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Bioethics and Cloning, Part 1

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This is Part 1 of a two-part Scope Note on Bioethics and Cloning. The two parts were published consecutively in the September and December 2002 issues of the Kennedy Institute of Ethics Journal.

Introduction

“Clone” is a collective noun (I, Stewart 1997, p. 771). A collective noun names a group and is composed of individual members, such as “herd” or “flock.” Derived from the Greek *klōn* for twig or slip, “clone” was first used in biology to describe the aggregate of asexually produced progeny of an individual, either naturally occurring or man-made; the definition later expanded to mean a group of genetically identical members who originate from a single ancestor. Thus, a clone is a group that results from the process of asexual reproduction.

In nature, cloning occurs either by parthenogenesis (reproduction without fertilization) or by fission (embryo splitting). In a pioneering experiment in 1952, Robert Briggs and Thomas J. King (I, 1952), cancer researchers at the Institute for Cancer Research (today part of the Fox Chase Cancer Center) in Philadelphia, demonstrated on frogs another method of cloning by transplanting nuclei into enucleated cells, a technique called “nuclear transplantation,” which John B. Gurdon and colleagues (I, 1958, 1975) used to create clones of frogs.

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Then, in the late 1970s and early 1980s, two back-to-back frauds in cloning occurred. First, the cloning of a human described by American science journalist David Rorvik in the 1978 book *In His Image* was called a hoax by a court in 1982. Second, the cloning of three mice, announced by German *wunderkind* Karl Illmensee (I) to scientific circles in 1979 (and to the public in 1981), could not be proven to be true, according to convincing evidence by McGrath and Solter (I) published in 1984.

With their pronouncement that mammalian cloning was impossible, McGrath and Solter essentially stopped cloning research and funding for such biological research. So by the mid-1980s, instead of further investigating cloning, developmental biologists studied embryology related to *in vitro* fertilization, while molecular biologists studied recombinant DNA under the newly relaxed NIH guidelines. These two strands of scientific investigation came together in the work of Ian Wilmut, (I) who created *in vitro* embryos using nuclear transplantation to reproduce genetically engineered cattle. Wilmut was seeking a way to increase the successful birth rate when, in the 1990s, he produced identical twin sheep, Megan and Morag, cloned from an embryonic cell, followed by another sheep, Dolly, cloned from an adult cell. The birth of a mammal from an embryo whose genetic material came from an adult cell firmly re-established the possibility of cloning from adults. Prior to Dolly's birth, scientists believed that adult cells lost the ability to dedifferentiate—i.e., to become unspecialized—and so could not direct the development of an embryo through to birth.

The 1997 announcement of Dolly's birth initiated the present widespread discussion of cloning. Because of its potentially vast applications across human health, medicine, agriculture, and business/economics, cloning raises a host of issues including those concerning: genetics and genetic engineering, patenting, animal rights and/or animal welfare (especially for transgenic, research, or cloned animals), organ transplantation, reproduction, eugenics, pharmacology (drug production using transgenic animals), research practices, informed consent, stem cell research, women's rights, children's rights, parental rights and responsibilities, and

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theology and philosophy. It fosters questions about the meaning and purpose of life, the limits of human powers to intervene in research and therapy, and what it means to be human and animal. In addition, environmentalists and organic farmers raise concerns about the effect of novel animals and plants on the environment, while nutritionists and the lay public wonder about the health implications of cloning and consuming mass quantities of bioengineered plants.

Keeping in mind at least four distinctions may help in understanding media reports of scientific developments in cloning technology, in evaluating claims about the promise of cloning technologies, and in being clear about ethical and theological arguments for and against cloning. First, one must distinguish the purpose of the cloning: Is it being done purely for research or for research to understand and develop treatments or cures for diseases or disorders (optimistically called therapeutic cloning) or for reproductive purposes? An often discussed focus of "therapeutic cloning" is the creation of cells, tissues, or fully formed organs for transplantation into humans to regenerate or replace damaged, diseased, deformed, or worn-out parts. These resources, cloned from a person's own cells, would have a common genetic identity, helping to avoid rejection based on genetic incompatibility. In addition, such cloned cells, tissues, or organs would help to alleviate the present shortage of organs and tissues available for transplant. The goal of reproductive cloning would be to produce an entire organism—animal or human. The genetic makeup of such "offspring" would be virtually identical to that of the individual from whom the genetic material is obtained. Questions

might also arise about the purpose for which the cloned individual was produced—e.g., to replace a dead or dying individual; to serve as an organ, tissue, or blood resource for its already existing genetic progenitor; or simply to create offspring.

Second, one should distinguish among multiple cloning techniques: Does the cloning occur by parthenogenesis (oocyte division without fertilization), blastomere separation (embryo splitting or twinning), or somatic cell nuclear transfer (SCNT), in which the nucleus of a somatic cell, from an adult, is transferred into an already enucleated egg? In addition, which of the different procedures available is used to combine the nucleus with the enucleated egg (ooplasm)—e.g., microsurgical injection or electrofusion? In all cases, although the host egg contributes its mitochondrial DNA (about 2 percent of the total DNA), the vast majority of the genetic material of the developing embryo comes from the transplanted nucleus. It is possible that the technique itself may influence the success and post-birth health of offspring.

Third, cloning must be distinguished from stem cell research. The same technique, SCNT, may be used to create embryos either for the purpose of developing *in vitro* stem cell lines or for the purpose of *in vivo* gestation. SCNT is, however, only one method of producing stem cells. Stem cells also can be obtained from surplus embryos from IVF treatments for infertility, from embryos created by IVF specifically for research purposes, from embryonic germ cells from aborted fetuses, from umbilical cord blood, and from some adult tissues—e.g., bone marrow or skin or blood—that have been reprogrammed to be totipotent without the use of the nuclear transfer technique (Danish Council of Ethics, *Cloning: Statements from the Danish Council of Ethics*, Copenhagen: The Council, 2002, Part 2, I). Although this Scope Note focuses on cloning, not on stem cell research, it is important to note that SCNT does open new research possibilities and therapeutic potentials. SCNT is a faster and more predictable way to reproduce nearly identical stem cells than is repeated re-engineering of the nuclei. Understandably, cloning and stem cell research often are linked together and often are confused.

Fourth, the nature of the cells to be cloned and

whether more than one species is involved also must be discerned. For example, the cells to be cloned can be embryonic or fetal or adult. They can be germ cells or somatic (body) cells. The source of the somatic cells can vary—mammary tissue (as with Dolly) or cumulus cells, which surround and nurture the oocyte during maturation of the egg in the female ovary (as with CC, a cloned cat) or skin cells, and so forth. Cloning efforts may combine genetic material from a single species or from different species—the latter process results in a transgenic animal.

Ethical Issues in Animal Cloning

The cloning of animals as part of an emergent technology for reproducing farm, companion, and research animals often is taken for granted. Despite this acceptance, animal cloning raises concerns about the pain and suffering that may be caused them by purposely tinkering with their genetic makeup and the way in which they are conceived. Potential physical concerns are low success rates, problems with gestation and delivery, concerns about fetal anomalies, and worries over increased vulnerability of clones to aging, disease, or disability. Deeper philosophical issues require consideration, such as the acceptability and implications of altering the genetic makeup of animals, especially in a world dominated by humans, as do practical concerns that efforts to create “ideal” animals will diminish genetic diversity (with implications for hardiness and disease resistance), more rapidly, than will the selective breeding practices already in use. Concern encompasses not only the animals born of the cloning procedure, but also the animals whose oocytes and genetic material are used, those who serve as *in vivo* incubators, and those who gestate the embryos. Animals providing the eggs into which the DNA will be transplanted generally are stimulated to force superovulation and then killed in order to retrieve the oocytes. At one time, in sheep, the only existing method for culture of oocytes after nuclear transfer was *in vivo*. The ewes that incubated SCNT embryos were subjected to surgery, and often to slaughter, to retrieve the developed blastocysts for transfer to the gestational mother (III, FAWC). The animals who gestate and give birth to cloned embryos also are subjected to foreseeable risk, such as the hazard of gestating and delivering

oversized offspring.

Ethical Issues in Human Reproductive Cloning

The prospect of human cloning engenders strong feelings and debate. The risks that surround animal cloning suddenly seem to take on greater significance when human reproductive cloning is suggested. The potential that human cloning also might result in low success rates, gestational problems, and long-term health concerns or shortened life spans for the cloned offspring are troubling to many. In addition to the purely physical issues, a variety of ethical and theological concerns have been discussed. Often, a central concern focuses on the fact that the cell created by SCNT is human in nature and has the potential to develop into a human being. Objections to research or reproductive efforts using cloned cells may assert that human life begins at the moment of conception (by whatever means that occurs), is worthy of respect, and should not be used in ways that contain the potential for waste, destruction, or unnecessary creation of, or harm to, cells with human potential. Even in the absence of religiously-grounded objections to experimental use of embryos based on the sanctity of human life, concerns exist that these “persons” are being subjected to research without consent. Some religious traditions that understand personhood or ensoulment to occur later in development permit some forms of embryo use and research, while objecting to other types of embryo research or use based on their purpose. Other ethical or theological issues involve objections to changing the fundamental nature of the human race, viewed by some as God’s creation; opposition to separating the creation of persons from the procreative relationship; misgivings about furthering the sense that children may be designed for our own purposes, rather than received as gifts born for their own purposes; concerns about the potential loss of individuality or the clone-born person’s inability to live an authentic life or to have an open future; worries about permitting cloning of persons without their consent; the potential for discriminatory treatment or overly explicit expectations of clone-born persons (or animals); and the need either to establish or to prevent limits on reproductive freedom.

Additional concerns lie in the commercial, scientific, and altruistic pressures women might face either to be sources for oocytes or to be gestators. Some commentators see these issues when associated with cloning to be of a distinct nature, while others view them as an extension of issues associated with other reproductive technologies.

Policy and Legislation

Government reports, like that of the National Bioethics Advisory Commission (Part 2, I) or that of the California Advisory Committee on Human Cloning (IV, A), although comprehensive, are simply advisory; they are not legally enforceable. Some existing laws ban human reproductive cloning, yet the way in which they define cloning varies widely. The President’s Council on Bioethics (Part 2, I) abandons the ambiguity of the terms reproductive cloning and therapeutic cloning, instead defining cloning in sensible terms as “cloning-to-produce-children” and “cloning-for-biomedical-research.” Most jurisdictions in the United States specify the nuclear transfer cloning technique, but Rhode Island law also includes embryo splitting. The United Kingdom bans all reproduction methods other than fertilization. Japan classifies the resulting product of cloning as either human or animal, and Australia bans clones of clones. Generally all jurisdictions describe both the biological components used in cloning and the resulting cloned offspring as property by proscribing particular property rights, such as sale, purchase or commerce, possession, and especially use. The focus both of legislation and of government reports advising legislative or executive bodies, however, remains the intended end use or purpose of cloning.

Scientific developments in cloning happen rapidly. To find resources in addition to those mentioned in this Scope Note and to keep abreast of the corresponding ethical and religious discussion, we recommend searching the databases of the National Reference Center for Bioethics Literature at <http://bioethics.georgetown.edu>.

I. History of the Science

(Citations are arranged chronologically.)

Dobzhansky, Theodosius. **Species as Natural Units.** In his *Genetics and the Origin of Species*, pp. 303-21. New York: Columbia University Press, c1937, 1982.

Dobzhansky synthesized two traditions: the evolutionary focus of experimental genetics and the emphasis on taxonomy and classification in natural history. To Dobzhansky, separation (or survival) of species has a genetic basis; it is not based on reproduction, sexual or asexual.

Briggs, R., and King, T. J. **Transplantation of Living Nuclei from Blastula Cells into Enucleated Frogs' Eggs.** *Proceedings of the National Academy of Sciences of the United States of America* 38 (1): 455-63, 15 May 1952.

Briggs and King report the first cloning by nuclear transplantation, a year before Crick and Watson publish their work on the helical structure of DNA. They continue turn-of-the-century experimental embryology investigation into the role of the nucleus in embryonic differentiation.

Gurdon, J. B.; Elsdale, T. R.; and Fischberg, M. **Sexually Mature Individuals of *Xenopus laevis* from the Transplantation of Single Somatic Nuclei.** *Nature* 182 (4627): 64-65, 5 July 1958.

Gurdon is the first published scientist to follow the nuclear transplantation work of Briggs and King.

Haldane, J. B. S. **Biological Possibilities in the Next Ten Thousand Years.** In *Man and His Future*, ed. G. Wolstenholme, pp. 350-55. London: J. & A. Churchill, c1963, 1967.

Haldane is credited with coining the term “clone” in a 1962 speech published in this book. In his prescient essay he discusses cloning, cell lines, and genetic engineering. He also brings up the idea of a Hitler clone.

Gurdon, J. B.; Laskey, R. A.; and Reeves, O. R. **The Developmental Capacity of Nuclei Transplanted from Keratinized Skin Cells of Adult Frogs.** *Journal of Embryology and Experimental Morphology* 34 (1): 93-112, August 1975.

Gurdon conclusively proves the work begun by Briggs and King in amphibians.

McKinnell, Robert Gilmore. ***Cloning: A Biologist Reports.*** Minneapolis: University of Minnesota Press, 1979. 130 p.

McKinnell states that reproduction by cloning is not desirable because greater diversity (necessary for survival of species) can be obtained through sexual reproduction. Cloning is appropriate to gain insight into some biological phenomena, but no such insight would come from cloning a human being.

Illmensee, K., and Hoppe, P. C. **Transplantation in *Mus musculus*: Developmental Potential of Nuclei from Preimplantation Embryos.** *Cell* 23 (1): 9-18, January 1981.

Illmensee and Hoppe claim to have cloned the first mammals, mice. Their work comes into doubt when others are unable to duplicate their claimed achievement.

McGrath, J., and Solter, D. **Nuclear Transplantation in the Mouse Embryo by Microsurgery and Cell Fusion.** *Science* 220 (4603): 1300-1302, 17 June 1983.

McGrath and Solter publish the first description of a reliable nuclear transfer technique, fusion between the nucleus and cytoplasm, not the surgical implantation technique of Illmensee and Hoppe, to be used on a mammal, the mouse.

McGrath, J., and Solter, D. **Inability of Mouse Blastomere Nuclei Transferred to Enucleated Zygotes to Support Development *In Vitro*.** *Science* 226 (4680): 1317-19, 14 December 1984.

McGrath and Solter conclusively prove the claims of Illmensee and Hoppe to be false. Their concluding suggestion—“that the cloning of mammals by simple nuclear transfer is biologically impossible”—effectively ends further investigation into cloning until Willadsen, Campbell, Wilmut, and others.

Willadsen, S. M. **Nuclear Transplantation in Sheep Embryos.** *Nature* 320 (6057): 63-65, 6-12 March 1986.

Willadsen produces the first clones of a large

domestic animal, the sheep, with nuclei from embryos.

Hall, J. L.; Engel, D.; Gindoff, P. R.; et al. **Experimental Cloning of Human Polyploid Embryos Using an Artificial Zona Pellucida.** *The American Fertility Society Conjointly with the Canadian Fertility and Andrology Society, Program Supplement*, 1993. Abstracts of the Scientific Oral and Poster Sessions, Abstract 0-001, S1.

Hall and his team report in a poster presentation on research in which polyploid human embryos were split using a technique traditionally called “blastomere separation.”

Kahl, G. **Dictionary of Gene Technology.** New York: VCH, 1995. 550 p.

This reference work lists two different definitions of “clone:” cells or organisms in the first definition and DNA molecules in the second one.

Campbell, K. H. S.; McWhir, J.; Ritchie, W. A.; and Wilmut, I. **Sheep Cloned by Nuclear Transfer from a Cultured Cell Line.** *Nature* 380 (6569): 64-66, 7 March 1996.

This is the first published report of mammalian cloning by nuclear transplantation using embryonic stem cells (inner mass cells established in tissue culture) as the source for donor nuclei, with implantation by fusion into enucleated eggs.

Solter, D. **Lambing by Nuclear Transfer.** *Nature* 380 (6569): 24-26, 7 March 1996.

Solter, reversing his 1984 position, comments that “[c]loning mammals from adult cells . . . can no longer be considered impossible.”

Wilmut, I.; Schnieke, A. E.; McWhir, J.; Kind, A. J.; and Campbell, K. H. S. **Viable Offspring Derived from Fetal and Adult Mammalian Cells.** *Nature* 385 (6619): 810-13, 27 February 1997.

Wilmut’s achievement of generating an adult mammal from another adult mammal establishes cloning and results in an explosive worldwide reaction. The donor nuclei come from a cell line established in tissue culture from an adult mammary gland. The offspring sheep’s name is Dolly.

Stewart, Colin. **An Udder Way of Making Lambs.** *Nature* 385 (6619): 769, 771, 27 February 1997.

Stewart points out that the birth of Dolly resulted from solving the scientific problem of compatibility between the development stage of the donor nuclei and the recipient oocyte cytoplasm. He concludes: “Maybe, in the future, the collective noun for sheep will no longer be a flock—but a clone.”

Wakayama, T.; Perry, A. C. F.; Zuccotti, M.; Johnson, K. R.; Yanagimachi, R. **Full-term Development of Mice From Enucleated Oocytes Injected with Cumulus Cell Nuclei.** *Nature* 394 (6691): 369-74, 23 July 1998.

Wakayama produces the first cloned mice by SCNT almost 20 years after the claim by Illmensee and Hoppe.

Cibelli, J. B.; Grant, K. A.; Chapman, K. B.; et al. **Parthenogenetic Stem Cells in Nonhuman Primates.** *Science* 295 (5556): 819, 1 February 2002.

Cibelli and colleagues induce unfertilized female oocytes from monkeys to divide by placing them into a chemical mixture similar to sperm. The resulting embryos, called parthenotes, have unknown development potential for birth. But Cibelli’s team took cells from the inner cell mass of the developing blastocysts and plated them in tissue culture, as if creating a stem cell line, for more than 10 months.

American Association for the Advancement of Science. **Statement on Human Cloning.** 14 February 2002 [Online]. Printed from <http://www.aaas.org/news/releases/Cloning.shtml>, 10 April 2002.

AAAS endorses a ban on “efforts to implant a human cloned embryo for the purpose of reproduction” based on the risks identified in animal studies. It supports nuclear transplantation for stem cell research, but urges federal oversight of this research in public and private sectors. AAAS suggests that new regulations specific to cloning research may be necessary.

National Research Council (U.S.) Committee on

Science, Engineering, and Public Policy [and] Division on Earth and Life Studies. Board on Life Sciences. Panel on Scientific and Medical Aspects of Human Cloning. *Scientific and Medical Aspects of Human Reproductive Cloning*. Washington, DC: National Academy Press, 2002. 296 p. [Available at <http://www.nap.edu>.]

This joint panel of the National Academies recommends that human reproductive cloning should not be practiced currently due to its danger and high failure rate and that this position should be affirmed by a legally enforceable ban. Reconsideration of this ban in five years should occur only if “(1) a new scientific and medical review indicates that the procedures are likely to be safe and effective and (2) a broad national dialogue on the societal, religious, and ethical issues suggests that a reconsideration of the ban is warranted” (pp. ES-1–ES-2). The panel does support biomedical research using nuclear transplantation to produce stem cells as recommended in the National Academies report *Stem Cells and the Future of Regenerative Medicine* (2002). [Available at <http://www.nap.edu>.]

II. Historical Commentary

(Citations are arranged chronologically.)

Lederberg, Joshua. **Experimental Genetics and Human Evolution**. *American Naturalist* 100 (915): 519-31, September-October 1966.

Nobel laureate geneticist Lederberg explores human cloning and other genetic engineering techniques within the framework of the potential eugenic advantages that could be derived—e.g., elimination of unpredictability and perpetuation of select genetic traits in reproduction. From a strictly biological standpoint, “tempered cloning” would best permit determination of whether sufficient genetic variability remains to deal with changing environmental conditions and other contingencies and evaluation of the claimed benefits of cloning. A “clonish group” could threaten a pluralistically dedicated species because of its potential for introversion and narrow-mindedness. He foresees two risks: (1) that the “scientific position [perspective]

is extremely unbalanced from the standpoint of its human impact and (2) that precedents affecting the long-term rationale of social policy [with regard to human cloning] will be set, not on the basis of well-debated principles, but on the accidents of the first advertized examples” (p. 531).

Ramsey, Paul. **Shall We Clone a Man?** In his *Fabricated Man: The Ethics of Genetic Control*, pp. 60-103. New Haven: Yale University Press, 1970.

Chapter 2 is Ramsey’s response to Lederberg’s argument in favor of clonal reproduction. Ramsey argues that our goal in searching for genetic knowledge ought always to be the treatment and benefit of real patients rather than the exertion of human control over our species or its evolution. He objects to cloning because it replaces God’s dominion with the “dominion of man over man” and a paradoxical seeking of “boundless determinism and boundless freedom” against which no values are exempt. This path will lead to concomitant violations of human nature, procreation, and parenthood.

Fletcher, Joseph. **Ethical Aspects of Genetic Controls**. *New England Journal of Medicine* 285 (14): 776-83, 30 September 1971.

Can the goals and methods of genetic engineering and cloning be justified by their therapeutic and nontherapeutic benefit? As an alternative to strict consequentialist or *a priori* (deontological) reasoning, Fletcher suggests his “pragmatic” method of ethical decision making, what he calls situational or clinical consequentialism: reason from the data of each actual case or problem to the course of action that offers the optimum or maximum of desirable consequences, which is human well-being. He argues that “laboratory reproduction is radically human compared to conception by ordinary heterosexual intercourse” because it is “willed, chosen, purposed, and controlled.” Needs, not rights are moral stabilizers, such that if the need to protect from or ameliorate disease or deformity or to cure and prevent genetic disorders requires research on embryos and fetal tissues or the sacrifice of some conceptuses, let rights take the back seat to

needs. Fletcher states that, “If the greatest good for the greatest number were served by it, it would be justifiable, not only to specialize the capacities of people by cloning or by constructive genetic engineering, but also to bio-engineer or bio-design parahumans or “modified men”—as chimeras (part animal) or cyborg-androids (part prosthetes).”

Watson, James D. **Moving Toward the Clonal Man.** *The Atlantic Monthly* 228: 50-53, May 1971.

In light of Edwards and Steptoe’s prediction that in 1972 their research would result in the birth of the first baby conceived in a test tube, Watson urges widespread public involvement in decisions about the scientific possibilities he foresees, namely, routine use of test-tube conception, surrogate motherhood, sex determination, and human cloning. Effective public policy must be international in scope, and decisions of such importance should not be left to the scientific and medical communities because “the possibility of our [the public] having a free choice will one day suddenly be gone.”

Jonas, Hans. **Biological Engineering—A Preview.** In his *Philosophical Essays; From Ancient Creed to Technological Man*, pp. 141-67. Englewood Cliffs, NJ: Prentice-Hall, 1974.

Jonas offers an existential critique of cloning that consists of four thoughts: the contemporaneity of identical twins; the uniqueness of genotype and the uniqueness of being; non-contemporaneity and the right to ignorance; and knowledge, ignorance, and freedom. Based on the last thought, he offers the ethical norm that we ought “never to violate the right to that ignorance which is a condition for the possibility of authentic action” or, in other words, “to respect the right of each human life to find its own way and be a surprise to itself.”

Rorvik, David. **In His Image: The Cloning of a Man.** New York: J. B. Lippincott Company, 1978. 239 p.

Rorvik, a freelance science and medical reporter, recounts the “true” story of events that allegedly led to the birth of the first cloned human in 1979. Eager for an heir, a

millionaire, identified only as Max, requests Rorvik’s help to assemble the team that eventually successfully clones him. The baby is brought to term by a surrogate mother. The book generated a great wave of discussion about the ethical implications of human cloning, and its publication as a work of non-fiction was the target of criticism.

Hellegers, André E. **Book on Cloning Is a Hoax.** *Washington Post*, B3, 4 June 1978.

Hellegers denounces Rorvik’s book as a hoax, suggesting the alternate title “In His Fantasy—The Cloning of Man.” He dissects the book based on its scientific errors (“obstetrical nincompoops”) and lists the ethical concerns with the imaginary account that should have troubled Rorvik. [In testimony before a Congressional Committee in 1978, Hellegers stated, “I think fundamentally the problem is that too many people believe that cloning is an end, namely, to production of an individual. Factually, cloning is a means. It is a means of cell study and an enormously important one” (see I, McKinnon 1979, pp. 5-6).]

Ebon, Martin. **The Cloning of Man: A Brave New Hope—or Horror?** New York: New American Library, 1978. 201 p.

Ebon provides a history of scientific discovery related to cloning, offers several chapters on cloning in literature and mythology, negatively assesses Rorvik’s truthfulness, summarizes the ethical debate, and discusses popular concerns associated with cloning humans.

Callahan, Daniel. **Cloning: Then and Now.** *Cambridge Quarterly of Healthcare Ethics* 7 (2): 141- 44, Spring 1998.

Callahan states that no substantially new arguments about cloning have been advanced in the current debate that were not anticipated in the discussion of the 1970s; however, in comparison, Callahan observes three qualitative differences. He notes a much more favorable attitude toward scientific and technological developments, the development of reproductive rights arguments giving rise to an almost absolute moral right to procreate (including rights to have any kind of child by

any kind of means), and the powerful advocacy alliance of scientists with pro-research lay persons that can effectively counter ethical objections to research based solely on predictions of *potential* scientific and clinical benefits, even if the benefits will be available to a very few.

Verhey, Allen. **Cloning: Revisiting an Old Debate.** *Kennedy Institute of Ethics Journal* 4 (3): 227-34, September 1994.

Verhey examines the theological debate about cloning between Protestant theologians John Fletcher and Paul Ramsey over Lederberg's 1966 essay. Fletcher took a utilitarian stance that approved cloning if it maximized happiness, while Ramsey, a nonutilitarian, focused his negative evaluation on concerns about families and relationships and questions of distributive justice. Verhey also describes Ramsey and Fletcher's thinking on freedom, embodiment, human relationship with nature, and the meaning of being a parent as they apply to cloning.

III. Animal Welfare

(Citations are arranged alphabetically.)

Bulfield, Grahame. **Biotechnology and Farm Animals.** *Bulletin of Medical Ethics*, No. 131: 13-17, September 1997.

Director of the Roslin Institute where Dolly was cloned, Bulfield states that animal welfare and other ethical issues raised about new animal breeding and production techniques were also raised with past scientific advances in these areas. He attributes the current concern to the rapid pace of developments and responds to a number of ethical issues as untroubling or well-regulated.

Cat Cloning Is Wrong-Headed States the Humane Society of the United States (HSUS), 14 February 2000. 1 p. [Available at <http://www.hsus.org>.]

Against the backdrop of an overpopulation of pet animals without homes, Wayne Pacelle, HSUS senior vice president, says "[c]loning animals strips away the altruistic component

behind pet-keeping and reduces the experience to one of selfishness." People ought to realize and accept that in most cases we outlive our pets.

Commission of the European Community. Group of Advisers on the Ethical Implications of Biotechnology (GAIEB). **Ethical Aspects of Cloning Techniques** [Opinion No. 9]. Brussels: GAIEB, 28 May 1997. 7 p. [Reprinted in *Journal of Medical Ethics* 23 (6): 349-52, May 1997.]

GAIEB examines the ethical concerns arising from animal cloning and the implications for humans. The Group concludes that animal cloning is only ethically acceptable if carried out with strict regard to animal welfare; to the need to maintain genetic diversity; and to honoring the public's rights to protection from risk, to adequate information, and to benefit from any reduced costs of animal production. Human cloning is unacceptable for reproductive purposes because of concerns about instrumentalization, eugenics, and safety. Nontherapeutic research on human embryos must be for the purposes of understanding the causes of disease or alleviating suffering and should never include placing a manipulated embryo in a uterus. GAIEB also urges the European Commission to educate the public, stimulate debate about cloning, and to foster further ethical research on cloning and related areas.

Farm Animal Welfare Council (FAWC) (Great Britain). **Report on the Implications of Cloning for the Welfare of Farmed Livestock.** Surbiton, Surrey: FAWC, 1998. 29 p. [Available at <http://www.fawc.org.uk/clone/clonetoc.htm>.]

Requested by the U.K. Ministry of Agriculture, Fisheries and Food to study the issue, FAWC, an independent advisory body, reported that "no aspect of cloning by nuclear transfer is intrinsically objectionable to the extent that it might be considered something that should not be done at all," but that safeguards are needed to protect the welfare of farm animals. FAWC further refines the general ethical principles outlined by the Banner Committee (see Great Britain, Ministry of Agriculture, below) as it focuses on mammalian species common to agricultural practice—e.g., sheep, cattle, and

pigs—and the question of livestock breeding. FAWC states that procedures that inflict very severe or lasting pain on animals, involve an unacceptable violation of a living being's integrity, mix kinds of animals to an unacceptable extent, and generate living beings whose sentience has been reduced to the extent they may be considered mere instruments or artifacts are never acceptable and are always intrinsically objectionable. They urge a moratorium on the use of cloning by nuclear transfer in commercial agricultural practice until physical and gestational problems are satisfactorily resolved. To ensure adequate animal protections and oversight and effective control of cloning technology and its introduction into agricultural practice, FAWC calls for a national standing committee.

Franklin, Sarah. **Dolly: A New Form of Transgenic Breedwealth.** *Environmental Values* 6 (4): 427-37, November 1997.

Franklin states, “[i]n my own mind, it is an insufficient argument to say that animal cloning is acceptable simply because it brings medical benefits to humans” (p. 429) and neglects other important questions. Franklin argues that Dolly represents a new form of culturally-invented property, which she terms breedwealth.” Dolly’s importance rests in the possibility of “more rapid dissemination of genetic progress from elite herds to the commercial farmer” and the ability to carry out precise replication in compressed time. Franklin suggests that we are mistaken to “treat this new form of reproductive property in a distinct ethical domain simply because [animals] are not human.”

Great Britain. Ministry of Agriculture, Fisheries and Food. **Report of the Committee to Consider the Ethical Implications of Emerging Technologies in the Breeding of Farm Animals.** (The Banner Committee.) London: HMSO, 1995.

In this pre-Dolly work, comments on cloning are limited to concerns about overlarge calves, calving difficulties, and the loss of genetic diversity. The Committee identified three principles that have influenced more recent assessment of cloning: (1) some treatments of animals are so harmful that they

should never be done; (2) some harms, although allowable, require justification—usually expressed in terms of balancing the degree of harm done to the animals against the benefits either to animals or to humans that might result from the research or testing; and (3) efforts should be made to minimize any harm justified by the second principle. This committee builds on the “Five Freedoms” identified in the 1965 Brambell Report on livestock welfare as those that must be assured to animals, namely, freedom from hunger and thirst; discomfort; pain, injury, or disease; and fear or distress, as well as the freedom to express normal behavior.

Great Britain. Parliament. House of Commons. Committee on Science and Technology. **The Cloning of Animals from Adult Cells, Fifth Report.** Volume I: Report, together with the Proceedings of the Committee [and] Volume II: Witnesses, Memoranda, Appendices, Unprinted Memoranda. 20 March 1997. 23 p. and 39 p.

This Committee justifies animal cloning based on its potential benefits, but recommends that Parliament reaffirm its intention to ban human cloning and confirm that the authority of the Human Fertilisation and Embryology Act (HFEA) extends to regulation of embryos created by cloning techniques even though “fertilisation” does not take place in the traditional sense.

Great Britain. Parliament. House of Commons. Committee on Science and Technology. **Cloning of Animals from Adult Cells, Fourth Report.** 4 August 1998.

The Committee applauds the government’s continued prohibition of human cloning (December 1997, reprinted here), but seeks further guidance on the HFEA (1990) authority, plans for public consultation on cloning, supports the idea of an international agreement on bioethics, and questions whether the current structure for considering the ethics of genetic modifications in animals will be matched for humans.

Hawthorne, Lou. **A Project to Clone Companion Animals;** Bok, Hilary. **Cloning Companion [Nonhuman] Animals Is Wrong;** Greene, Mark. **New Dog: Old Tricks;** Hawthorne, Lou.

Hawthorne's Rebuttal. *Journal of Applied Animal Welfare Science* 5 (3): 229-246, 2002.

In this set of papers, Hawthorne, CEO of Genetic Savings and Clone (GSC), describes the project's program and goal to clone pets and livestock and its two governing codes of bioethics, reflective of our society's divergent values toward pets and livestock, while philosophers Greene and Bok assess the strength and ethical acceptability of GSC's endeavor and justification. Hawthorne holds that if animal suffering is not increased by cloning, then it is ethically acceptable. Greene says that this consequentialist stance does not capture all ethical concerns, but that it places the onus on critics to develop ethical reasons why GSC should not clone animals and to distinguish it in type from already accepted practices in livestock husbandry and pet breeding. Bok argues that cloning is not safe and has unknown risks and that animals suffer high rates of real genetic and health dangers. In light of these concerns and because no extremely compelling reason exists to justify cloning animals, she asserts, "... people who want to clone their pets must be either mistaken about what cloning is or immoral."

Humane Society of the United States. **HSUS Statement on the Cloning of Pets.** [Available at <http://www.hsus.org/>] 1 p.

The HSUS condemns the commercial cloning of companion animals because of its potential dangers for animals, the pet overpopulation problem, and the fact that persons seeking to recreate a companion animal will be disappointed because even more so than in humans, genetic makeup in animals can only influence, but not determine or guarantee, physical appearance, attributes, and personality.

Linzey, Andrew. **Ethical and Theological Objections to Animal Cloning.** *Bulletin of Medical Ethics* No. 131: 18-22, September 1997.

Asserting that "the stark moral truth must be unmasked: not satisfied with simply exploiting animals, we now presume to change their nature in order to do so more profitably" and conveniently (p. 20), Linzey objects to cloning for five reasons: (1) "cloning represents an ethically regressive

view of animals" (treats them as instruments not sentient beings with their own intrinsic value, dignity, and rights); (2) "cloning renders animals liable to harm;" (3) "cloning intensifies a morally reductionist view of animals" (reduces them, even in their very nature, to mere tools for human use); (4) "cloning involves the commercial degradation of animal life" (manipulates them for consumer satisfaction); and (5) "cloning represents a spiritually impoverished view of animals."

Missyplicity Project [Available at <http://www.missyplicity.com/>, 14 March 2002] and its financing agent, Genetic Savings and Clone (GSC) [Available at <http://geneticsavingsandclone.com/>, 17 March 2002]

Privately funded by a couple who want to clone their dog, Missy, these entities are involved in an effort to clone traditional companion animals. Operation CopyCat, a subproject, achieved success in February 2002 with the birth of a kitten named CC created at the lab at Texas A& M University affiliated with the Project. Both projects have codes of bioethics (posted online). Involving egg donors, genetic donors, and surrogate mothers, the research is similar to IVF and other reproductive technologies used in humans and raises similar questions. Adoption for animals used or created by the projects is possible. GSC has commercial gene banking services for pet owners and will offer cloning services after Missy is successfully cloned.

Straughan, Roger. **Ethics, Morality and Animal Biotechnology.** Swindon: Biotechnology and Biological Sciences Research Council, 1999. 25 p. [Available at <http://www.bbsrc.ac.uk/>.]

Straughan addresses the ethical, moral, and social issues surrounding recent developments that involve genetic modification, including the direct manipulation of an animal's genetic makeup and nuclear transfer.

IV. Laws and Legal Literature

(Citations are arranged alphabetically within subsections.)

A. United States

California Codes. Business and Professional Code. Section 2260.5.

Violation of the above prohibition constitutes “unprofessional conduct.” The five year moratorium (1997-2003) relates only to cloning a whole human being and does not apply to cloning human cells, tissues, or organs.

California Codes. Health and Safety Code. Sections 24185–24189.

The first state law in the United States to prohibit nuclear transplantation cloning of humans, California’s 1997 law actually only prohibits the selling or buying of an “ovum, zygote, embryo, or fetus” for the purpose of cloning. It expires 1 January 2003.

California. State Senate. *Final Report of the California Advisory Committee on Human Cloning*. Sacramento, 11 January 2002. [Available at www.law.stanford.edu/features/greely.]

The Committee makes five main recommendations to the legislature: (1) ban human reproductive cloning; (2) reasonably regulate human nonreproductive cloning; (3) monitor federal action; (4) define statutory terms with care and delegate implementation to a state agency; and (5) establish an ongoing advisory group to the governor and legislature.

Louisiana. Revised Statutes. Sections 1299.36–1299.36.6.

Louisiana’s 1999 law prohibits cloning and attempts at cloning a human being by persons and by health facilities or agencies, but it also states that it “does not prohibit scientific research or a cell based therapy not specifically prohibited” elsewhere in this law.

Michigan. Compiled Laws. Sections 333.26401–333.26406.

Michigan’s 1999 Human Cloning Funding Prohibition Act “does not prohibit the use of state funds for scientific research or cell-based therapies not specifically prohibited by that section.”

Missouri. Revised Statutes. Section 1.217.

Missouri’s law, added in 1998, states, “No state funds shall be used for research with respect to the cloning of a human person.” Cloning means replication of a human person.

Rhode Island. General Laws. Sections 23-16.4-1–23.16.4-4.

Rhode Island’s 1998 statute bans both “somatic cell nuclear transfer” for human pregnancy and the division of zygote, blastocyst, or embryo for the creation of identical human beings. The legislature intended the law not to apply to cloning of human genes, cells, tissues, or organs that would not result in an “entire human being” nor to apply to assisted reproductive technologies as long as the purpose is not to create a child genetically identical to another. The law expires in 2003.

Virginia. Code. Sections 32.1-162.21–31.1-162.22.

Virginia’s 2001 law prohibits human cloning by nuclear transplantation, attempts at pregnancy with human cloning, possession of the product of human cloning, and commerce for the purpose of human cloning.

B. International

Australia. Commonwealth of Australia Acts. Gene Technology Act 2000. Section 192B.

Knowingly or recklessly acting to clone “a whole human being” is an offense, with cloning defined as “the use of technology” for production of genetically identical descendants. Australia’s definition covers serial or successive cloning, meaning cloning from a clone.

Australia. National Health and Medical Research Council. Australian Health Ethics Committee. *Scientific, Ethical and Regulatory Considerations Relevant to Cloning of Human Beings*. 16 December 1998. 74 p. [Available at <http://www.health.gov.au/nhmrc/issues/clone.pdf>.]

The Committee makes a noteworthy recommendation on primate resources for reproductive research. It distinguishes cloning a human being from cloning human parts, such as DNA or cells.

Australia. Parliament. House of Representatives. Standing Committee on Legal and Constitutional Affairs. **Human Cloning: Scientific, Ethical and Regulatory Aspects of Human Cloning and Stem Cell Research**. 17 September 2001. 267 p.

In what is also known as “The Andrews Report,” the Committee recommends that the Council regulate and license human embryo research and the Parliament ban human cloning.

Canada. Institutes of Health Research. Working Group on Stem Cell Research. **Human Pluripotent Stem Cell Research: Recommendations for CIHR-Funded Research; Report of the Ad Hoc Working Group on Stem Cell Research**. January 2002. 19 p. [Available at http://www.cihr.ca/about_cihr/ethics/stem_cell/stem_cell_intro_e.shtml.]

The recommendations within this report are the basis for practice guidelines, which took effect 4 March 2002, that prohibit the use of human stem cells for either therapeutic or reproductive cloning. Under the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans, however, Canada, like Britain, allows research on human embryos up to 14 days after fertilization.

France. National Consultative Ethics Committee for Health and Life Sciences (CCNE). **Reply to the President of the French Republic on the Subject of Reproductive Cloning**. 22 April 1997. 27 p. [Available at <http://www.ccne-ethique.org/english/start.htm>.]

The Committee’s Reply is based on a human rights concept of dignity. The Committee reaffirmed the distinction between human cloning for reproductive and nonreproductive purposes. Its concluding statement suggested that France lead an international initiative “to uphold Human Rights” from the danger of cloning, but leaves to the legislature whether to make the 1994 French Civil Code revisions more explicit to ban cloning.

France. National Consultative Ethics Committee for Health and Life Sciences (CCNE). **Opinion on the Preliminary Draft Revision of the Laws on Bioethics**. 18 January 2001. 19 p. [Available at

<http://www.ccne-ethique.org/english/start.htm>.]

For the first time, CCNE considers the ethical issues on cloned human embryos through cell nuclear replacement (or CNR, the British term). Not only does CCNE adopt British terminology, but the Committee also recommends creation of a Human Reproduction, Embryology, and Genetics Authority, such as already exists in the U.K. The Committee emphasizes its unanimous favor for an explicit prohibition of reproductive cloning; although opinions differ on therapeutic cloning, the majority favors controlled authorization.

Great Britain. Department of Health. Chief Medical Officer’s Expert Group Reviewing the Potential of Developments in Stem Cell Research and Cell Nuclear Replacement to Benefit Human Health. **Stem Cell Research: Medical Progress with Responsibility**. June 2000. 54 p. [Available at <http://www.doh.gov.uk/cegc/stemcellreport.pdf>.]

The Expert Group recommends permitting basic research using cloned human embryos. The report covers the scientific possibilities of human embryo research, along with ethical and legal considerations, within the existing regulatory framework in the U.K.

Great Britain. **Human Reproductive Cloning Act 2001**. 2001. Chapter 23. [Available at <http://www.legislation.hmso.gov.uk/acts/acts2001/20010023.htm>.]

This law, which took effect 4 December 2001, is intended to make cloning a crime. It makes placement “in a woman” of a human embryo “which has been created otherwise than by fertilisation” an offense.

Great Britain. House of Lords. Select Committee on Stem Cell Research. **Report from the Select Committee on Stem Cell Research**. 27 February 2002. 2 vol. (Report and Evidence [Available at <http://www.parliament.the-stationery-office.co.uk/pa/ld/ldstem.htm>.])

In Chapter 5, the Committee discusses therapeutic and reproductive cloning in the context of the 1990 Act and 2001 Regulations on human embryology and fertilization. The Committee also looks at oocyte nucleus transfer, which is both therapeutic and

reproductive because the donor nucleus comes from a female seeking to reproduce without the possibility of mitochondrial disease from her oocyte. In Chapter 7, the Committee recommends national support for an international ban or moratorium on cloning.

Israel. Academy of Sciences and Humanities. Bioethics Advisory Committee. *Report on the Use of Embryonic Stem Cells for Therapeutic Research*. August 2001. 27 p. [Available at <http://www.academy.ac.il/bioethics.html>.]

The Academy finds that cloned human embryos, those created by nuclear transfer, are acceptable to use in biomedical research as sources for stem cells. Israeli law already prohibits reproductive cloning.

Japan. *The Law Concerning Regulation Relating to Human Cloning Techniques and Other Similar Techniques*. (Provisional Translation). 14 p. In English. [Available at <http://www.biol.tsukuba.ac.jp/~macer/eclone.pdf>.]

Enacted by the Japanese Diet or Parliament on 30 November 2000, this law bans reproductive cloning.

Sweden. Swedish Research Council. *The Swedish Research Council's Guidelines for Research—Ethical Review of Human Stem-Cell Research*. 4 December 2001. 16 p. [Available at <http://www.vr.se/fileservers/index.asp?fil=I83HIDEU49LZ>.]

The Swedish Research Council specifically recommends that “[c]reation of embryos through somatic cell nuclear transfer may be ethically defensible but cannot be allowed in the present legal situation,” meaning Sweden must request an exemption from the Council of Europe’s ban on production of embryos solely for research.

C. Other

Council of Europe. *The Additional Protocol to the Convention on Human Rights and Biomedicine on the Prohibition of Cloning Human Beings*. Effective 1 March 2001. [Available at <http://conventions.coe.int/treaty/en/treaties/>

[html/168.htm](http://conventions.coe.int/treaty/en/treaties/html/168.htm).]

The first binding international agreement on cloning human beings, the Protocol does not apply to cells and tissues used for research purposes. The Protocol is silent on the definition of “human being,” thus allowing the domestic law of signatory states to define that term. The Protocol does define “genetically identical” to mean “sharing with another the same nuclear gene set.”

United Nations Educational, Scientific, and Cultural Organization (UNESCO). General Conference. *Universal Declaration on the Human Genome and Human Rights*. Paris: UNESCO. 11 November 1997. [Available at and printed (27 March 2002) from http://www.unesco.org/human_rights/hrbc.htm.] 7 p.

This landmark document represents the moral commitment of all UNESCO Member States to adhere to this set of ethical principles in genetics and genetics research. Adopted by the General Conference in 1997, it was endorsed by the U.N. General Assembly in 1998. Article 11 states that the reproductive cloning of human beings is not permitted because it is a practice contrary to human dignity. Member states should adopt appropriate national and international legislation to enforce this principle.

United Nations. General Assembly. *Request for the Inclusion of a Supplementary Item in the Agenda of the Fifty-Sixth Session; International Convention Against the Reproductive Cloning of Human Beings*. Letter dated 7 August 2001 from the Permanent Missions of France and Germany. [Available at http://www.un.org/law/cod/sixth/56/english/a_56_192e.pdf.]

The joint letter from France and Germany is the first step in an international ban against human cloning. It has two appendices, one, an explanatory memorandum about the approach to drafting such a ban, and the other, the draft resolution itself.

D. Legal Literature

Centre for Ethics and Law. *On Cloning: European and International Instruments, National Legislation: Bibliography*. Copenhagen:

Centre for Ethics and Law, 1998. 104 p.

Gathered by the Centre, this document provides reference to national and international documentation, including legal and political instruments, reports, scientific journal articles, and newspaper articles (mainly Danish) available before April 1998.

Macklin, Ruth. **Cloning and Public Policy**. In *A Companion to Genethics*, ed. Justine Burley and John Harris, pp. 206-15. Malden, MA/Oxford: Blackwell Publishers, Ltd. 2002.

Macklin reviews the international public policy response to cloning, analyzes the reason for strong and rapid adverse reactions, and argues for the need to clarify what the oft-cited concept of human dignity means and for a public policy based on reason, not intuition or emotion. She asserts that any such policy should require prior consent to clone from the adult person to be cloned and should include laws prohibiting commercial transactions involving cloned human beings sufficient to protect people's rights, to prevent harmful commercial and scientific applications, and to punish violators. Macklin points to a key question about cloning, namely, "whether public policy prohibitions should be based on a relative absence of prospective benefits or on a demonstration of probable harms" (p. 213). She acknowledges that any answer is further complicated because the same result is viewed alternatively as a benefit or harm by people of different opinions.

Senoff, Shirley K. **Canada's Fetal-Egg Use Policy, The Royal Commission's Report of New Reproductive Technologies, and Bill C-47**. *Manitoba Law Journal* 25 (1): 1-30, Fall 1997.

This article concerns the use of fetal eggs, as opposed to fetal tissue, in the context of assisted reproductive technologies. Senoff's conclusion, that the policy's name is a misnomer, comes from the fact that she believes the use of fetal eggs is not the issue, the issue is how society chooses to use them.

Tribe, Laurence H. **Clones, Cyborgs and Chimeras: A Series of Lectures on Science Fiction and Legal Thought in Modeling of Life**. Unpublished, given at the Kennedy Institute of Ethics, Georgetown University, Washington, DC,

4-5 and 11-12 April 1978.

Clones, cyborgs, and chimeras are, respectively, copies, human-machine hybrids, and human-animal hybrids. Tribe's lectures look at these prospects through the lenses of science, art, and law. In his first lecture, Tribe compares a decision on cloning to the Supreme Court decision on abortion in *Roe v. Wade*, where the Court focused on a definition, viability, in determining a woman's right to choose. He points out that "no 'definition' can avoid the need to choose" and concludes "[w]hen bio-fantasy becomes bio-technology, biology thus becomes a branch of politics."

Tribe, Laurence H. **Cloning a Child**. In his *Channeling Technology Through Law*, pp. 186-303. Chicago, IL: Bracton Press, 1973.

In a legal textbook predating the 1973 Supreme Court abortion decision (*Roe v. Wade*), Tribe looks at procedure and power in decision making. In one of his notes, he describes a hierarchy—compensable interests, exchangeable rights, inalienable rights—addressed by the legal process.

What Is Cloning? In *Mapping Public Policy for Genetic Technologies: A Legislator's Resource Guide*, ed. Brenda Trolin. Washington, DC: National Conference of State Legislatures (NCSL), 1998. [Available at <http://204.131.235.67/programs/health/Genetics/BOOK/chapt04.htm>.]

This chapter forms part of a useful overview of genetic technologies and the variety of associated legislative issues—e.g., the challenge of drafting legislation to cover genetic technologies, federal legislation, insurance, employment, privacy, criminal justice issues, agriculture, and family issues. See also NCSL's Genetics Technologies Project homepage at <http://www.ncsl.org/programs/health/genetics.htm> and, for lists of current state and federal legislation on human cloning, see <http://www.ncsl.org/programs/health/Genetics/rt-shcl.htm> and <http://www.ncsl.org/programs/health/Genetics/01clone.htm>, respectively.

Wright, R. George. **Second Thoughts: How Human Cloning Can Promote Human Dignity**.

Valparaiso University Law Review 35 (1): 1-38, Fall 2000.

Wright takes a Kantian approach based on freedom and autonomy in his support of human cloning. His title on “Second Thoughts” indirectly responds to a special issue on cloning in the Spring 1998 *Valparaiso University Law Review*. [Other special issues on legal aspects of cloning are the Fall 1997 issue of *Jurimetrics*, the Spring 1999 issue of *Hofstra Law Review*, the Summer 1999 issue of *Louisiana Law Review*, and the Symposium Issue on Legislating Morality: The Debate Over Human Cloning published in the *New York University Journal of Legislation and Public Policy* 4 (1): 1-79, 2000-2001.]

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