied, its instruction on stewardship should be examined as well. Even if a means is available to circumvent the physical inability of a couple to produce children, it may be unwise to employ it. Incurring huge amounts of debt, depleting family funds needed to pay routine bills, and other such practices may not fall within the purview of biblical stewardship. All of these factors, and more, should be considered by those contemplating use of these new technologies.

Prenatal Manipulation

Fetal Tests and Treatments

Prenatal (i.e., before birth) manipulation is becoming increasingly common. No doubt this is due, at least in part, to the easy availability of a diagnostic procedure known as amniocentesis, in which a needle attached to a syringe is inserted through the abdominal wall of the pregnant woman in order to collect approximately 200 cc of amniotic fluid (the liquid surrounding the baby). The process, which takes about an hour, is relatively painless and provides fluid that can be inspected for fetal cells.

However, usually there are too few cells in the amniotic fluid to examine directly, so the cells are collected and grown

for about three weeks. Determinations then may be made using the resulting fetal cells. With amniocentesis, physicians can diagnose more than seventy disorders such as Tay-Sachs disease, Down's syndrome, Turner's syndrome, Klinefelter's syndrome, and galactosemia, among others. In addition, the sex of the fetus can be determined via amniocentesis as well (Fletcher, 1980).

Other procedures, such as sonograms, also may be employed, within limits, to determine the health of the unborn infant. This is another example where the technology is neither "good" nor "bad" within itself; rather, it is the ultimate **use** of the technology that determines its nature.

Motives play an important part here. If parents request, or submit to, any or all of these procedures because they wish to equip themselves with additional information in order to prepare for the birth of their child–regardless of the pre-or postnatal condition of that child–that is one thing. But should the parents desire to use the tests to decide the ultimate fate of their as yet unborn child, that is something else altogether.

If, for example, based upon the results of any of these tests, the fetus is determined to be "defective," what options are open to the prospective parents? First, and perhaps most obvious, the parents simply may do nothing and allow the child to be born, thereby taking its rightful place in their family Second, depending on the prevailing circumstances, *in utero* prenatal surgery and/or blood transfusions may be performed to correct, or eliminate, the medical problem. However, even with the technology available today, this is a rare option, and one that is not in widespread use. [There had been only 200 successful fetal surgeries as of March 2003; see http://www.fetal-surgery.com for additional information on such procedures.] Third, parents may choose to terminate the pregnancy via abortion. Norman Gant, chairman of obstetrics and gynecology at the Health Science Center of the University of Texas, remarked: "We are able to give our parents information on which to base real choices about continuing or terminating a pregnancy, and it is very reassuring to them during the remainder of their pregnancies" (1980, p. 33). Dr. Gant's

point was that with certain of these techniques, it is possible to "have a look at" the unborn baby and then choose whether to allow it to live or to kill it via abortion.

Of these three options, there is little doubt which one has become the most popular. Genetic surgery is rare, because currently so few genetic diseases are capable of being treated or prevented in this fashion. Fetal blood transfusions offer limited success because they are not beneficial in all cases and are difficult to perform. The "burden" of a "defective" child does not fit into the lifestyle of many in this generation. Abortion is the obvious means of avoiding such an occurrence. Thus, it is to abortion-on-demand that many are turning in an effort to rid themselves of the so-called "defective" child growing in the womb.

Abortion

The topic of the human embryo is admittedly controversial. It also is extremely important–a point that was brought home to us quite vividly as a result of a telephone call we received some time ago from a Christian mother who had sent her son away to college. Just a few short months later, she realized that her son had begun to question his faith, and was on the verge of abandoning the Bible in favor of "science." He had shared with her some of the things he was learning in his biology class, and it was obvious that the information was completely at odds with biblical teaching. During our conversation, the mother related some of the information that her son said "proved" that humans had evolved–claims like human embryos having gill slits and evolutionary tails while they are growing in the womb.

Embryology, as its name implies, is the study of the embryo. In *The Origin of Species* (1859), Darwin asserted (in a discussion occupying 12 pages) that similarity among the various embryos of animals and man was a primary proof of the theory of evolution. In fact, he called it "second to none" in importance. In *The Descent of Man* (1871), Darwin devoted the entire first chapter to this line of evidence, stressing how critical it was to the success of his theory. Perhaps a brief history lesson would be appropriate at this point.

Ernst Heinrich Haeckel (1834-1919) was a German biologist who was such a devoted follower of Darwin that he was dubbed "the apostle of Darwinism in Germany." He taught at the University of Jena, and became famous for his popularization of the so-called "theory of embryonic recapitulation" (or, as he referred to it, the great "Biogenetic Law"). [NOTE: Haeckel's "Biogenetic Law" should not be confused with the Law of Biogenesis, which correctly states that all life comes from previous life of its kind.] Haeckel suggested that the successive stages of human embryonic development repeat the evolutionary stages of our animal ancestry. The catch-phrase he developed to popularize this idea was that "ontogeny [the development of one] recapitulates [repeats] phylogeny [the development of the race]." In other words, the human embryo passes through all stages representing its ancestors–from the one-celled stage to the human. Seeing a human embryo grow would therefore be like watching a silent, moving picture of all our ancestral history. "Ontogeny recapitulates phylogeny" is the mantra still being parroted in various biology classes.

Today, however, we recognize that this argument is specious, and those who keep up with the scientific literature no longer use it. Why? To quote the late George Gaylord Simpson of Harvard: "It is now firmly established that ontogeny does not repeat phylogeny" (1965, p. 352). Over seventy years ago, Sir Arthur Keith bluntly stated:

> It was expected that the embryo would recapitulate the features of its ancestors from the lowest to the highest forms in the animal kingdom. Now that the appearances of the embryo at all stages are known, the general feeling is one of disappointment; the human embryo at no stage is anthropoid in appearance. The embryo of the mammal never resembles the worm, the fish, or the reptile. **Embryology provides no support whatsoever for the evolutionary hypothesis** (1932, p. 94, emp. added).

A word of explanation is in order. Haeckel was an accomplished artist who used his artistic talent to falsify certain of the drawings that accompanied his scientific articles. One writer summarized the matter as follows:

> To support his theory, however, Haeckel, whose knowledge of embryology was self-taught, faked some of his evidence. He not only altered his illustrations of embryos, but also printed the same plate of an embryo three times, and labeled one a human, the second a dog and the third a rabbit to show their similarity (Bowden, 1977, p. 128).

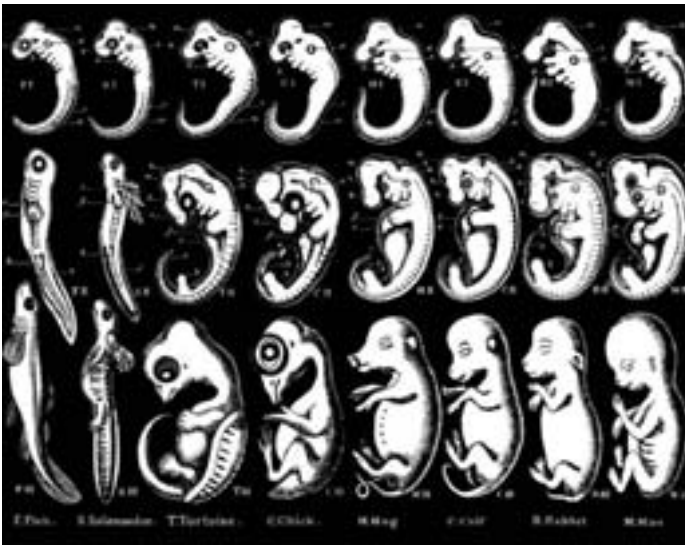

Figure 4 – Haeckel's drawings of embryos at three different stages for (from left to right): fish, salamander, tortoise, chick, hog, calf, rabbit and man (from 1876, Plates VI-VII). The alleged "gill-slits" are shown in gray.

Haeckel even went so far as to alter the drawings of some of his colleagues, including the famous embryologist, professor L. Rutimeyer of Basel University, and professor Arnold Bass. The two university professors, after realizing what Haeckel had done, publicly condemned his actions. In the end, as H.H. Newman of the University of Chicago put it, Haeckel's works "did more harm than good to Darwinism" (1932, p. 30).

Haeckel's falsified drawings were published around 1866. One of the major points stressed by Haeckel in his "research" –and one of the items that has remained ensconced in the

evolutionary literature to this very day–is the idea that the human embryo possesses gill slits that are leftovers from its past fish-like ancestor stage. Evolutionist Irvin Adler, in his book, *How Life Began*, wrote:

> The embryo of each species seems to repeat the main steps by which the species developed from the common ancestor of all living things. All mammal embryos, for example, pass through a stage in which they have gills like a fish, showing that mammals are descended from fishlike ancestors (1957, p. 22).

Fast-forward almost fifty years to the twenty-first century. In an educational program produced in 2001 by the University of Chicago for its Newton Electronic Community division, the following statement appeared: "All mammals have gill slits in their very early fetal development" (Myron, 2001, p. 1).

We have known for almost 150 years that the "Biogenetic Law" is not correct, and that human embryos do not possess gill slits (see Assmuth and Hull, 1915; Grigg, 1996, 1998; Pennisi, 1997; Richardson, 1997a, 1997b; Youngson, 1998). Even though it was common knowledge by the end of the 1920s that Haeckel's concepts, to use Stephen Jay Gould's words, had "utterly collapsed" (1977a, p. 216), Haeckel's drawings and ideas still continue to turn up in modern biology texts and instructional tools as a "proof" of evolution. Modern editions of most high school and college textbooks rarely present the latest evolutionary ideas on embryology, but instead remain content to rest their case on century-old woodcuts and misnamed "gill slits." Unfortunately, even today the "Biogenetic Law" still is being taught as a scientific fact in many public schools and universities. Of fifteen high school biology textbooks being considered for adoption by the Indiana State Board of Education as late as 1980, nine offered embryonic recapitulation as evidence for evolution. In a letter to the editor in the August 28, 1998 issue of *Science*, Michael Richardson lamented: "Sadly, it is the discredited 1874 drawings that are used in so many British and American biology textbooks" (281:1289). Yes, sadly, it is. The question is: Why?

Evolutionists themselves have conceded that the idea of embryonic recapitulation has become so deeply rooted in evolutionary dogma that it cannot be "weeded out." Paul Ehrlich observed: "Its shortcomings have been almost universally pointed out by modern authors, but the idea still has a prominent place in biological mythology" (1963, p. 66). The evidence of such an assessment is obvious when one looks at just how far-reaching Haeckel's drawings have become. America's famous "baby doctor," Benjamin Spock, perpetuated Haeckel's recapitulation myth in his well-known book, *Baby and Child Care*. Spock confidently assured expectant mothers that

> each child as he develops is retracing the whole history of mankind, physically and spiritually, step by step. A baby starts off in the womb as a single tiny cell, just the way the first living thing appeared in the ocean. Weeks later, as he lies in the amniotic fluid of the womb, he has gills like a fish (1998, p. 223).

Such imagery persists in the popular media, too. As an example, consider the position of the late atheist Carl Sagan and his third wife, Ann Druyan. In an article on "The Question of Abortion" that they co-authored for *Parade* magazine, these two humanists contended for the ethical permissibility of human abortion on the grounds that the fetus, growing within a woman's body for several months following conception, is not a human being. Sagan and Druyan stated that the embryo begins as "a kind of parasite" that eventually looks like a "segmented worm." Further alterations, they wrote, reveal "gill arches" like that of a "fish or amphibian." Supposedly, "reptilian" features emerge, which later give rise to "mammalian...pig-like" traits. By the end of two months, according to these two authors, the creature resembles a "primate but is still not quite human" (Sagan and Druyan, 1990, p. 6).

Although they never mentioned Haeckel by name, their point was clear: abortion in the first few months of pregnancy is acceptable because the embryo or fetus is a lower form of life during this period. Their conclusion, therefore, was that the killing of this tiny creature is not murder. And what was the basis for this assertion? Sagan and Druyan argued their

case by subtly employing embryonic recapitulation. Even in our day and age, it is not unusual for individuals to employ this false concept to justify their belief that embryos are, to use Sagan and Druyan's phrase, "not quite human." After all, they say, at various stages the fetus is no different from a fish or reptile.

Three years after Sagan and Druyan's article appeared, *USA Today* published an article on genetic similarities as proof for evolution, the author's analogy and sole illustration invoked the icons of comparative embryology (Friend, 1993).

The cover story of the November 11, 2002 issue of *Time* magazine detailed what were at the time the latest findings in human fetal development. Juxtaposed between the illustrations and the article were photo-captions that contained throwbacks to the outdated concept of embryonic recapitulation theory: "32 days: ...The brain is a labyrinth of cell-lined cavities, while the emerging arms and legs still resemble flipper-like paddles. 40 days: At this point, a human embryo looks no different from that of a pig, chick or elephant. All have a tail, a yolk sac and rudimentary gills" (Nash, 2002, 160[20]:71). The article itself presented a "marvelous," seemingly "miraculous," and "vastly complicated" embryonic process. But the glossy pictures that accompanied the article–the ones that people tend to remember–had captions that painted an entirely different picture.

The scientific community has known for decades that Ernst Haeckel–the man responsible for conjuring up this theory and then falsifying drawings to support it–purposely misled the public during the late 1800s. Embryologist Erich Blechschmidt regarded Haeckel's "Great Biogenetic Law" as one of the most egregious errors in the history of biology. In his book, *The Beginnings of Human Life*, he minced no words in repudiating Haeckel's fraudulent forgeries: "The so-called basic law of biogenetics is wrong. No buts or ifs can mitigate this fact. It is not even a tiny bit correct or correct in a different form. It is totally wrong" (1977, p. 32). Biologist James W. Leach of Ohio State University bluntly commented:

> The undeniable tendency of a complex animal to pass through some developmental stages reminiscent of the adult conditions of a selected and graduated series of lower forms has long been described as the "Biogenetic Law." But as "law" inscribed by nature it is perhaps more full of "loopholes" and "bypasses" than any law thus far inscribed by man (1961, p. 44).

In their widely used high school biology textbook, *Life: An Introduction to Biology*, George Gaylord Simpson and William Beck included a footnote to their student readers on this point. They wrote: "The human embryo does not have any differentiated gill tissue, and the gill-like pouches do not have open gill slits as in fishes. Fins are lacking. The tail is not at all like any fish's tail. Indeed, the resemblance to an adult fish is vague and superficial" (1965, p. 240). Simpson and Beck went on to conclude: "It is now firmly established that ontogeny does **not** recapitulate phylogeny" (p. 241, emp. in orig.). The eminent Canadian biologist, W.R. Thompson, in the "Introduction" he authored for the 1956 edition of Darwin's *Origin of Species*, wrote: "The 'Biogenetic Law' as a proof of evolution is valueless" (1956, p. xvi). Biologist Aaron Wasserman observed that the mammalian embryo "can in no sense be called a fish; it never actually develops functional gills and is at all times a mammal" (1973, p. 497).

Why, then, does the concept of embryonic recapitulation persist? Perhaps John Tyler Bonner, former head of the biology department at Princeton University, explained it best when he admitted: "We may have known for almost a hundred years that Haeckel's blastaea-gastraea theory of the origin of the metazoa is probably nonsense, but it is so clear-cut, so simple, so easy to hand full-blown to the student" (1961, p. 240). Yes, it is. But is it **right**? No, it is not. In fact, recognition of Haeckel's falsehoods still appears in scientific journals from time to time, as was evident in a letter to the editor in the May 15, 1998 issue of *Science*. The seven authors of the letter pointed out (correctly) that Haeckel was overzealous and purposely gave incorrect details in his embryonic drawings (Richardson, et al., 1998). In her book, *Essays in the History of Embryology and Biology*, Jane Oppenheimer observed that Haeckel's work "was the culmination of the extremes of exaggeration

which followed Darwin" (1967, p. 150). She lamented: "Haeckel's doctrines were blindly and uncritically accepted," and "delayed the course of embryological progress." Almost thirty years earlier, W.D. Matthew, former chairman of the geology department at the University of California, had acknowledged the fact that, sadly, some doctrines are "blindly and uncritically accepted." He wrote: "Many a false theory gets crystallized by time and absorbed into the body of scientific doctrine through lack of adequate criticism when it is formulated" (1939, p. 159). Never was there a more blatant case of such, than Haeckel's "Biogenetic Law" with its catch-phrase of "ontogeny recapitulates phylogeny."

In the end, as Jonathan Sarfati noted, "a human embryo never looks reptilian or pig-like. A human embryo is always a human embryo, from the very moment of conception; it is never anything else. It does not **become** human sometime after eight weeks" (2002b, p. 202, emp. in orig.). It is the "humanness" of the embryo that is so critically important, because it is such humanness that guarantees to the embryo sanctity of life. Without an acknowledgment of such sanctity, unspeakable horrors can result. For example, in his book, *Man's Search for Meaning*, internationally renowned psychiatrist Viktor E. Frankl wrote about his years of witnessing just such unspeakable horrors–in Nazi death camps. In discussing the value of human life, he wrote:

> Under the influence of a world which no longer recognized the value of human life and human dignity, which had robbed man of his will and had made him an object to be exterminated (having planned, however, to make full use of him first–to the last ounce of his physical resources)–under this influence the personal ego finally suffered a loss of values. If the man in the concentration camp did not struggle against this in a last effort to save his self-respect, he lost the feeling of being an individual, a being with a mind, with inner freedom and personal value. He thought of himself then as only a part of an enormous mass of people; his existence descended to the level of animal life (1984, p. 70).

Animal life–isn't this what many scientists tell us humans descended from?

Are humans nothing more than "higher animals," as some would have us to believe? Sadly, the questions revolving around the value of human life are found at both ends of the spectrum. On one end there are individuals who consider embryos tucked away safely in the wombs of mothers, who are eight or nine months pregnant, to be nothing more than "tissue." Interestingly, this "tissue" is known to have well-developed internal organs, possesses active brain waves, responds to light and sound, and occasionally will suck its thumb. On the other end of the spectrum are aged individuals who argue that they already have lived a full life, and therefore their death should be facilitated and hastened by the medical community via euthanasia (literally, "good death"). Lying in between these two extremes are those heart-rending cases in which families must decide whether or not to remove life support from a comatose individual who is lying in a bed and connected to a respirator. And then there are the cases where terminal illnesses have invaded the lives of those far too young to battle these wretched afflictions. Although rarely discussed aloud–and certainly never admitted publicly–there are also those cases in which the medical establishment often "trades off" a human life in a complex cost-benefit ratio, after comparing the high cost of medical treatment. But what is the **real** cost?

What **is** the value of human life? As Christians, what are our obligations, and what should be our attitude, in such matters? In order to better investigate these moral dilemmas, we first need to define "life" and "death." According to *Stedman's Concise Medical Dictionary*, life is: "vitality, the essential condition of being alive; the state of existence characterized by active metabolism. The existence of organisms" (see McDonough, 1994, p. 567). Death is defined as:

> cessation of life. In multicellular organisms, a gradual process at the cellular level, with tissues varying in their ability to withstand deprivation of oxygen; in higher organisms, a cessation of integrated tissue and organ functions; in man, manifested by the loss of heart beat, by the absence of spontaneous breathing, and by cerebral death (p. 253).

On occasion, physicians will specify that someone has reached a state of brain death or cerebral death. This is defined as: "in the presence of cardiac activity, the permanent loss of cerebral function, manifested clinically by absence of purposive responsiveness to external stimuli, absence of cephalic reflexes, apnea, and an isoelectric electroencephalogram [EEG] for at least 30 minutes in the absence of hypothermia and poisoning by central nervous system depressants" (p. 253). But not everyone agrees with such definitions. When does life truly begin, and when is someone truly considered dead? Our society is finding ways to "bend" these definitions in order to accommodate specific situations as they arise.

As our knowledge of science has increased, so have the ways in which we define human life. Consider the following views on when human life actually begins.

- **The metabolic view**. As soon as metabolic processes start, then the organism is considered living.
- **The genetic view**. A new individual is created at fertilization when the genes from the two parents combine to form an individual with unique properties.
- **The embryological view**. In humans, identical twinning can occur as late as the twelfth day after conception. Such twinning produces two look-alike individuals with different personalities. Even conjoined ("Siamese") twins can have different personalities. Thus, individuality sometimes is not fixed earlier than day 12. (In religious terms, the two individuals have different souls.) Some medical texts consider the stages before this time as a "pre-embryonic." This view is expressed by scientists such as Renfree (1982) and Grobstein (1988), and has been endorsed theologically by Ford (1988), Shannon and Wolter (1990), and McCormick (1991), among others. (Such a view would allow contraception, "morning after pills," and contragestational agents after two weeks, but not abortion.)
- **The neurological view**. Our society has defined death as the loss of the cerebral EEG (electroencephalogram) pattern. Conversely, certain scientists have

thought that the point of acquisition of the human EEG (at about 40 days) should be defined as the point when human life has begins.

- **The ecological/technological view**. This view sees human life as beginning when it can exist separately from its maternal biological environment. The natural limit of viability occurs when the lungs mature, but technological advances can now enable a premature infant to survive after about 25 weeks of gestation. [This is the view currently operating in some states. Once a fetus is potentially independent, it cannot be aborted except in instances where it is ruled by a physician to pose a threat to the (physical or mental) health of the mother.]
- **The immunological view**. This view sees human life as beginning when the organism recognizes the distinction between self and non-self. In humans, this occurs around the time of birth.
- **The integrated physiological view**. This sees human life as beginning when it has become independent of the mother and has its own functioning circulatory system, alimentary system, and respiratory system. This is the traditional birthday when the baby is born into the world and the umbilical cord is cut.

In writing his lengthy opinion for the court in the infamous *Roe vs. Wade* case, Justice Harry Blackmun stated: "We need not resolve the question of when life begins." With those few words, the lives of millions of tiny babies were cut short, sending their souls heavenward. And since that infamous decision on the part of the Unites States' highest court, scientists have invented even more ways to murder tiny, innocent children.

RU-486–An Abortion Alternative?

On September 28, 2000, the United States Food and Drug Administration approved mifepristone for sale in the United States for use in ending early pregnancies (up to 7 weeks after a missed menstrual period). In the approval notice, the drug was described as a "safe, effective, and non-invasive way" of

ending a pregnancy. Known more commonly as RU-486, this pill is now the preferred form of abortion in at least 14 countries, including the United Kingdom and Israel. Thanks to Chinese manufacturers, it currently is marketed and available under the name Mifeprex in the United States. That's right—the country that strictly limits the number of children families can have, and that reports an estimated 10 million abortions each year, was awarded a multimillion dollar trade deal to produce America's abortion pill. Mifepristone was first developed by a French pharmaceutical firm, and was approved for use in France in 1988. Since then, more than 620,000 European women have taken mifepristone, in combination with a prostaglandin, to terminate their pregnancies. [Is it mere coincidence that RU-486 was developed originally by a drug company whose parent corporation manufactured Zyklon B—the poison gas used in Nazi concentration camps to destroy millions of lives?]

Mifepristone is a synthetic steroid designed to interfere with the embryo's ability to adhere to the uterine lining. A pregnant woman is given three, 200-milligram pills by mouth. The drug interferes with the flow of blood and nutritional elements from the wall of the uterus to the developing embryo. Deprived of support, the embryo dies. Returning to the doctor two days later, the woman takes two, 200-microgram pills of misoprostol (a prostaglandin that induces uterine contractions), and soon after aborts the embryo. [The woman remains in the physician's office for several hours of observation.] The prostaglandin, not the mifepristone, causes the most common side effects: vaginal bleeding, cramping, nausea, and diarrhea. The fetus may be expelled via blood clots either during the observation period, or later at home or at work, but almost always is aborted within 14 days of the treatment regimen. Women are required to return for a follow-up visit approximately 14 days after taking the mifepristone, to determine whether the pregnancy has been terminated. An RU-486 abortion costs approximately $300 (about the same as a surgical abortion), according to Advances in Health Technology, Inc., a Washington, D.C., company established to market the pill.

Misoprostol (sold under the name Arthrotec) induces uterine contractions, and was developed originally to fight arthritis. The first line in the 2001 edition of the *Physician's Desk Reference* regarding Arthrotec reads: "Contraindications and Warnings: Arthrotec, because of the abortifacient property of the misoprostol component, is contraindicated in women who are pregnant" (p. 2977) The warning goes on to state that "Arthrotec should not be used in women of childbearing potential…" (p. 2977). And yet this arthritis drug is part of the cocktail given to women who want a "non-surgical" abortion.

While the FDA has given its "stamp of approval," the words "safe" and "effective" hardly are words that would be used to describe this procedure. The following list of "drawbacks" was taken from a planned parenthood (pro-abortion) Website.

- Slightly greater risk of having an "incomplete" abortion when using the "abortion pill"–when this happens (maybe 4 percent of the time), the contents of the uterus are not completely shed (and the pregnancy is not ended). If it happens, women have to consent to have a "surgical" abortion to completely end the pregnancy.
- "Non-surgical" abortions require at least three visits to a clinic or doctor's office (instead of the two required for a surgical abortion). You must follow through with all three visits, or the abortion may not be completed, and a damaged fetus might continue to develop. An abortion caused by the "abortion pill" may actually take place over several hours or days. With a "surgical abortion," the abortion is complete when you leave the clinic, and the abortion itself takes only ten or fifteen minutes.
- While some women experience "a greater sense of control over the process," others actually find "non-surgical" abortion to be more stressful than a "surgical" abortion. For example, with the "abortion pill," **some women see small amounts of pregnancy tissue coming out of their vagina, and they may find this to be sort of traumatic** (emp. added–BT/BH).

Additionally, the "abortion pill" now can be prescribed by almost any licensed doctor or nurse-practitioner (even though most "regular" doctors and nurse-practitioners cannot perform surgical abortions). In communities that do not have an abortion clinic, women often have to travel great distances for a surgical abortion, so "pro-choice" individuals view this increased availability as a victory. With the abortion pill, women may be able to obtain a non-surgical abortion from a local provider. This means that while your child's sore throat is being cared for in exam room 1 at your family practitioner's office, an abortion may be taking place next door in exam room 2!

Now that RU-486 has received FDA approval (and big profits are in the forecast), competitors are looking for substances that produce the same effects. Methotrexate is a prescription drug that was developed in the fight against cancer. Used in combination with misoprostol, it also causes an abortion. As with RU-486, a methotrexate abortion requires three visits to a clinic or doctor's office. During the first visit, methotrexate is given in the form of a shot. Then, a week later at during second clinic visit, the misoprostol is administered as a pill or in suppository form (the suppository is a capsule that is inserted deep inside the vagina, where it dissolves). After this, the uterus contracts and the baby is expelled. A third visit to the clinic is necessary to confirm that an abortion has taken place. If a complete abortion has not occurred (which happens in about four percent of the cases), the woman then must have a surgical abortion to prevent the development of a damaged fetus (and related problems). Currently, the FDA has approved methotrexate for use as a **cancer treatment**. It is widely available in the United States, but not all health-care providers are willing to use it for abortions. This procedure is still relatively new and somewhat controversial.

Abortion and the Value of Human Life

The Centers for Disease Control (CDC) in Atlanta, Georgia, report that over 1,200,000 abortions were performed in the United States in 1995 (see CDC–Abortion statistics, 2001;

remember that these are only the instances that were reported). In fact, the United States has averaged well over a million abortions per year since 1977. The CDC estimates that 55 percent of legal abortions occur within the first eight weeks of gestation, and that 88 percent are performed within the first twelve weeks. According to many, this short span of time makes a big difference. Prior to the twelfth gestational week, many people view the embryo as "nonliving"; thus, life is not "terminated" in an early abortion. However, the facts indicate a totally different picture, as James Drummey has pointed out:

> One of the key elements in the abortion debate is the true nature of the victim. If the unborn child is a human being, then he or she deserves the full and equal protection of the law. Though it may still surprise some, there are few things more certain in January 1986 than that the unborn are human beings. It is a biological and scientific fact that human life begins at fertilization, when the sperm cell of the father penetrates the egg cell of the mother. That unique genetic package, something that each of us once was, contains everything that a person will become–the color of her eyes, the size of his feet, even whether he or she will contract diabetes at age fifty.
>
> Thanks to the wonders of modern technology, we are able to study the unborn child from the earliest moments of its existence. We know that its heart begins to beat eighteen days after fertilization, that brain waves can be recorded by the fortieth day, and that all body systems are present at eight weeks and working by the eleventh week. Technological advances are such that more and more babies are surviving births after only 20 to 24 weeks of the normal forty-week pregnancy. And yet, the Minnesota Supreme Court ruled last month that an 8½ month-old unborn child was not a human being under Minnesota law (1986, p. 22).

While Minnesota and Justice Harry Blackmun may not view the unborn as human beings, scientists are finding it harder and harder not to do so. A study reported from Queen's University in 2003 revealed that, even *in utero*, human fetuses

possess the ability to recognize their mother's voice (see "Fetal Heart…," 2003). This study demonstrated that the fetus not only could recognize its mother's voice, but also could distinguish it from other female voices. Using thirty fetuses in their experiment, university researchers played a two-minute audiotape of each fetus' own mother reading a poem. The researchers then played a second, two-minute audiotape of another female voice reading a poem. The scientists discovered that the unborn babies responded to their own mother's voice with heart-rate acceleration. When the stranger's voice was played, the heart rates of the infants decelerated. This confirms what scientists have speculated for more than twenty years–that experiences in the womb help shape newborn preferences and behavior.

Barbara Kisilevsky, a Queen's University professor, believes this research indicates that a fetus in the womb can exhibit "preference/recognition" before birth. This would suggest that fetuses are capable of learning in the womb, and can remember and distinguish several different voices. How does our federal government continue to designate these babies as "nonliving tissue" when, in fact, we have evidence that they can **learn**, even while in the womb?! Dr. Kisilevsky's team is continuing its study to determine if there is a similar fetal response with the father's voice. Scientists speculate that these results may help demonstrate when the foundation for speech and perception are laid down. After hearing about studies such as these, doesn't the question beg to be asked: How can a "thing" that is "not living" **learn** in the womb?

As Christians, we cannot afford to be so tranquil in resolving this question of when life begins. Our actions, or lack therefore, will stand in judgment one day. The inspired Word of God is crystal clear on such matters. Beginning as early as Genesis chapter 4:1, we read: "And Adam knew Eve his wife; and she conceived, and bare Cain, and said, 'I have gotten a man from the Lord.'" Some forty times the Scriptures make reference to women conceiving. It is no accident that the inspired writers mention this extraordinary moment in which the sperm and egg come together–for it is only at that instant

that their chromosomes join to form the full complement of chromosomes that is capable of producing human life. James observed: "The body apart from the spirit (*pneuma*) is dead" (2:26). But the opposite of that statement also must be true; if the body is living, then the spirit must be present. Thus, upon conception–when that full complement of chromosomes is actively metabolizing and living–God already has placed a soul within the living embryo. Additionally, the Lord talking to the prophet Jeremiah stated: "Before I formed thee in the belly, I knew thee; before thou camest forth out of the womb, I sanctified thee, and I ordained thee a prophet unto the nations" (1:5). It is obvious from the text that God does not consider life as beginning at **birth**, but rather at **conception**.

In addressing a Senate Judiciary Subcommittee on April 23-24, 1981, Richard V. Jaynes stated: "To say that the beginning of human life cannot be determined scientifically is utterly ridiculous." Those hearings were carried out to determine the question of when human life begins? Accompanying Dr. Jaynes that day were numerous internationally known geneticists and biologists who conclusively reiterated that life begins at conception–and they told their story with a profound absence of opposing testimony.

Dr. Micheline Mathews-Roth of Harvard Medical School gave confirming testimony, supported by references from over twenty embryology (and other medical) textbooks that human life begins at conception. The man known as the "father of modern genetics," Dr. Jerome Lejeune, told the lawmakers: "To accept the fact that after fertilization has taken place a new human has come into being is no longer a matter of taste or opinion...it is plain experimental evidence." Dr. Hymie Gordon, chairman of the department of genetics at the Mayo Clinic, added: "By all the criteria of modern molecular biology, life is present from the moment of conception." Dr. McCarthy de Mere of the University of Tennessee, who is both a medical doctor and law professor, testified: "The exact moment of the beginning of personhood and of the human body is at the moment of conception." Dr. Alfred Bongiovanni of the University of Pennsylvania School of Medicine

concluded: "I am no more prepared to say that these early stages represent an incomplete human being than I would be to say that the child prior to the dramatic effects of puberty...is not a human being."

One of those giving testimony during that hearing was Landrum Shettles, often called the "father of *in vitro* fertilization." Dr. Shettles stated: "To deny a truth [about when life begins–BT/BH] should not be made a basis for legalizing abortion." Interesting words from a man who helped fill *in vitro* fertilization clinics with embryos–embryos that already have been fertilized and thus, in all aspects are human.

In speaking about the Supreme Court justices' decision, professor Eugene Diamond stated: "…either the justices were fed a backwoods biology or they were pretending ignorance about a scientific certainty." In *Roe v. Wade* [410 U.S. 113 (1973)], the United States Supreme Court held that the U.S. Constitution protects a woman's decision to terminate her pregnancy. Only after the fetus is viable and capable of sustained survival outside the mother's body (with or without artificial aid) may individual states ban abortion altogether. Abortions necessary to preserve the woman's life or health still are being allowed, however, even after fetal viability. [Viability is defined as being able to survive (given the benefit of available medical therapy) to the point of independently maintaining heartbeat and respiration.] If a fetus is viable after delivery, it then is called a premature infant. In the past, physicians have tried to define viability in relation to gestational age. According to evolutionist Elie A. Schneour:

> During development, the fertilized egg progresses over 38 weeks through what is, in fact, a rapid passage through evolutionary history: From a single primordial cell, the conceptus progresses through being something of a protozoan, a fish, a reptile, a bird, a primate and ultimately a human being. There is a difference of opinion among scientists about the time during pregnancy when a human being can be said to emerge. But there is a general agreement that this does not happen until after the end of the first trimester (1989, p. V-5).

Today, biology classes all over the United States are filled with students with sponge-like minds who are soaking up the notion that up until a certain point in the pregnancy, the embryo is nothing more than an evolving blob of tissue. Insurance companies and physicians have tried to make a black-and-white determination of when an embryo actually is living (and thus viable). Fifty years ago, viability was acknowledged as existing as the 50-week stage. Then, the cutting-off point between viable and non-viable was set at 28 weeks. However, in 2000, a baby at 24 weeks gestation, weighing only 14.3 ounces, was born in Laguna Hills, California. On June 10, this baby, weighing just 3.5 pounds, was released from the hospital. Just a few years ago, this baby, according to most viability scales, would have been considered "non-viable" and therefore "not alive." In *Planned Parenthood of Central Missouri v. Danforth* [428 U.S. 52 (1976)], the U.S. Supreme Court recognized that judgments of viability are inexact and may vary with each pregnancy. As a result, the court granted the attending physician the right to ascertain viability on an individual basis. In addition, the Court rejected as unconstitutional fixed gestational limits for determining viability. The court reaffirmed these rulings in the 1979 case, *Colautti v. Franklin* [439 U.S. 379 (1979)].

With one giant step, Nobel laureates James Watson and Francis Crick hurled researchers into the Genetic Age. Unfortunately, however, their discovery of the molecular structure of the gene comes at the expense of human subjects. No longer are scientists content with atomic experiments of the past Nuclear Age. Now, living "subjects" are required. And our attitude toward those "subjects" has shifted in an effort to view them as less human and thus to allow more experimentation. Watson once stated: "No one should be thought of as alive until about three days after birth," adding that parents could then "be allowed the choice" to keep their baby or "allow" their baby to die (1973, p. 13). The other member of that famed partnership, Francis Crick, stated: "No newborn should be declared human until it has passed certain tests regarding it genetic endowment and that if it fails these tests it forfeits the right to life" (as quoted in Smith, 2000, p. 55). So now we find ourselves arbitrating who should "forfeit their right to life" amongst the young and the old.

"Should Fetuses Have Rights?" That question was scrawled in huge gold and white letters across the front cover of the June 9, 2003 issue of *Newsweek*. A subtitle, in smaller white letters, read, "How Science is Changing the Debate"–as if an appeal to "science" alone somehow could provide the answer.

Should a fetus have rights? In the feature article ("The War Over Fetal Rights") that she wrote as the cover story for *Newsweek*, Debra Rosenberg pondered that question. The minute the reader opened the magazine to page 40 to begin reading the article, the answer should have been plainly obvious. In a breathtaking (and extremely graphic!) two-page spread on pages 40 and 41, Ms. Rosenberg had eight 2.5 x 4-inch full-color photographs of a human embryo as it developed *in utero* from the 7-week-old stage to the 35-week-old stage. Four of the photographs "floated" above the text of the article, and four floated beneath the text. While we certainly cannot speak for anyone else who might have read the article, we have to admit that we had a bit of trouble forcing ourselves to even begin reading the story, because we were so incredibly impressed, and so completely captivated, with the striking photographic images of the beautiful fetus as it developed from the tiniest, most fragile of humans into a child almost ready to be born.

But almost equally amazing were the captions beneath the pictures. In small-but-still-legible print were descriptions such as these: "Week 7, the fetus is tiny, grape-size, but fingers and toes are starting to form"; "Week 10, now two inches long, the fetus has its first tooth buds and a sense of touch. Body proportions begin to resemble an infant's"; "Week 13, the fetus starts to move and has all major organs"; "Week 16, the fetus quadruples in weight, limbs lengthen, fingerprints appear and newly curious hands may tug on the umbilical cord"; "Week 12, putting its long legs to use, the fetus begins to kick"; "Week 23, after this week, partial-birth abortion is banned in 40 states, and the fetus, able to survive outside the womb, **achieves viability**" (emp. added); "Week 32, the brain can now control breathing and body temperature"; "Week 35, the fetus is now almost full mature, with perfect hearing."

After reading such vivid descriptions of this precious unborn child, should anyone **really** have to ask, "Do fetuses have rights?" We hardly think so. Yet such a question **is** being asked. Why? Notice the two-word phrase in the caption for "week 23" that we have placed in bold print–"after this week… the fetus…**achieves viability**." What does it mean when a fetus "achieves viability"? From a medical/scientific viewpoint, viability is defined as: "of living things, capable of normal growth and development." But in the current controversy, there is much more to it than that. Hubert Markl, as president of the Max Planck Society, wrote a stinging article for the "Commentary" section in the August 2, 2001 issue of *Nature*, under the title of "Research Doesn't Denigrate Humanity," in which he wrote:

> This all boils down to the eternal question, "What is a human being?" ...Every human being is new, unique and developed from a fertilized egg cell. However, **the fertilized egg is far from being a human being** in the full sense of that word: it can be called a human being only if the word is given a meaning totally different from its usual definition. When we refer to an organism as "human," this is an expression of self-reference, the meaning of which is stipulated not by nature but by humans themselves. "Human" is a culturally defined attribute, not a purely biological fact....
>
> **A human being is made not at conception but when the zygote becomes implanted**.... [T]here is no biological reason to attribute complete personhood to a few-celled embryo simply because, in interaction with a mother organism, it has the ability to become one (2001, 412:479,480, emp. added).

John Harris, in his volume, *Clones, Genes, and Immortality*, suggested that "it would not be wrong" to use unwanted embryos left over from *in vitro* fertilization procedures "so long as the embryo is not in fact implanted" (1998, p. 63).

So–if we take these two scientists at their word–were the embryo to be allowed to attach itself to the uterine wall, **then** it would be wrong to employ it in any given research procedure, even if that procedure "kills" the embryo/fetus. But if it is **not** allowed to implant, then there would be nothing wrong

with destroying the embryo or fetus. [One cannot help but wonder, upon seeing statements such as these, what makes it "right" to destroy the embryo or fetus seconds **before** it attaches itself to the womb, but "wrong" to destroy it seconds **after** it implants? Furthermore, think for a moment (from the viewpoint of those who defend such a position) about how this argument simultaneously would apply to those cells harvested from aborted fetuses–which represent embryos that most definitely have "already implanted." Such a procedure–given their own definition–would be "wrong"!]

In her article, Rosenberg related various "horror stories" that relate to the issue of viability. She told, for example, of a fetus that had "died" as a result of a pregnant woman being attacked (the attacker, however, could not be charged with homicide because the fetus was not considered a "born person"). [Do not overlook the obvious question that begs to be asked: If the fetus is not a "person," how can "it" be designated as a "he" or "she" that can "**die**"?] Rosenberg also told of a Catholic couple that was opposed to abortion, but whose ill daughter desperately needed stem cells that could be acquired by "killing" a human embryo. [Another obvious question: If the embryo is not "viable," how can it be "killed"?] The mother involved in this scenario admitted: "My conscience tells me that for me personally, having an abortion would not be the right thing to do. That same conscience tells me that stem-cell research is needed" (as quoted in Rosenberg, 2003, 141[23]: 42). After presenting such scenarios, Rosenberg observed:

> The politics of the womb have never been more personal–or more complicated. When abortion foes are willing to destroy embryos for lifesaving medical research and abortion-rights supporters are willing to define a fetus as a murder victim, the black-and-white rhetoric of the 1970s abortion wars no longer applies. People on all sides of the debate are confronting long-held beliefs, often sending their most private emotions on a collision course with their political principles…. Activists on both sides are struggling to tread this new territory without losing their political footing (p. 42).

Sadly, when all the dust has settled from the controversy, "political principles" and "political footing" seem to be what this is all about. Gloria Feldt, president of Planned Parenthood, defended her organization's stance against considering granting "human rights" to fetuses when she said: "If they are able to make fetuses people in law with the same standing as women and men, then *Roe* [the *Roe. v. Wade* Supreme Court decision that allowed women the right to have abortions–BT/BH] will be moot" (as quoted in Rosenberg, p. 43). With a giant "Harrumph!," Ms. Feldt clears her throat and cuts through the rhetoric to scream that the one thing the pro-abortion camp does **not** want is for fetuses to the considered as (gulp!) "people."

According to Paul Marx, the United Nations estimates that there are some 55 million abortions performed annually throughout the world (*Abortion International*, n.d., p. 1). On January 22, 1973 the nine justices that form the Supreme Court of the United States voted (in a seven-to-two decision) to allow abortion as a legal method of destroying unwanted babies. Subsequent to that edict, the Centers for Disease Control in Atlanta, Georgia, have reported the number of infants slain by abortion to be approximately 1.5 million each year–more than all the American lives lost in the almost 200 years of wars since our country's inception. In fact, in the unpopular 11-year Vietnam War, over 58,000 Americans lost their lives, yet this country's medical profession, via abortion, kills more than that in any given 11 days!

If a person shoots an eagle–the symbol of our country–the judicial system will throw him in prison and toss away the key. That same system will stop a multi-million dollar dam in the state of Tennessee to save an inch-long snail-darter fish, or fly a former president of the United States to the northwest sector of America to sit around a conference table and discuss the fate of a spotted owl. Yet should someone wish to destroy the human baby growing inside the mother's womb, such an act will be looked upon not only as entirely within that person's rights as an American citizen, but also as perfectly legal.

While the U.S. Supreme Court outlawed the death penalty for hardened criminals, it simultaneously imposed that same penalty upon multiplied millions who never had committed a single crime. Their only "crime" was that they were not "perfect," or that they threatened to arrive at an "inconvenient" time. These tiny infants, still in the womb, are being murdered by techniques crueler, more vicious, and more inhumane than any thus far devised by even Hollywood's worst gut-wrenching horror movies. These deaths occur in abortion clinics, doctors' offices, and hospitals around the world. The conspirators in this atrocity include potential mothers, consenting doctors, whining advocates of "planned parenthood," and approving judges.

We lead western civilization in many areas, yet we have come to the point where life is so cheap that hospitals have been turned into slaughter houses, doctors have been turned into butchers, and our own children have been turned into "blobs of tissue" to be excised and unceremoniously dumped in the local landfill. We abhor from a distance the unspeakable crimes of Adolf Hitler as he murdered six million Jewish men, women, and children, or mass murderers like Saddam Hussein and Osama Bin Laden. Yet in our own land we snuff out the lives of countless millions far more defenseless than they. The announcement of an unwanted pregnancy, or one that likely will produce a less-than-perfect child, often is met with sheer hysteria. Years of having been taught evolution as a fact have taken their toll. Convinced that man is nothing but a "naked ape," the value of human life has diminished. After all, they shoot horses, don't they? And now the violence spawned by such thinking has reached even into the womb itself in what must be one of the most despicable of all acts—murder of the helpless!

Abortion is a violation of biblical morality, and should be opposed by every faithful child of God. The Proverbs writer stated: "There are six things which Jehovah hateth; Yea, seven which are an abomination unto Him; haughty eyes, a lying tongue, And **hands that shed innocent blood** (6:16-17, emp. added). What blood could be more innocent than that of a tiny infant not yet fresh from the womb?

And that is exactly the position taken by those on the other side of the issue–people like Ken Connor, president of the anti-abortion Family Research Council, who said in regard to husbands being put on trial for killing an unborn fetus (numerous cases of which are before various courts around the country): "It's not OK for the husband to kill his wife's child, but it's OK for the mother [to have an abortion]?" (as quoted in Rosenberg, p. 43). Hmmm. Good question, that.

Should a fetus have rights? The fact that those of us in America have to ask such a question in the first place is a sad commentary on the sorry state of our national conscience and (im)morality, is it not? If we would listen **first** to God's Word on this matter, and then **second** to the incoming scientific information that touches on the subject, we would have our answer. And that answer is: **Yes, a fetus should have rights!**

As we investigate this issue, we must ask the question: When does life actually begin? The answer, as we pointed out earlier, is that **life begins at conception**. When the male and female gametes join to form the zygote that eventually will grow into the fetus, it is at that very moment that the formation of a new body begins. It is the result of a **viable** male gamete joined sexually with a **viable** female gamete, which has formed a zygote that will move through a variety of important stages.

The first step in the process–which eventually will result in the highly differentiated tissues and organs that compose the body of the neonatal child–is the initial mitotic cleavage of that primal cell, the zygote. At this point, the genetic material doubles, matching copies of the chromosomes move to opposite poles, and the cell cleaves into two daughter cells. Shortly afterwards, each of these cells divides again, forming the embryo. [In humans and animals, the term "embryo" applies to any stage after cleavage but before birth (see Rudin, 1997, p. 125).]

As the cells of the embryo continue to divide, they form a cluster of cells. These divisions are accompanied by additional changes that produce a hollow, fluid-filled cavity inside the ball, which now is a one-layer-thick grouping of cells known

as a blastula. Early in the second day after fertilization, the embryo undergoes a process known as gastrulation in which the single-layer blastula turns into a three-layered gastrula consisting of ectoderm, mesoderm, and endoderm surrounding a cavity known as the archenteron. Each of these layers will give rise to very specific structures. For example, the ectoderm will form the outermost layer of the skin and other structures, including the sense organs, parts of the skeleton, and the nervous system. The mesoderm will form tissues associated with support, movement, transport, reproduction, and excretion (i.e., muscle, bone, cartilage, blood, heart, blood vessels, gonads, and kidneys). The endoderm will produce structures associated with breathing and digestion (including the lungs, liver, pancreas, and other digestive glands) [see Wallace, 1975, p. 187].

Within 72 hours after fertilization, the embryo will have divided a total of four times, and will consist of sixteen cells. Each cell will divide before it reaches the size of the cell that produced it; hence, the cells will become progressively smaller with each division. By the end of the first month, the embryo will have reached a length of only one-eighth of an inch, but already will consist of millions of cells. By the end of the ninth month, if all proceeds via normal channels, a baby is ready to be born. As one biologist (and author of a widely used secular university biology textbook) noted:

> As soon as the egg is touched by the head of a sperm, it undergoes violent pulsating movements which unite the twenty-three chromosomes of the sperm with its own genetic complement. From this single cell, about 1/175 of an inch in diameter, **a baby** weighing several pounds and composed of trillions of cells will be delivered about 266 days later (Wallace, p. 194, emp. added).

Is it alive? Of course it is alive. In fact, herein lies one of the most illogical absurdities of arguments set forth by those who support and defend abortion, and who would opposed granting fetuses rights "as people." They opine that the "thing" in the human womb is not "alive." **If it is not alive, why the need to abort it? Simply leave it alone!** Obviously, of course,

from their perspective that is not an option because, as everyone knows, in nine months, that growing, vibrant, developing fetus will result in a **living human baby**. The truth of the matter is that human life begins at conception and is continuous, whether intrauterine or extrauterine, until death. Consider the following scientific facts regarding the living nature of the fetus.

(1) The baby's heart starts beating 18-25 days after conception.

(2) By the age of two months, the heart beats so strongly that a doctor actually can listen to it with a Doppler stethoscope.

(3) At about this same time, brain activity can be recorded by use of an electroencephalogram. Brain waves are readily apparent.

(4) By the age of just two months, everything is "in place"–feet, hands, head, organs, etc. Upon close examination, fingerprints are evident. Although less than an inch long, the embryo has a head with eyes and ears, a simple digestive system, kidneys, liver, a heart that beats, a bloodstream of its own, and the beginning of a brain.

(5) The unborn child wakes, sleeps, hiccups, and sucks his or her thumb.

(6) The unborn child responds to touch, pain, cold, sound, and light. In fact, a study reported from Queen's University revealed that, even *in utero*, human fetuses have the ability to recognize their mother's voice (see "Fetal Heart…," 2003). This study demonstrated that the fetus not only could recognize its mother's voice, but also could distinguish it from other female voices. Using thirty fetuses in their experiment, university researchers played a two-minute audiotape of each fetus' own mother reading a poem. The researchers then played a second, two-minute audiotape of another female voice reading a poem. The scientists discovered that the unborn babies responded to their own mother's voice with

heart-rate acceleration. When the stranger's voice was played, the heart rates of the infants decelerated. This confirms what scientists have speculated for more than twenty years–that experiences in the womb can help shape the preferences and behaviors of newborns.

Barbara Kisilevsky, a Queen's University professor, believes this research indicates that a fetus in the womb can exhibit "preference/recognition" before birth. This would suggest that fetuses are capable of learning in the womb, and can remember and distinguish several different voices. How does our federal government continue to designate these babies as "nonliving tissue" when, in fact, we have evidence that they can **learn**, even while in the womb?! Dr. Kisilevsky's team is continuing its study to determine if there is a similar fetal response with the father's voice. Scientists speculate that these results may help demonstrate when the foundation for speech and perception are laid down.

Is the child alive? Do you know any **dead** creature that attains such marvelous accomplishments?

But is the fetus growing in the uterus actually **human**? It is the result of the union of the **human** male gamete (spermatozoon) and the **human** female gamete (ovum)–something that certainly guarantees its humanness. [The *Washington Post* of May 11, 1975 contained an "Open Letter to the Supreme Court"–signed by 209 medical doctors–which stated: "We physicians reaffirm our dedication to the awesome splendor of **human life–from one-celled infant to dottering elder**."]

And how, exactly, does God view this unborn yet fully human child? In addition to the passages considered earlier from the pens of Isaiah and Jeremiah, consider what King David, writing in Psalm 139:13-16, had to say as he provided a clear and compelling discussion on the nature and importance of life *in utero*:

> For thou didst form my inward parts: Thou didst cover me in my mother's womb. I will give thanks unto thee; For I am fearfully and wonderfully made: Wonderful are thy works; And that my soul knoweth right well. My frame was not hidden from thee, When I was made in secret, And curiously wrought in the lowest parts of the earth. Thine eyes did see mine unformed substance; And in thy book they were all written, Even the days that were ordained for me, When as yet there was none of them.

The phrases, "I was made in secret" and "curiously wrought in the lowest parts of the earth," refer to the psalmist's development in the womb (see Young, 1965, p. 76). Notice also that David employed the pronouns "me," "my," and "I" throughout the passage in reference to his own prenatal state. Such usage clearly shows that David was referring to himself, and one cannot talk about himself without having reference to a living human being. The Bible thus acknowledges that David was a human being while he inhabited his mother's womb (and prior to his birth).

Job, who was undergoing a terrible life crisis, cursed the day he was born when he said: "Why did I not **die from the womb**? Why did I not give up the ghost when my mother bore me?" (3:11). It is clear that if the fetus had **died** in the womb, prior to that it must have been **living**. Something (or someone) cannot die if it (or they) never lived. It also is of interest to observe that in Job 3:13-16, the patriarch listed several formerly-living-but-now-dead people with whom he would have had something in common **if** he had died *in utero*. Included in the list–along with kings and princes–was the child who experienced a "hidden untimely birth" (i.e., a miscarriage). Job considered the miscarried child to be in the same category as others who once lived but had died. Obviously, the Holy Spirit (Who guided the author of the book of Job in what he wrote) considered an unborn fetus as much a human being as a king, a prince, or a stillborn infant

In the Old Testament, even the accidental termination of a pregnancy was a punishable crime. Consider Exodus 21:22– "If men strive together, and hurt a woman with child, so that

her fruit depart, and yet no harm follows; he shall be surely fined, according as the woman's husband shall lay upon him... but if any harm follows, then thou shalt give life for life." The meaning of the passage is this: If the child was born prematurely as the result of this accident, but "no harm follows" (i.e. the child survived), then a fine was to be exacted; however, if "harm follows" (i.e., either mother or child died), then the guilty party was to be put to death. Look at it this way. Why would God exact such a severe punishment for the accidental **death** of an unborn child–if that child were not **living**?

The same understanding of the fetus as a living child is found within the pages of the New Testament. The angel Gabriel told Mary that "Elisabeth thy kinswoman, she also hath conceived **a son** in her old age" (Luke 1:36, emp. added). Please note that the conception resulted in neither an "it" nor a "thing," but in **a son**. In Luke 1:41,44, the Bible states (in speaking of Elisabeth, who was pregnant with John the Baptist) that "the babe leaped in her womb." The word for "babe" in these passages is the Greek term *brephos*, and is used here for an unborn fetus. The same word is used in both Luke 18:15 and Acts 7:19 for young or newborn children. It also is used in Luke 2:12,16 for the newborn Christ-child. *Brephos* therefore can refer to a young child, a newborn infant, or even an unborn fetus (see Thayer, 1958, p. 105). In each of these cases a living human being must be under consideration because the same word is used to describe all three.

The fact that the zygote/embryo/fetus is living (an inescapable conclusion supported by both weighty biblical and scientific evidence) thus becomes critically important in answering the question, "When does man receive his immortal nature?" When James observed that "the body apart from the spirit is dead" (James 2: 26), the corollary automatically inherent in his statement became the fact that **if the body is living, then the spirit must be present**. Since at each stage of its development the zygote/embryo/fetus is living, it must have had a soul/spirit instilled at conception. No other view is in accord with both the biblical and scientific evidence.

Conclusion

Should fetuses have "rights"? Yes, they should! They should be afforded the same protection under the law as any other human. The fact that they are not a "born" person, does not mean they are not a "person"! Those of who us are "pro-life" object (and rightly so!) to **any** procedure that results in the death (like aborting a fetus) or destruction (like dissecting a human embryo) of a human being. In an article titled "Cloning: Where Do We Draw the Line?" in the August 13, 2001 issue of *Time*, Nancy Gibbs properly assessed the pro-life position when she wrote:

> For strict pro-lifers the issue is straightforward: an embryo at any stage of development is a human life, worthy of protection, and any kind of research that entails destroying an embryo to harvest its cells is immoral, no matter how worthy the intent. It involves using people as means; it turns human life into a commodity and fosters a culture of dehumanization that we accept at our peril (158[6]:20).

That "culture of dehumanization" will indeed come "at our peril." In Proverbs 24:11-12, the writer urged:

> Deliver them that are carried away unto death, and those that are ready to be slain see that thou hold back. If thou sayest, Behold, we knew not this; doth not he that weigheth the heart consider it? And he that keepeth thy soul, doth not he know it? **And shall not he render to every man according to his work?** (emp. added).

We, as individuals and as a nation, would do well to remember the message of 1 Samuel 16:7:

> But Jehovah said to Samuel, Look not on his countenance, or on the height of his stature; because I have rejected him; for **Jehovah seeth not as man looketh, for man looketh on the outward appearance, but Jehovah looketh on the heart** (emp. added).

The sanctity of human life must be affirmed both prior, and subsequent, to birth. In speaking of the Judeo-Christian ethic, Eugene Diamond referred to the fact that "its tattered mantle of protection over newborn defective infants must be

upheld. It is really protecting us all" (1982, p. 63). Indeed, when that ethic fails to protect the unborn, eventually it will fail to protect the child in the nursery or the elderly in the rocking chair. Physician R.A. Gallop addressed this very point:

> Once you permit the killing of the unborn child, there will be no stopping. There will be no age limit. You are setting off a chain reaction that will eventually make you the victim. Your children will kill you because you permitted the killing of their brothers and sisters. Your children will not want to support you in your old age. Your children will kill you for your homes and estates. If a doctor will take money for killing the innocent in the womb, he will kill you with a needle when paid by your children. This is the terrible nightmare you are creating for the future (as quoted in Waddey, 1978, p. 6).

The legalization of infanticide (or, for that matter, euthanasia) represents a Pandora's box of evils being thrust upon society. Christians must oppose such atrocities in a forthright (yet, of course, legal and non-violent) manner. John J. Davis has explained why:

> Human life is sacred because God made man in his own image and likeness (Gen. 1:26,28). This canopy of sacredness extends throughout man's life, and is not simply limited to those times and circumstances when man happens to be strong, independent, healthy, and fully conscious of his relationships to others. God is actively at work in the womb, for example (Ps. 139: 13-16; Job 10:8-13), long before the human being can exercise the mental functions that secular humanists tend to see as the key criteria of value for human personality. The same God who lovingly is present in the womb can be present in the dying and comatose patient, for whom conscious human relationships are broken. The body of the dying can still be a temple of the Holy Spirit (cf. I Cor. 6:19), and hence sacred to God (1985, p. 191).

It is not an "option" for Christians to care for those who cannot care for themselves; God's Word contains specific commands regarding such actions (James 1:27; Isaiah 1:11,23; Romans 15:1; Leviticus 19:32; Psalm 71:9). Ignoring those commands, and remaining apathetic to the horrors occur-

ring around us, invariably produces evil fruits. What will be the natural progression that flows from the legalization of abortion on demand? Are we not seeing it, even as we write this book? The attitude is beginning to be expressed that, if one can justify the destruction of the "unwanted" fetus inside the womb, then why not treat the "unwanted" person outside the womb in a similar fashion? "Euthanasia on demand" is right around the corner. And once we have euthanized the first group (say, for example, the comatose, the chronically ill, and others), who will be next? Will it be the mentally retarded, the lame, the blind–or even those of a different color?

Take away the fetus' right to life, and how long do you think it will be before those who carried out that act decide to take away the right to life of other humans? Dr. Gallop was right–this is the horrible nightmare we have created for our future. Fetuses **do** have rights. They, just like every other living human, are made in the "image and likeness of God" (Genesis 1:26-27). And is that not one of the greatest "rights" of all?

Postnatal Manipulation

Occasionally amniocentesis is incorrect in its diagnosis, resulting in the birth of a "malformed" child. Or, perhaps amniocentesis was not performed, and thus the child born to unsuspecting parents is "deformed" in some way. In such cases, it is too late for any type of prenatal manipulation, even abortion. In order to cope with this problem, some hospitals have begun to employ what is known among health care professionals as "passive treatment." This term is a euphemism intended to disguise the fact that the baby is placed on a cold, stainless-steel table in an empty, dark, hospital room beneath a large air-conditioning vent and allowed to starve to death or die of exposure (see Lygre, 1979, p. 66). Joan Hodgman of the University of California School of Medicine admitted: "If we have a baby that I know is malformed beyond hope, I make no attempt to preserve life" (as quoted in Lygre, 1979, p. 66). Richard McCormick of the Kennedy Center for the Study of Reproduction and Bioethics at Georgetown University has suggested: "Life is a value to be preserved only insofar as it contains some potentiality for human relationships" (1974).

An investigation carried out over thirty years ago–1970 to 1972–at the Yale/New Haven Hospital in Connecticut uncovered the fact that forty-three babies died at this one hospital when medical doctors decided they were "unfit to live" and therefore withdrew food, water, etc. (Lygre, 1979, p. 65). It hardly is surprising, then, to hear Joseph Fletcher (of situation ethics fame) suggest that any individual with an IQ of 20 or less is not a person, and that anyone ranging from 20 to 40 is only marginally so (see Lygre, 1979, p. 63). Bentley Glass has suggested that "no parents will in that future time have a right to burden society with a malformed or a mentally incompetent child" (1971).

Lest someone wonder if such things actually do occur, perhaps we should be reminded of the famous "Baby Doe" case in an American hospital (see Davis, 1985, pp. 158ff.). Physicians recommended that the newborn baby girl be allowed to die, due to the fact that, in their opinion, she was too badly deformed to live. The parents accepted that advice and the hospital staff withdrew food, water, and other reasonable care. The government stepped in to state that a violation of the baby girl's civil rights had occurred ("**life**, liberty, and the pursuit of happiness"). Ronald Reagan, President of the United States, ordered the Secretary of the Department of Health and Human Services to deliver strict rules to hospitals receiving federal funds–rules which made it clear that all necessary steps were to be taken for the continuation of human life. It was postnatal manipulation that made such extraordinary governmental intervention necessary.

More and more there is a clamoring in this country to kill the handicapped, the weak, the old, the terminally ill, and others with a diminished "quality of life." Nobel laureate Francis Crick has urged that "no newborn infant should be declared human until it has passed certain tests regarding its genetic endowment and...if it fails these tests it forfeits the right to live" (as quoted in Howard and Rifkin, 1977, p. 81). Robert Cooke of the University of Wisconsin testified before a Senate subcommittee that an estimated "2,000 infants a year are dying in America because treatment has been withheld or stopped" (as quoted in Marx, 1975, p. 9). Glanville Williams,

in his book, *The Sanctity of Life and the Criminal* Law, strongly advocated the legalization of both "humanitarian infanticide" and "euthanasia for handicapped children" (1957). Joseph Fletcher even has stated that we are "morally obliged" to end the lives of those who are terminally ill (1979, p. 152). William Gaylin, professor of psychiatry and law at Columbia University, declared: "...It used to be easy to know what we wanted for our children, and now the best for our children might mean deciding which ones to kill. We've always wanted the best for our grandparents, and now that might mean killing them..." (as quoted in Marx, 1975, p. 3).

The ulterior motives behind such statements can best be expressed in one word: **selfishness**. The conclusion is drawn that it would be "best for the individual involved," when in reality the person drawing the conclusion is saying, "I don't want to be saddled with the burden of a defective child, incapacitated grandparent(s) or parent(s), etc. I want to be free to 'do my own thing' without the restrictions imposed on me by another individual." Such attitudes as these are horribly wicked and must be opposed by faithful Christians. In Proverbs 24:11-12, the writer urged:

> Deliver them that are carried away unto death, and those that are ready to be slain see that thou hold back. If thou sayest, Behold, we knew not this; doth not he that weigheth the heart consider it? And he that keepeth thy soul, doth not he know it? And shall not he render to every man according to his work?

Those who are intent on ridding us of the "defective" and "malformed" would do well to read 1 Samuel 16:7:

> But Jehovah said to Samuel, Look not on his countenance, or on the height of his stature; because I have rejected him; for Jehovah seeth not as man looketh, for man looketh on the outward appearance, but Jehovah looketh on the heart.

The words of the Lord in Luke 14:13-14 also are appropriate:

> But when thou makest a feast, bid the poor, the maimed, the lame, the blind, and thou shalt be blessed; because they have not wherewith to recompense thee; for thou shalt be recompensed at the resurrection of the just.

The sanctity of life must be affirmed both prior, and subsequent, to birth. In speaking of the Judeo-Christian ethic, Eugene Diamond referred to the fact that "its tattered mantle of protection over newborn defective infants must be upheld. It is really protecting us all" (1982, p. 63). Indeed, when that ethic fails to protect the unborn, eventually it will fail to protect the child in the nursery or the elderly in the rocking chair. R.A. Gallop has addressed this very point:

> Once you permit the killing of the unborn child, there will be no stopping. There will be no age limit. You are setting off a chain reaction that will eventually make you the victim. Your children will kill you because you permitted the killing of their brothers and sisters. Your children will not want to support you in your old age. Your children will kill you for your homes and estates. If a doctor will take money for killing the innocent in the womb, he will kill you with a needle when paid by your children. This is the terrible nightmare you are creating for the future (as quoted in Waddey, 1978, p. 6).

Christians must oppose such atrocities as infanticide and euthanasia. John J. Davis has explained why:

> Human life is sacred because God made man in his own image and likeness (Gen. 1:26,28). This canopy of sacredness extends throughout man's life, and is not simply limited to those times and circumstances when man happens to be strong, independent, healthy, and fully conscious of his relationships to others. God is actively at work in the womb, for example (Ps. 139: 13-16; Job 10:8-13), long before the human being can exercise the mental functions that secular humanists tend to see as the key criteria of value for human personality. The same God who lovingly is present in the womb can be present in the dying and comatose patient, for whom conscious human relationships are broken. The body of the dying can still be a temple of the Holy Spirit (cf. I Cor. 6:19), and hence sacred to God (1985, p. 191).

It is not an option as to whether Christians should care for those who cannot care for themselves. God's Word contains specific commands regarding such actions (James 1:27; Isa-

iah 1:11,23; Romans 15:1; Leviticus 19:32; Psalm 71:9). Ignoring those commands, and remaining apathetic to the horrors occurring around us, invariably produces evil fruits. As Trevor Major has commented: "Euthanasia represents a natural progression from the legalization of abortion on demand. After all, if one can justify the taking of 'unwanted' or 'useless' life inside the womb, then why not take 'unwanted,' 'useless' life outside the womb?" (1991, pp. 6-7). Dr. Gallop was right—this is the horrible nightmare we have created for our future. We will have more to say on this issue in chapter 5.

4

THE ETHICS OF HUMAN STEM-CELL RESEARCH

Undoubtedly, one of the most significant scientific achievements in human history was the cloning of Dolly–the sheep cloned from an adult mammalian cell. In the minds of many scientists, another scientific milestone was the report that appeared in the November 6, 1998 issue of *Science*, discussing the creation of a line of embryonic stem cells taken from discarded embryos donated by *in vitro* fertilization clinics (Thomson, 1998). Shortly thereafter, scientists from Johns Hopkins announced a method of obtaining similar cells from the primordial tissue of aborted fetuses (Gearhart, 1998). Then, the April 2, 1999 issue of *Science* reported on the development of a line of adult human mesenchymal stem cells (Pittenger, et al., 1999).

The incredible brouhaha created by global cloning efforts has spawned equally incredible scientific scenarios–which are turning into reality even as we write this series of articles. Researchers generally distinguish among four types of genetic applications. **Somatic cell therapy** refers to efforts to correct the functioning of a defective gene in an individual's body cells or to replace it and thus cure the disease that it causes. **Germ-line interventions** alter germ (reproductive) cells, thereby making changes that affect the next generation through the present generation's progeny. **Enhancement genetic engineering** entails using genetic engineering to produce (in already healthy individuals) improvements such as greater height, increased strength, or sharper memory. **Eugenics** involves systematic efforts to breed superior individuals, in this case through genetic selection or alteration.

Scientists are absolutely enthralled with the possibilities they see on the horizon of treating (or preventing) all kinds of diseases or creating "replacement" organs. Plus, people around the world are clamoring for "designer babies." With the new technology that is becoming available on almost a daily basis, apparently the sky is the limit. As one Web site promised: "Come [to our facility] and return to your country pregnant with the child of your dreams" (see Boisellier, 2001b). Under the heading, "Designer Baby," the October 16, 2000 issue of *Time* reported a real-life scenario about that very thing–the child of your dreams.

A Colorado couple–the Nashes–had a daughter, Molly, who desperately needed a bone marrow transplant–preferably from a genetically matched sibling. But the Nashes had no other children. So, using presently available *in vitro* fertilization techniques, they set out intentionally to create a "genetically matched" brother or sister for Molly–with the specific goal of using the newborn's stem cells (derived from the umbilical-cord blood shortly after birth) to treat Molly's condition. In late 1999, the IVF procedure was carried out, and in early October of 2000, as *Time* reported, researchers working at the Fairview University Hospital in Minneapolis, Minnesota, successfully transferred the stem cells from the newborn's (his name is Adam) umbilical cord to Molly. The *Time* writer acknowledged, however:

> The Nashes' decision has prompted inevitable questions about the ethical implications of parents' choosing their offspring's features as if they were options on a minivan. But even as the issue is debated, the practice is catching on. Already, 300 IVF babies in the U.S. have been born after the same genetic-screening procedure the Nashes used.... Welcome to Brave New World, Molly and Adam (Park, 2000, 156[16]: 102).

Unfortunately, it is not just Molly and Adam that are entering a "Brave New World." The rest of us are being dragged–kicking and screaming–into that Huxlian alternative cosmos as well.

So where is all this leading? And why the sudden interest in "stem cells"? While employing "stressed" body cells (e.g., mammary gland cells from an adult, such as those used to clone Dolly the sheep) has no ethical overtones (when used in non-human cloning procedures), the use of certain **human** stem cells does. Stem cells are the body's "blank slates"–sometimes referred to as "magic seeds." As such, they have the ability to divide for indefinite periods in a laboratory culture to produce more stem cells, or to give rise, under specified conditions, to a veritable plethora of other cells. [Humans have over 250 cell types; Baldi, 2001, p. 147.] Stem cells are known to exist in three varieties. **Totipotent** stem cells possess an unlimited capability to specialize into any type of cell necessary–extraembryonic membranes and tissues, post-embryonic organs and tissues, etc. [The embryo itself is totipotent.] **Pluripotent** stem cells are capable of giving rise to most, although not all, tissues found within an organism; generally, their potential for future development has not yet been "locked in." **Multipotent** stem cells are committed to giving rise to cells that have a particular function. For example, blood stem cells give rise only to red blood cells, white blood cells, and platelets. Skin stem cells give rise only to the different types of skin cells (melanocytes, keratinocytes, fibroblasts, etc.).

SOURCES AND FUNCTIONS OF STEM CELLS

In the past, stem cells generally were obtained from four main sources: (1) umbilical-cord blood from a newborn's afterbirth; (2) adult bone marrow and/or brain tissue; (3) aborted fetuses; and (4) "discarded" embryos that no longer are "needed"–and thus will be destroyed–after *in vitro* fertilization (IVF) procedures.

Are there potential benefits that could inure from the use of stem cells? Yes, there are. When asked in an interview, "What are the potential benefits of researching these cells," bioethicist Alta Charo of the University of Wisconsin (who is a member of the National Bioethics Advisory Commission to the President), responded:

> They could help regrow heart muscle after a heart attack. They could regrow brain tissues that could be an answer to Alzheimer's, Parkinson's, and Lou Gehrig's disease. They could be used as a therapy for burns or to regenerate skin and would help in developing new drugs (2001, 56[8]:101).

But **why** is this the case? The answer lies in the way stem cells "differentiate." In his book, *The Genetic Inferno*, John Medina explained the procedure.

> [T]he cells in your cheek have the genetic instructions for your heart, your liver, your big toe, in fact every tissue in the body. Sixty million copies of everything, truly an exercise in redundancy.
>
> If that extraordinary fact is true—and it is—you can ask an important question of your mouth: why is a cheek cell always a cheek cell? If that cell truly has all the genetic information to make every tissue, why isn't every tissue in your cheek? Even if you wound the inside of your mouth, you won't grow back a foot, but rather other cheek cells. So not only is there selectivity, there is also memory. How does it all occur?
>
> The answer to that question is beginning to be understood at a refined level, and it is the reason why scientists are so delighted. It turns out that all the genes necessary to make a cheek cell are turned on in a cheek cell, and all the other genes are repressed, rendered nonfunctional. The same is true of a liver cell, where all the genes necessary to make a liver function correctly are active, and everything else (including any cheek cell genes) is turned off. This idea of turning genes on and off is exciting because we are learning how nature does it, and are in kind learning to turn them on and off ourselves (2000, p. 16).

In his intriguing book, *Fly: The Unsung Hero of Twentieth-Century Science* (about the tiny fruit fly *Drosophila melanogaster* used in so many research programs), Martin Brookes elaborated on the idea discussed by Medina.

> The ability of genes to be turned off and on could account for the range of cell identities. But the deeper question still remained: **Who was throwing the switches in the first place? Who was overseeing and organizing the whole operation? Who was the architect?**...

> To understand the overall picture of genes and development, think of the body in terms of everyday geography. Instead of the body, for example, think of a map of the United States. At the beginning of development, there is just a basic country. Then a group of control genes swings into action, dividing the outline into north, south, east, and west. A second group of genes, the "state" genes, if you like, is responsible for directing the division of the country into fifty states. Of course, the same "genes" will be present in all states. But in Texas, only the "Texas" genes are switched on, while in Maine, only the "Maine" genes are switched on. Next, the "county" genes become active, dividing each state into a collection of counties. After counties, yet another group of control genes directs the formation of towns and cities within each county, and so on (2001, pp. 61,66, emp. added).

The fact that embryonic stem cells–at such an early juncture in their lives–are undifferentiated (what Brookes referred to as a "basic country") makes them both valuable and widely sought after. Within them lies the potential, for example, to grow heart muscle that could be used to repair the damage brought on by a heart attack. They could be used to regenerate skin cells as a therapy for burn patients, or pancreas cells to treat diabetics. They could grow into fresh new brain cells that might restore brain functions in conditions like Alzheimer's, Parkinson's, and Lou Gehrig's disease. And so on.

Pro-life groups have no problem whatsoever with scientists harvesting stem cells for use in research or in procedures intended to help cure certain diseases (such as diabetes) when those stem cells are derived from either the umbilical-cord blood of a newborn or adult bone marrow and/or brain tissue. Harvesting such cells does not kill an already-living human being.

However, the minute quantities of cells that can be obtained from umbilical-cord blood, and the complexity of obtaining such cells from adult tissues, have made these two practices unpopular. Plus, scientists fear that stem-cell lines from adults may lose their potency over time because they do not always grow well in culture settings. In addition, researchers are un-

certain as to whether stem cells derived from adults will prove to be as versatile as embryonic stem cells. Scientists have learned that the earlier they obtain stem cells, the less likely those cells are to have undergone any differentiation. As a result, scientists involved in stem-cell research generally prefer to use cells derived from the earliest possible (embryonic) stages of development, rather than from the umbilical cord blood of newborns or tissues harvested from adults. Therefore, the use of stem cells from aborted fetuses and discarded embryos from "leftover" IVF procedures now is viewed as a practical necessity since those two sources guarantee large quantities of undifferentiated cells.

But this "practical necessity" has developed into a roiling controversy because of some of the sources of the **non-adult** stem cells that are being recommended for use in research programs (specifically, sources such as aborted fetuses and soon-to-be-discarded IVF embryos). In fact, emblazoned across the front cover of the July 9, 2001 issue of *Newsweek* were the words, "The Stem Cell Wars." In her feature article ("Cellular Divide") in that issue, staff writer Sharon Begley commented that using stem cells from aborted fetuses and/or discarded IVF embryos has resulted in "the latest embryo war" (138[2]: 24).

The argument set forth by those who support embryonic stem-cell research is that fetuses are being aborted by the thousands every day in America (conservative estimates, place the number upwards of 4,000/day!). And, leftover IVF embryos are becoming available in similar (or larger!) numbers. So, why not make "good use" of these aborted fetuses before they reach the landfill? Why not "retrieve" the extra, unwanted, soon-to-be-discarded embryos produced by IVF clinics that never will be used? After all, these represent invaluable sources of ready-made stem cells that otherwise would be destroyed. As paralyzed Hollywood star Christopher Reeve (of the *Superman* movies) remarked, in his view it would be unethical to let healthy embryos "be tossed away as so much garbage when they could help save thousands of lives" (as quoted in Chapman, 2001). The banner across the front cover of the July 23, 2001 issue of *Time* heralded "Stem Cells: The

Battle Heats Up," and in his feature article, staff writer John Cloud spent five full pages discussing the controversy and laying out the options presently available to researchers (158[3]: 22-26).

On August 23, 2000, the National Institutes of Health (NIH) "opened the floodgates" by publishing guidelines for the public funding of embryo stem-cell research in the United States, an about-face of its earlier position. Previously, embryo stem-cell research was funded exclusively from private sources. The NIH announcement lifted a ban that had been in place on such research since 1996. On January 22, 2001, Britain's House of Lords became the first government to effectively legitimize cloning of human embryos for stem-cell research (with the stipulation that the cloned embryos be destroyed no later than 14 days after having been created).

THE SANCTITY OF HUMAN LIFE AND SCIENCE'S "SLIPPERY SLOPE"

There are those who insist that such non-adult sources are the very ones we **ought** to be using in research efforts (especially IVF "left-over" embryos). In his volume, *Clones, Genes, and Immortality*, John Harris suggested that "it would not be wrong" to use unwanted embryos left over from IVF procedures "so long as the embryo is not in fact implanted" (1998, p. 63). In chapter 3, we quoted Hubert Markl, president of the Max Planck Society, who made the following statement in the "Commentary" section in the August 2, 2001 issue of *Nature,* under the title of "Research Doesn't Denigrate Humanity":

> This all boils down to the eternal question, "What is a human being?" ...Every human being is new, unique and developed from a fertilized egg cell. However, **the fertilized egg is far from being a human being** in the full sense of that word: it can be called a human being only if the word is given a meaning totally different from its usual definition. When we refer to an organism as "human," this is an expression of self-reference, the meaning of which is stipulated not by nature but by humans themselves. "Human" is a culturally defined attribute, not a purely biological fact....

> **A human being is made not at conception but when the zygote becomes implanted**.... [T]here is no biological reason to attribute complete personhood to a few-celled embryo simply because, in interaction with a mother organism, it has the ability to become one (2001, 412:479,480, emp. added).

And so–if we are to understand these two scientists correctly–were the embryo to be allowed to attach itself to the uterine wall, **then** it would be wrong to employ it in any given research procedure. But if it is **not** allowed to implant, then there would be nothing wrong with destroying the embryo by robbing it of its stem cells. [One cannot help but wonder, upon seeing statements such as these, what makes it "right" to destroy the embryo seconds **before** it attaches itself to the womb, but "wrong" to destroy it seconds **after** it implants? Furthermore, think for a moment (from the viewpoint of those who defend such a position) about how this argument simultaneously would apply to those cells harvested from aborted fetuses–which represent embryos that most definitely have "already implanted." Such a procedure–given their own definition–would be "wrong"!]

Pro-life supporters object (and rightly so!) to **any** procedure that results in the death (like aborting a fetus) or destruction (like dissecting an IVF embryo) of a human being–regardless of the potential for good that may result from being able to use the harvested cells for such noble purposes as the alleviation of suffering or the extension of life. In her article titled "Cloning: Where Do We Draw the Line?" in the August 13, 2001 issue of *Time*, Nancy Gibbs properly assessed the pro-life position when she wrote:

> For strict pro-lifers the issue is straightforward: an embryo at any stage of development is a human life, worthy of protection, and any kind of research that entails destroying an embryo to harvest its cells is immoral, no matter how worthy the intent. It involves using people as means; it turns human life into a commodity and fosters a culture of dehumanization that we accept at our peril (158[6]:20).

While many scientists today adhere to the "technological imperative" that we mentioned earlier (the idea that whatever

can be done, **will** be done), they have failed to realize that **the end does not always justify the means!** We **can** retrieve stem cells from aborted fetuses. And we **can** obtain stem cells from discarded IVF embryos. But that is not the point. The question is: **should** we? Is it **right** to abort fetuses in the first place? Is it **right** to create by *in vitro* fertilization thousands of "extra" embryos that we know never will be permitted to grow into an adult human? John Cloud summarized the issue quite well when he wrote in his July 23, 2001 *Time* article:

> Stem cells derived from human embryos could lead to cures for some of humanity's most devastating illnesses–**but to get to the little knots of magic tissue, we have to destroy the embryos, which might otherwise one day become babies** (158[3]:22, emp. added).

Yes, those aborted fetuses and discarded embryos "might otherwise one day become babies"–a reality that United States President George W. Bush artfully acknowledged in his carefully crafted August 9, 2001 speech on funding of stem-cell research by the federal government. During that speech, he stated:

> Research on embryonic stem cells raises profound ethical questions, because extracting the stem cell destroys the embryo, and thus **destroys its potential for life**. Like a snowflake, each of these embryos is unique, with the unique genetic potential of an individual human being....
>
> At its core, this issue forces us to confront fundamental questions about the beginnings of life and the ends of science. It lies at a difficult moral intersection, juxtaposing the need to protect life in all its phases with the prospect of saving and improving life in all its stages.... Embryonic stem-cell research is at the leading edge of a series of moral hazards.... [W]hile we must devote enormous energy to conquering disease, it is equally important that we pay attention to the moral concerns raised by the new frontier of human embryo stem cell research. **Even the most noble ends do not justify any means**....

> **I also believe human life is a sacred gift from our Creator.** I worry about a culture that devalues life, and believe as your President I have an important obligation to foster and encourage respect for life in America and throughout the world. And while we're all hopeful about the potential of this research, no one can be certain that the science will live up to the hope it has generated.
>
> Eight years ago, scientists believed fetal tissue research offered great hope for cures and treatment–yet, the progress to date has not lived up to its initial expectations. Embryonic stem-cell research offers both great promise and great peril. So I have decided **we must proceed with great care** (2001, emp. added).

Indeed, we **must** proceed with great care! We are dealing not merely with the lives of those in this generation, but with the lives of those who will compose the next generation as well. And, truth be told, on January 22, 1973 when the U.S. Supreme Court legalized abortion on demand, it took the first step on the slippery slope toward the dehumanization of every American. As newspaper columnist Cal Thomas put it: "A nation that will not protect babies at the moment of their birth is not likely to acquire a latent morality on the way to exterminating them at ever-earlier stages" (2001). Or, as *Time* writers Gibbs and Duffy commented in their "We Must Proceed with Great Care" (August 20, 2001) article: "**This is biology spilled down a slippery slope**" (158[7]:15, emp. added). A slippery slope indeed! No amount of impassioned or inflamed rhetoric on the part of those who support research using aborted fetuses or left-over IVF embryos can alter the fact that the tiny "knots of magic tissue" known as stem cells could–given an opportunity–one day become babies.

THE ETHICS OF STEM-CELL RESEARCH

As we noted earlier, basic medical ethics requires that any experiment on humans be to the **subject's benefit**. It hardly is to the benefit of the tiny embryo to be ripped apart as it is "mined" for its mother lode of stem cells. Nor is it to its advantage to be washed down the drain and drowned in the early

hours of life! Are these tiny embryos human? If one of them were traveling down a woman's Fallopian tube or implanted in her uterus instead of floating in a Petri dish, it would be considered unquestionably human. Yet somehow because it now is capable of being manipulated outside the safety of the womb its "humanness" ceases? With what kind of incongruous logic do we reach such a conclusion? In his response to the manner in which IVF procedures are carried out, ethicist Allen Verhey commented:

> Even if one did not hold that the human being's history begins with conception, respect for human life is nevertheless violated here...because here human life is created in order to be destroyed. Here the procedure demands from the very beginning the intention to kill those intentionally fertilized but not chosen (1978, p. 16).

Dr. Verhey's statement was made in 1978 in regard to strict *in vitro* fertilization techniques. Now, more than two decades later, it has taken on an entirely new meaning. Why so? In the July 2001 issue of *Fertility and Sterility*, scientists from the famous Howard and Georgeanna Jones Institute for Reproductive Medicine in Norfolk, Virginia, announced that they had paid women volunteers from $1,200 to $2,000 each to donate their eggs–eggs that then were fertilized with donor sperm cells to produce living embryos **that subsequently were destroyed intentionally in a procedure that robbed them of their precious stem cells**.

Of the 162 eggs collected and inseminated by donor sperm, 50 embryos were successfully created. The researchers destroyed 40 of those to get the stem cells that resided inside. Until now, scientists had derived embryonic stem cells mainly from "excess" embryos donated from infertility treatments occurring at IVF clinics. That was not true in this particular case, however. Rather, researchers approached donors and informed them that their eggs and sperm would be used specifically to develop embryos for stem-cell research (see "Virginia Lab Harvests Stem Cells Created for Research," 2001).

In the July 23, 2001 issue of *Newsweek*, Debra Rosenberg and Karen Springen reviewed the Jones Institute's research.

> The ethics of the experiment immediately rang alarm bells. Until now most researchers have proposed using frozen embryos left over from *in vitro* fertility treatments as a source of stem cells. Creating embryos so they can be destroyed was something else, even though the researchers obtained informed consent from the egg and sperm donors (2001, 138[4]:6).

When Dr. Verhey suggested–as long ago as 1978–that "here the procedure demands from the very beginning the intention to kill those intentionally fertilized but not chosen," he likely had no idea how prescient his statement was in regard to events occurring more than twenty years later. Now, as a result of the efforts of the Jones Institute, the creation of the embryos has nothing whatsoever to do with the **production** of life, but rather with the **destruction** of life. Now, we actually have reached the point in science where we are **creating** life in the laboratory for the sole purpose of **destroying** it!

And so, the argument that we merely are "making good use" of embryos left over as a result of IVF procedures–embryos that would have been discarded anyway–no longer holds sway. In fact, now, for all practical intents and purposes, it is a moot point. We no longer need those embryos. Why use frozen specimens when we can produce fresh ones at will–as we need them?

The thought of creating life to destroy it even upsets some of those who otherwise support stem-cell research. In the June 23, 2001 issue of *Time*, Charles Krauthammer, M.D. authored an essay titled "Mounting the Slippery Slope" in which he lamented the current ongoings in science.

> Had we not all agreed that it is unethical, a violation of the elementary notion that we don't make of the human embryo a thing–to be made, unmade and used as a mere instrument for others?...
>
> A day after the news from Norfolk, we learned that a laboratory in Worcester, Mass. (the very same lab that three years ago produced a hybrid human-cow embryo) is trying to grow cloned human embryos to produce stem cells–but could be used to produce a full or (even more ghastly) partial human clone. **What other monstrosities are going on that we don't know about**?...

> People are horrified when a virgin hill is strip-mined for coal; how can they be unmoved when a human embryo is created solely to be strip-mined for its parts?
>
> What next? Today a blastocyst is created for harvesting. Tomorrow, researchers may find that a five-month-old fetus with a discernible human appearance, suspended in an artificial placenta, may be the source of even more promising body parts. At what point do we draw the line?... [We] owe posterity a moral universe not trampled and corrupted by arrogant, brilliant science (2001, 158[3]:80, emp. added).

Krauthammer is correct in his assessment. Barring governmental intervention, cloning human stem cells likely will become as routine as paying women to donate their eggs, or paying men to donate their sperm, to produce embryos for the sole purpose of destroying them in order to harvest their stem cells. That phrase, "barring government intervention," is critically important.

LEGAL GUIDELINES FOR STEM-CELL RESEARCH

In the United States, prior to the decision by President Bush on August 9, 2001 to allow limited research on stem cells using solely those lines already in existence, two distinct sets of guidelines addressed the status of research on human embryos–both of which militated against their use in research. The first was the *1994 Report of the Human Embryo Research Panel;* the second was a group of regulations regarding research on transplantation of fetal tissues (section 498A of the Public Health Services Act). Both sets of guidelines specifically prohibited the use of public funds for research on tissues derived from human embryos.

Late in 1998, however, Harold Varmus, who at the time was the director of the National Institutes of Health, decided to allow funding of pluripotent stem-cell research. In response to his decision, in February 1999 seventy members of Congress signed a letter calling upon the Department of Health and Human Services to reverse Varmus' decision and impose a ban on stem cells from human embryos or fetuses. In

July 1999, the National Bioethics Advisory Commission recommended federal funding not only for research on human embryonic stem cells, but also for the production of cell cultures, even at the cost of sacrificing embryos. The White House, however, eventually adopted a more conservative position which suggested that research on embryonic stem cells "is permissible under the current congressional ban"–a position that backed the NIH interpretation of current laws allowing government funds to be spent **to study, but not to derive,** stem cells from embryos (derivation could occur only in private laboratories).

In late 1999, the NIH issued new guidelines for research on embryonic stem cells. Those guidelines, reported in the December 10, 1999 issue of *Science,* were as follows: (see Vogel, 1999, 286:2050-2051):

Deriving new cells from embryos	**Prohibited**
Research on privately derived cell lines from embryos	**Prohibited**
Deriving new cell lines from fetal tissues	**Allowed**
Research that would use stem cells to create a human embryo	**Allowed**
Combining human stem cells with animal embryos	**Prohibited**
Use of stem cells for reproductive cloning	**Prohibited**
Use of stem cells for reproductive cloning Research on stem cells derived from embryos created for research purposes	**Prohibited**

Then, in August 2000, the NIH revised the above guidelines (as reported in *Science,* September 1, 2000; see Vogel, 2000b, 289:1442-1443) to state that NIH-funded researchers could work on embryonic pluripotent stem cells derived by privately funded researchers, provided that:

> Embryonic stem cell lines are derived only from frozen embryos created for fertility treatments (viz., IVF procedures).
>
> The decision to donate the embryos is separated from fertility treatment.

Embryo donors are told they cannot accept financial or other compensation and that the cells may be used indefinitely, possibly even for commercial purposes (embryo donors may be identified, if they are notified in advance).

No stem cells may be used for research if those cells have been derived from nuclear transfer technology (i.e., cloning).

On January 28, 2001, Tommy G. Thompson, Secretary of the U.S. Department of Health and Human Services, sent a letter to the National Institutes of Health, asking the NIH to submit a report on the current status of the science involved in stem-cell research. The 168-page, heavily illustrated document (*Stem Cells: Scientific Progress and Future Research Directions*), which was produced in compliance with Secretary Thompson's request, was released on June 10, 2001, and encouraged federal funding of human embryonic stem-cell research (see *Stem Cells: Scientific Progress...*, 2001).

Many scientists are loath to restrict their future experiments to already-existing stem-cell lines, due mainly to the fact that they do not believe current lines offer enough genetic diversity. Plus, cutting off the source for any future stem cells, scientists say, would limit severely the diversity that is required to make the stem-cell research applicable in all cases since each stem-cell line varies subtly from all others and researchers have not yet determined which ones are best. Cell biologists believe that even if there are as many as 60-65 cell lines available worldwide (the number identified by the NIH), that still would be too few to ensure successful therapies for many diseases. They also note that several of the existing cell lines do not grow well in culture, rendering them impractical for important research efforts.

IS STEM-CELL RESEARCH A PANACEA?

The use of stem cells is controversial, especially when those stem cells have been harvested from embryos or fetuses. But adding to the controversy is the fact that we now have evidence to show that stem cells can be **disadvantageous** when

injected into the body. Need proof? Consider article that appeared in the August 2003 issue of *Reader's Digest*, alongside an image of a cheerful-yet-insistent face (Kinsley, 2003). The title read simply: "Cure Me If You Can." The author, Michael Kinsley, was diagnosed in November 1993 with Parkinson's disease–a neurodegenerative disorder characterized by a selective loss of a specific group of (nigrostriatal) nerves that release dopamine. Judging from the photograph accompanying his article, it is obvious that this progressive neurodegenerative disease struck Mr. Kinsley at an unusually young age. He understands that his condition will worsen with each passing year, and that ultimately it will "take away most of what makes life enjoyable" (p. 104).

Kinsley pointed out that medical research is making great progress, but noted that the real "kicker" is that "government has entered the race–on the side of the disease" (p. 104). He remarked: "It is frustrating to know that scientists believe important breakthroughs or even a cure could be just over the horizon, but the way is being blocked" (p. 105). He went on to write:

> Fetal tissue research, which also has shown promise for Parkinson's, uses dopamine-producing brain cells from aborted fetuses. They are implanted in patients' brains, in the hope that they will replace dopamine-producing brain cells that have died. Cells from several fetuses are needed for each Parkinson's patient who gets the treatment (p. 105).

In trying to argue his case for the use of stem cells and therapeutic cloning, Kinsley admitted:

> None of these distinctions [between stem cells, fetal tissue, cloning, etc.–BT/BH] matters, of course, if you believe that full human life and rights begin at the moment of conception.... None of this matters if you actually believe that destroying an embryo is morally just like murdering your next door neighbor (p. 106).

As tragic as Mr. Kinsley's situation is, it does not change God's position regarding human life. Some forty times, the Scriptures make reference to women conceiving. It certainly is no accident that the inspired writers mention this extraor-

dinary moment in which the sperm and egg come together–for it is at that very instant that their chromosomes join to form the full complement of chromosomes that is capable of producing human life. Upon conception –when that full complement of chromosomes is actively metabolizing and living–God already has placed a soul within the embryo. Consider also the fact that the prophet Jeremiah stated that the word of the Lord came unto him, saying: "Before I formed thee in the belly, I knew thee; and before thou camest forth out of the womb I sanctified thee, and I ordained thee a prophet unto the nations" (1:5). The prophet Isaiah wrote:

> Listen, O isles, unto me, and hearken ye peoples, from afar; Jehovah hath called me from the womb; from the bowels of my mother hath he made mention of my name.... And now, saith the Lord that formed me from the womb to be his servant (49:1,5).

Jehovah not only viewed Isaiah as a **person** prior to his birth, but also **called him by name**. It is obvious from the text that God considers human life as beginning at conception. Thus, as Christians, we must not support research that would compromise His view.

But what about Mr. Kinsley's suggestion that scientists are on the brink of "important breakthroughs?" Do aborted fetuses and "leftover" embryos from *in vitro* fertilization procedures offer **so much hope** that Christians should support this form of killing in favor of curing humankind of these horrendous diseases? The truth is, we have been fed a lie–a lie that the media continue to use to justify the 1.2+ million infants killed by abortion each year, as well as the 400,000 embryos that have been plunged into the icy depths of liquid nitrogen. We are told repeatedly about the "potential benefits" of these embryonic tissues. Yet science has shown otherwise–not once, but twice!

In a telling article titled "Strike Two for Transplants," science writer Gretchen Vogel lamented: "For the second time, cells transplanted from fetuses into brains of Parkinson's patients have failed to show a significant effect." She went on to note that the double-blind study "failed to produce significant improvements in patients' movement, **but caused serious side effects in more than half the patients**" (2003b,

emp. added). Not only did the aborted fetal tissue not help, it actually hurt in some cases! C. Warren Olanow and his colleagues conducted the collaborative study (which consisted of 34 patients), in an effort to determine the effects of transplanting fetal nigral neurons (nerve cells) into Parkinson's patients. Parkinson's patients, ranging in age from 30 to 75 years old, received tissue transplants that were obtained from one to **four** aborted fetuses. Thus, in twelve cases, the tissue from **four** aborted fetuses was required to try and "cure" one Parkinson patient. We wonder if Mr. Kinsley would condone the murder of 4 human beings in an effort to save one–**him**? All told, **59** aborted fetuses were used in this study.

So what was the end result after using the nigral cells from **59** aborted babies? The authors observed that "there was no overall treatment effect" (Olanow, 2003, 54:405). They then concluded:

> Furthermore, unanticipated and potentially disabling off-medication dyskinesias [difficulty moving–BT/BH] developed in greater than 50% of the patients. **We cannot therefore recommend fetal nigral transplantation as a therapy for PD** [Parkinson's disease –BT/BH] at this time (p. 413, emp. added).

As Ms. Vogel noted, however, this was not the first time this type of procedure has failed. She wrote: "The first major study of the technique, led by Curt Freed of the University of Colorado Health Sciences Center in Denver, ended in controversy when it failed to help patients overall, and left some with frightening uncontrollable movements" [as reported in *Science*, March 16, 2001, p. 2060], (Vogel, 2003b)]. So we now have multiple clinical trials that show conclusively no effect (and even serious detrimental effects) of having used fetal tissues. Additional research has shown that the use of some stem cells may even produce tumors resulting from rapid growth. In the words of Michael Shamblott, a researcher in John Gearhart's laboratory at Johns Hopkins University: "Injected into the body, stem cells can produce tumors" (see "New Lab-Made Stem Cells May be Key to Transplants," 2000). Not exactly what you would call a panacea, eh?

Why haven't *Time* and CNN announced this as their lead stories? The media parade every scientific "breakthrough" that might be of potential benefit to patients with Parkinson's or Alzheimer's, yet when these breakthroughs are shown to be "potential killers," nary a word is said. How terribly unfortunate. And how very wrong!

Critics of stem-cell research point out, accurately, that the cells for this research still come from the destruction of human embryos. In a feature article in the July 30, 2001 issue of *U.S. News & World Report* on "Matters of Life and Death," Terence Samuel commented on this gruesome fact and presented the view of one conservative United States senator (Sam Brownback of Kansas) when he wrote:

> Stem cells are elemental human cells that can generate many different kinds of human tissue.... Opponents contend that extracting cells for research kills the embryos and therefore kills the children that might have developed from the embryos. It is, in their eyes, a simple act of murder (2001, 131[4]:16).

The fact that the destruction took place in the past does not lessen the dastardly nature of the deed; nor does it justify the use of the cells merely because the humans that provided them are not being killed **now**. As Gene Tarne, spokesman for the Coalition of Americans for Research Ethics, observed: "The stem-cell lines are derived from destroying embryos, whether that was yesterday or next week" (as quoted in Wadman, 2001).

The sad part of all of this is that the destruction of embryonic stem cells is completely unnecessary. There are acceptable alternatives. As Kelly Hollowell observed:

> The best sources of stem cells are (1) from our own organs–termed adult stem cells or tissue stem cells; (2) cord blood (the small amount of blood left in an umbilical cord after it is detached from a newborn); (3) bone marrow stem cells which have been demonstrated to make more than blood but also bone, muscle, cartilage, heart tissue, liver, and even brain cells; (4) and neuronal stem cells which can be stimulated to make more neurons, or to take up different job descriptions as muscle and blood.

Bone marrow and cord blood are already successfully being used clinically, while clinical use of embryonic stem cells is years away. Current clinical applications of adult stem cells include treatments for cancer, arthritis, lupus and making new corneas, to name a few (2001, emp. added).

CONCLUSION

The potential legalization of the wanton destruction of human embryos does not represent a panacea. Rather, it represents a Pandora's box of evils about to be thrust upon an unexpecting society. As medical ethicist Paul Ramsey, quoted earlier, correctly observed: "We cannot even develop the kinds of reproductive technologies being discussed here "without conducting unethical experiments upon the unborn who must be the mishaps (the dead and retarded ones) through whom we learn how" (1970, p. 113, parenthetical item in orig.).

Faithful Christians must oppose such atrocities in a forthright (yet, of course, non-violent) manner. It is incomprehensible to think that we have come to such a point in America's history. More than thirty years ago, the American judicial system declared that it was permissible to murder–with complete impunity–unborn children in the womb. Now, we have come to a time when scientists have stated publicly that they are willing to destroy, not just the developing fetus, but even the tiny human embryo, in ever-increasing numbers in order to achieve their stated goals. Sad times, these. Sad times indeed.

5

EUTHANASIA

The Hippocratic Oath contains the phrase: "I will follow that system of regimen which, according to my ability and judgment, I consider for the benefit of my patients, and abstain from whatever is deleterious and mischievous. I will give no deadly medicine to any one if asked, nor suggest any such counsel; and in like manner I will not give to a woman a pessary [a medicated vaginal suppository–BT/BH] to produce abortion." However, those words apparently hold little meaning to many physicians who have graduated from medical school in the last twenty years. Today many physicians often joke about taking the "Hypocritic" oath. In light of the changes that are taking place in our society, it is not surprising that only eight percent of doctors pledge to forswear abortion, **and only fourteen percent promise not to commit euthanasia** (Smith, 2000, p. 20, emp. added).

The American Medical Association (AMA) defines euthanasia as "the administration of a lethal agent by another person to a patient for the purpose of relieving the patient's intolerable and incurable suffering" (see *AMA Code of Medical Ethics, Opinion 2.21*). According to their own code of ethics, physicians are to respond aggressively to the needs of patients at the end of life, but not engage in euthanasia. Glover defines three categories of euthanasia: (1) Voluntary: where the person is assisted to die in their best interests after a competent request; (2) Non-voluntary: where a person is assisted to die in their best interests, but without being able to make such a request; and (3) Involuntary: where a person is assisted to die, supposedly in their best interests, but against their expressed wishes (1977). The last of these could scarcely be distinguished from murder. Our English word "euthanasia" de-

rives from the Greek *eu*, meaning "well," and *thanatos*, meaning "death." However this "good death," as many like to call it, is not as altruistic as it sounds.

In a prophetic article in the July 14, 1949 issue of the *New England Journal of Medicine*, Leo Alexander, an individual who had worked for the chief counsel for war crimes after World War II, examined the initial causes of the Holocaust. The beginnings, he stated, were merely a subtle shift in emphasis in the basic attitudes of physicians. It started with the belief–which is common today among those in the euthanasia movement–that there is such a thing as "a life not worthy to be lived." The Nazis often described the patients that they were killing as "useless eaters." Among those physicians who helped start the Nazi killing mentality was Ernst Wetzler, who, ironically, invented one of the first types of incubators for children born prematurely. In commenting on his gruesome acts, Dr. Wetzler called his participation in the murder of disabled infants in Germany "a small contribution to human progress" (as quoted in Smith, 2000, p. 43). It is not surprising, in light of recent attitudes here in the United States, that just before his death in 1984, Alexander warned that these same lethal attitudes were taking root in this country. Biomedical ethicist Amil E. Shamoo agreed. He wrote:

> We in the United States don't have systemic atrocities, we have compartmentalized atrocities. But the intellectual underpinnings are the same as they once were in Germany: for the good of science; for the advancement of knowledge; for the benefit of society; for the national interest (as quoted in Smith, p. 47).

What happens when the elderly members of society no longer feel loved, and begin to think of themselves as a "burden"? Consider the eighty-year-old grandmother with multiple medical complications who does not want to be a "bother" to her children. Society sometimes places very little value on the disabled and elderly, and therefore many are taking their own lives prematurely–either through euthanasia or suicide. Diane Coleman, founder of Not Dead Yet, stated: "There is a great revulsion against disabled people that is visceral. This disdain is masked as compassion but many people believe that in an ideal world, disabled people wouldn't be there" (as quoted in Smith, p. 28).

Columbia, Switzerland, the Netherlands, and Australia have all legalized euthanasia. On November 28, 2000, the lower chamber of the Netherlands's parliament became the first group to vote in favor of legalizing euthanasia (see Comiteau, 2000). In 1996, Australia's Northern Territory legalized medically assisted suicide for terminally ill patients. Elsewhere (such as in Colombia and Switzerland), governments have ruled that it is not a crime to help a terminally ill person die as long as they have given clear and precise consent. While the Swiss outlaw active euthanasia, there is leeway for doctors to assist in suicides where they provide patients with lethal drugs but then leave them alone to administer those drugs on their own. Other countries, such as Denmark, Singapore, portions of the United States, Canada, and Australia, give patients the right to refuse life-prolonging treatment. A new study from pro-euthanasia researchers reports that euthanasia in the Netherlands continues to increase, and that now doctors not only are killing the terminally ill, but also those with chronic conditions (Smith, p.110). As of 1995, more than 1 in 42 deaths in Holland were assisted suicides. Even more alarming, 1 in 4 doctors **admits** killing patients **without the patient's request or approval** (*Washington Post*, 11/28/96, citing the *New England Journal of Medicine*).

> The experience of the Dutch people makes it clear that legalization of assisted suicide and euthanasia is not the answer to the problems of people who are terminally ill. The Netherlands has moved from assisted suicide to euthanasia, from euthanasia for people who are terminally ill, to euthanasia for those who are chronically ill, from euthanasia for physical illness to euthanasia for psychological distress, and from voluntary euthanasia to involuntary euthanasia (Hendin, 1996).

The pattern is frighteningly clear. During the past thirty years, the Dutch have proceeded down the slippery slope by first killing terminally ill patients who **request** death. They then moved on to chronically ill persons **who asked** to be killed. And they now are killing infants born with defects, who by definition **cannot ask** to be killed.

Groups now even advertise on-line various types of "death products" (such as the "Exit Bag"–see Deathmart). For just a few dollars, you can order an "infoPAK" that will give you detailed information on the latest killing devices. Is it any wonder, then, that suicide took the lives of 30,575 Americans in 1998 (11.3 per 100,000 population) [see CDC–*Suicide in the United States*]. Sadly, more people die from suicide than from homicide. In fact, in 1998 the CDC reported that there were 1.7 times as many suicides as homicides. Overall, suicide is the eighth leading cause of death for all Americans, and is the third leading cause of death for young people aged 15-24. More teenagers and young adults die from suicide than from cancer, heart disease, AIDS, birth defects, stroke, pneumonia, influenza, and chronic lung disease combined! What's going on around us? What has warped our mentalities so much that we find ourselves contemplating whether a life really is "worthy to live"?

In countries were it has been legalized, it is not considered a crime to help the terminally ill or elderly die, as long as they have given their consent. However, a survey in Holland reported that one in four doctors admits to killing patients without the patient's request or approval. But this atrocity does not take place just overseas. In 1994, the state of Oregon began forging the way for this same crime to take place in the United States. An Oregon report on assisted suicide for the year 2000 showed that more patients than ever before took their lives because they felt they had become a burden to friends, family, and caregivers. In Oregon, where assisted suicide was legalized in 1994, doctors prescribed deadly drugs to 39 patients (and yet when the local newspapers ran headlines bemoaning the state's soaring suicide rate among adolescents, nobody connected the dots). Of those 39 cases, at least 27 people were reported as having died from a deliberate lethal overdose of controlled substances under Oregon's assisted-suicide law. Additionally, the median time between a patient's initial request for assisted suicide and his or her death went from 83 days in 1999 to a mere 30 days in 2000. Interestingly, all of the patients who died under the Oregon law took barbiturates, which are regulated by the federal gov-

ernment. The 1970 Controlled Substance Act specifically states that drugs may be used only for "legitimate medical purposes." Does assisted suicide fit that definition? The American Medical Association (AMA) is on record as supporting abortion, yet this same professional organization has taken a firm stand in defense of life in the area of doctor-assisted suicide. In a medical brief, the AMA stated: "There is, in short, compelling evidence of the need to ensure that all patients have access to quality palliative care, but not of any need for physician-assisted suicide…" (see AMA: *Anti-Euthanasia, Pro-Pain Control*).

U.S. Attorney General John Ashcroft issued a legal opinion that the use of these drugs is not medically "legitimate" under federal law. Ashcroft made his determination in a memo to Drug Enforcement Agency (DEA) head Asa Hutchinson in November 2002, stating: "I hereby determine that assisting suicide is not a 'legitimate medical purpose' under the federal Controlled Substances Act (CSA)" (see Ashcroft, 2001). He went on to note that "prescribing, dispensing, or administering federally controlled substances to assist suicide violates the CSA." Thus, any physicians who participated in dispensing these drugs for uses not intended by the manufacturer would risk losing their federally issued prescription licenses. However, Oregon-based federal district Judge Robert E. Jones has issued a permanent injunction, barring the U.S. DEA from taking action against Oregon doctors who prescribe lethal barbiturates, or any federally controlled substance, for assisted suicides. States like Oregon already allow euthanasia, and it is only a matter of time before other states adopt their own versions of this murderous legislation.

Euthanasia–the killing of someone prior to their natural death–is totally unacceptable to God, regardless of the motive behind it. Recall the case of King Saul (1 Samuel 31:1-6), who was critically injured in battle against the Philistines. Rather than die slowly in torture or suffering the humiliation of the enemy taking him captive, Saul begged for his own armor-bearer to plunge his sword through him. When the orderly refused, Saul attempted suicide. We read later in 2 Samuel of an Amalekite from a neutral nation passing by, and Saul begging him to take his life:

> And David said unto the young man that told him, "How knowest thou that Saul and Jonathan his son be dead?" And the young man that told him said, "As I happened by chance upon mount Gilboa, behold, Saul leaned upon his spear; and, lo, the chariots and horsemen followed hard after him. And when he looked behind him, he saw me, and called unto me. And I answered, 'Here am I.' And he said unto me, 'Who art thou?' And I answered him, 'I am an Amalekite.' He said unto me again, 'Stand, I pray thee, upon me, and slay me: for anguish is come upon me, because my life is yet whole in me.' So I stood upon him, and slew him, because I was sure that he could not live after that he was fallen" (1 Samuel 1:4-10).

What happened to this Amalekite? We read just a few verses later where this man was killed for his act. But why? David described the act as "putting forth the hand to destroy" (2 Samuel 1:14). David believed the story to be true, and showed his disapproval of euthanasia by killing the Amalekite. From this, we see the biblical importance of the sacredness of life, and of the need to preserve it. Prematurely ending the life of someone could hardly be considered doing good unto all men (Galatians 6:10). God charges His people to benevolently **care for** the poor, the aged, the handicapped, and the unwanted–**not kill them**.

Have we forgotten that with each death a soul steps into eternity forever, never to walk on this Earth again–a soul that one day be will be judged by our Creator. Leon Kass, who, in August 2001, was appointed by U.S. President George W. Bush to chair a national advisory committee on bioethics, stated: "To regard life as sacred, means that it should not be violated, opposed, or destroyed, and that positively, it should be protected, defended and preserved" (1990, p. 35). We agree–wholeheartedly!

6

CONCLUSION

While we have not yet reached a point in which we are throwing live individuals into crematoriums like the Nazis did during the Holocaust, an indifferent and apathetic attitude toward human life nevertheless has quietly taken root in this country–the seeds of which were first sown in the act of violence against human life as recorded in Genesis 4:8. This murderous act of Cain firmly established the roots of violence amidst humanity. The evil fruit of death that we see daily in newspapers and on the evening news is the result of generations of humans who have forgotten God. Thus, man's perspective of the inherent value of human life has plummeted.

It is worth noting that one of the warnings Moses issued to the children of Israel before they entered that land of milk and honey was not to forget God.

> When thou hast eaten and art full, then thou shalt bless the Lord thy God for the good land which he hath given thee. **Beware that thou forget not the Lord thy God**, in not keeping his commandments, and his judgments, and his statutes, which I command thee this day: Lest when thou hast eaten and art full, and hast built goodly houses, and dwelt therein; And when thy herds and thy flocks multiply, and thy silver and thy gold is multiplied, and all that thou hast is multiplied; Then thine heart be lifted up, and **thou forget the Lord thy God**, who brought thee forth out of the land of Egypt, from the house of bondage (Deuteronomy 8:10-14, emp. added).

Have we, in our own land of milk and honey, "forgotten God"? It appears that our prosperity is causing us to strive for an "ideal" human population in which the old, sick, disabled, and unwanted often are discarded like yesterday's trash.

Is science to blame for this radical shift in our attitudes? Hubert Markl, writing as president of the Max Planck Society, stated:

> The German president, Johannes Rau, was right to warn us scientists to uphold ethical values.... But we must categorically distinguish between the atrocities of scientists in a regime of terror, and the procedures used in research and medicine for pre-implantation genetic diagnosis, therapeutic cloning and development of treatments for serious diseases using cell cultures from embryos. Equating the one with the other is totally wrong and belittles the suffering of the Nazis' victims. Everyone agrees that these victims were misused and humiliated human beings, whereas **there is no biological reason to attribute complete personhood to a few-celled embryo simply because, in interaction with a mother organism, it has the ability to become one** (2001, 412:480, emp. added).

Indeed, Johannes Rau was right to warn scientists! No one disagrees that the victims of the Holocaust suffered immensely. But not everyone agrees with Markl's comment that "there is no biological reason to attribute complete personhood to a few-celled embryo simply because, in interaction with a mother organism, it has the ability to become one." Scientists can use sterile terms like "mother organism" and "embryo," but that does not change the fact that a human mother and a human child are involved. Lives are at stake–just like those of the Jews who were herded into boxcars.

There are parts of the scientific discipline known as "genetic engineering" that faithful Christians may both defend and employ, and in which they may rejoice rightfully. At the same time, however, there also are portions that they may neither defend nor employ, and that they must oppose. Since it is God Who "giveth life, and breath, and all things," (Acts 17:25), life becomes a sacred gift. It should be viewed as such by every human, but especially so by the Christian.

Each day brings new scientific discoveries, the large percentage of which are welcome indeed. New medicines cure or prevent old diseases. Improved techniques block pain and

prevent suffering. Advancements in knowledge and methodology continually work to mankind's benefit. Suzuki and Knudtson, in their book, *Genethics*, have addressed this point.

> There is no reason to fear the stunning new conceptions of human hereditary disease now emerging from genetics research. In fact, we can rejoice that this new genetic knowledge is certain to improve the prevention, detection and treatment of many previously untreatable genetic disorders. At the same time, each of us shares responsibility for ensuring that techniques allowing the manipulation of the human genome are never exploited for arbitrary and self-serving ends or in ways that fail to consider the potential long-term consequences of large-scale genetic repair on human populations (1989, pp. 206-207).

Certainly, the faithful child of God may support most scientific advances that eliminate or cure disease, alleviate suffering, and make life better. But the Word of God remains the criterion against which every advance must be measured. We wish to reemphasize that the end does not always justify the means.

We also wish to reemphasize that with increased knowledge comes increased power. And with increased power comes the potential for misuse or abuse of that power. Some of the scenarios now being played out in the field of medical science are textbook examples of exactly that. In the distant past, technology (e.g., the use of amniocentesis) did not exist to "peek into" the womb in order to determine whether an unborn child was "defective." Today that technology not only exists, but is being used to destroy children even before their birth because they are not the "perfect specimens" their parents sought as offspring. When compared to the moral yardstick of God's Word (see Proverbs 6:16-17), the wickedness of such actions becomes evident and must be opposed by every Christian.

Further, some now are willing to "play God" in their attempts to rid the world of those who do not quite measure up to certain standards, or whose life, by those same standards, no longer is deemed worthy of living. Thus, if a deformed or retarded child is born, and the parents suddenly feel that child

not worth the time and trouble to rear, they opt for "passive treatment" and ask the hospital staff to withdraw food and water–thereby ensuring the child's death. This, of course, is done under the guise of "alleviating suffering." Christian Barnard, the renowned heart surgeon, once said: "If it's playing God to stop suffering, I don't think God would mind very much" (as quoted in Marker, 1984, p. 11). What many do not realize is that it is not always the suffering of the **patient** that is under consideration, but that of the parents, friends, or relatives who will "suffer" because they are "burdened" with a "defective" child. For some, that is too much suffering to ask them to endure. And so the child's life is terminated and the parents' "suffering" is brought to an end.

Attitudes affect outcomes. When **selflessness** battles **selfishness**, the one that wins generally determines the plan of action to be taken. Numerous examples abound. But few stir the souls like the story of David Able (see Grant, 1989). Daniel and Cecelia Able married in 1971, and four years later were blessed with a beautiful, brown-eyed little boy they named Patrick. Three years later, Cecelia's doctor prescribed the drug Provera (which is known to cause potential birth defects in unborn fetuses) to aid in the regulation of her menstrual cycle. Unbeknownst to her doctor, Cecelia was pregnant at the time he prescribed the drug. During a routine prenatal examination, which included an ultrasound and X-rays, the doctor discovered that not only was the baby in a breech position (which would require birth by caesarean section), but the infant had no arms or legs. The Ables never considered abortion. Speaking of his son's birth, Daniel said:

> It was emotional. In a way, you were prepared for it. But it was also a shock. What David had was perfect and normal. It was what he was lacking that made him different. We tried not to look at what was different about him. He was a part of us (as quoted in Grant, 1989, p. 54).

Not only was he born with no arms or legs, but David had a congenital defect in the sphincter muscle connecting the stomach to the esophagus that would require extensive surgery to repair. By the age of 10, David had learned to feed himself,

could draw or use a computer by holding a pencil between his teeth, and attended regular classes at Satchel Ford Elementary School in Columbia, South Carolina, where the Able family lives. He has a go-cart, lots of friends who play with him every day, and an award on the wall in his room for a drawing he made of the Statue of Liberty. "The Lady" is all torso, with short little legs and hardly any arms.

Why did the Ables name their boy David? "Because he will have so many giants to slay in his lifetime," said Cecelia. True. But he also will have something his biblical namesake did not–the help of family and friends in slaying those giants.

Will David's rearing place "undue burdens" upon the Ables? No doubt about it. Will they face medical bills and perhaps an uncertain future for their little giant slayer? Indeed. But has that deterred them from doing what is right? Absolutely not. And who, by their lifetime commitment, has been blessed?

David has been blessed, because he lives amidst a family that loves and cares for him. His brother Patrick has been blessed, because he has been taught, by example, altruistic love and self-sacrifice. Daniel and Cecelia Able have been blessed, because they have had to learn what selflessness is–the same kind of selflessness God forever has displayed through His love for His creation. Those around them have been blessed, because they have seen firsthand what *agape* love is all about. And I have been blessed, because a little boy with no arms and no legs has reminded me that the love of God is more important than being able to hold a dog or walk along the seashore.

In the midst of the controversy over medical ethics–a controversy that is unlikely to be resolved anytime soon–perhaps we should be reminded that this world never was intended to be our final home (Hebrews 11:13-16); our time here is temporary (James 4:14). With God's help, we can triumph over whatever comes our way (Romans 8:35-39; Psalm 46:1-3), and understand that whatever befalls us in this world is "not worthy to be compared with the glory which shall be revealed" (Romans 8:18).

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