

Human Stem Cells: Research and Respect

The more we know about reproductive processes and the complexity of a biological human body—and also the beauty and abundance of the Earth, its creatures and resources—the more awe and respect we feel. For many religious people, the source of all this good is God. For many equally religious people, the processes of the universe have evolved into this interdependent web of which we are a part. Even when submerged in routines of daily life, many people pause daily, or at holidays, and at religious observances, to express awe, respect, and thanks for the goodness of life.

These religious and spiritual groundings are carried into theological praxis (study, reflection, and action), ethical reasoning, and medical-social rational analysis in their great variety and with some commonalities. One important and growing area of theological and medical ethics is the debate around human embryonic stem cell research.

To focus the discussion, let us first examine a claim: Embryos from which we derive human stem cells are both worthy of respect AND can be useful tools toward potential cures for serious human diseases. Are both statements true? Can only one or the other be true? How do people of faith—how do people of many different faiths—wrestle with yet another polarized dilemma? So often in our society this is presented as an “either/or” dilemma—

either human tissue in any form or stage of development is sacred and therefore cannot be destroyed for any purpose, or the potential for life-saving cures overrides all other ethical considerations.

As ever in our hurried culture, choices are presented as soundbytes, or simple pro-and con- snapshots. This is insufficient and dishonoring of the complexity of life. Imagine, if only one statement can be true, which will your faith tradition choose: shall we advance science OR respect human life? In order to search for cures for diabetes, Parkinsonism, Alzheimer’s disease, must we treat the very secrets of human life as marketable products? On the other hand, should we give up on potentially life-saving treatments in the name of respect for the potential life of the embryo? But yet, we’re told that, if we pause to deliberate, we lose opportunities to alleviate suffering.¹ Much hope is expressed, by celebrities and for-profit companies, that “regenerative medicine” holds possibilities for cures for many illnesses and conditions.² But cautions about effectiveness and side effects are not so newsworthy.

As we think through such issues, our religious and moral convictions recoil from simplistic arguments. In this paper, we will suggest ways to avoid the “either/or” positions and reach agreements that resonate among religious movements and people who are “Pro-Faith, Pro-Family, Pro-Choice.”

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This publication is one in a series of educational resource materials. The views are those of the author and do not necessarily reflect those of the member groups of the Religious Coalition for Reproductive Choice.

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Stem Cells Defined

Many of us who have participated in embryological and molecular studies and in teaching the public about them, regard the events of reproduction, even when utterly routine, as quite amazing. To know the processes through which a fruit fly, or a fern, or a salamander, and surely a human being, comes to full adult form, is fascinating. The more tools are developed, the more knowledge we gain, the more our religious instincts—respect, gratitude, and responsibility—grow.³

Among the many biological processes during the human life cycle—from conception through infant, from child through adolescent to reproductive-aged adult, from middle age to old age, and death at some time—some of our most fascinating life processes are growth and differentiation of the fertilized egg. Fertilization, growth, and differentiation processes provoke awe, even when embryologists and physicians can describe many of their details. Every human began as the fusion of two specialized (one set of chromosomes) cells, forming a zygote with two sets of chromosomes.⁴

Following fertilization, cleavage (mitotic division) begins. At first, all the resulting cells look nearly alike. Their overall shape is spherical, their overall size the same as the unfertilized ovum. As cell division (mitosis) happens over and over, cells end up in various positions, near the poles of the embryonic cell mass, or around the equator or below the surface of the sphere. Next, sheets of cells slide and form three layers. Exterior cells will be outer skin (epidermis) or will be the tubular nervous system. Inner cells will be “gut” and associated organs. A middle layer will be connective tissue, muscle, and bone. Once “committed” to a position in one of these layers, the cells become *differentiated*. That is, their capacity has been narrowed from the ability to form a whole organism to an ability to form only one kind of tissue.

In considering the *sources of stem cells*, we usually distinguish between:

1. Embryonic stem cells from (a.) cleavage stages and (b.) layered embryos
2. Capacity-narrowed, partially differentiated stem cells = “adult stem cells,” which may be found in (c.) cells taken from a fetus or newborn, or in (d.) child or adult.

Stem cells can be hard to visualize; they are usually identified by their behavior, not by their appearance. Only in recent years have newer technologies displayed chromosomal material or repair activities, informing us there may be many more types of human stem cells than previously detected.

Embryonic stem cells from cleavage stages:

The earliest embryonic stem cells are called “totipotent.” Each cleavage cell probably can form an entire organism, if separated from the whole. If a single cell is removed (perhaps for genetic disease-marker studies or chromosome analysis) the remaining cleavage cells can form an entire organism. We do not understand these processes (yet); we continue to study a long-held hypothesis that “position” affects the various developmental pathways.

Such human embryonic cells (hES) can be used in laboratory research. Their source may be an early spontaneous or induced abortion. Or tissue culture techniques can be used to produce embryos by in vitro fertilization (IVF).⁵ Usually more eggs are fertilized than will be placed in the uterus. Questions about the disposition and the status of “extra embryos” have been significantly discussed elsewhere; this paper will only note the substantial considerations going on in religious, political, and research communities⁶.

Stem cells from layered embryos: Once layers begin to form, embryonic stem cells become “pluripotent”—partially differentiated. Control genes direct cells down the path of one layer, toward differentiating as skin or nerve, muscle, or an organ lining. Some research suggests pluripotent cells can, in tissue culture, develop into several different tissue types, but how they reach an assigned destination and function only in the “target organ” and not the whole body, is not yet clear.

Hoped-for uses of such embryonic stem cells include: to restore endocrine tissue such as insulin-producing cells; block lethal cardiac defects; prevent brain blood vessels from hemorrhaging; provide dopamine-secreting cells to brain centers affected by Parkinsonism or Huntington’s chorea; repair spinal cord injury or regrow myelin, the insulation around nerve cells.⁷

Stem cells from fetus or newborn: The developed four-month embryo, the second-trimester fetus, and the newborn, all contain pluripotent stem cells. Some investigators suspect near-totipotent cells may persist far into fetal development. Dopamine-producing brain cells are a well-known example of partially differentiated cells with potential curative benefits. Because dissection is needed to locate the partially differentiated desired cells, in most cases the organism is, we recognize, destroyed or “sacrificed.” (This term leads to confusion, since the laboratory meaning is akin to, but not the same as, some religious meanings of the word.) Abortion, or on occasion spontaneous miscarriage, provides such tissue, if the woman gives consent to use the tissues in research or clinical care.

Another source of pluripotent stem cells becomes available at birth, when the umbilical cord connecting child and mother is severed. The cord blood vessels contain red and white blood cells, platelets, and also stem cells that can differentiate into these blood cell types. Cord blood transfused to a child or adult with leukemia apparently is more effective than transplantation of adult bone marrow cells and certainly less painful to obtain. Newborns’ stem cells invoke less rejection-reactions, being “more tolerant”—immunologically less differentiated than adult cells. As scientist Robert Kline says, “Since 1988 hundreds of lives have been saved by the three ounces of blood contained in a typical placenta and umbilical cord.”⁸

Stem cells from a child or adult: Stem cells from an adult are “pluripotent” or “multipotent,” but their capacity is narrowed. They act as a reservoir for production of some specific tissue—the kinds of tissue that are routinely worn out or used up during daily life. For example, red blood cells circulate for some 40 days, then are replaced from continuously mitosing stem cells in the bone marrow. (New white blood cells, too, develop from multipotent stem cells.) Adult bone marrow can be transplanted *if* tissue-types of donor and recipient match, or *if* tissue rejection can be blocked. Both require considerable medical-technology intervention.

Technical Cautions

Were adult stem cells obtainable from all organs, the argument against the study and use of hES (human embryonic stem cells) might be stronger. But, until the 1990s, repeated experimental searching did not locate stem cells in adult muscles, nerves, and some endocrine organs. So, totipotent embryonic or early fetal cells, not localized pluripotent later-stage cells, seem to be the necessary source of stem cells.

More recent work suggests that stem cells may “lurk” in all sorts of adult tissues—brain, intestine, eye, muscle, dental tissue. Such “rests” are detectable by their functioning in repair, not by their appearance. Some researchers hypothesize their origin could be circulating bone marrow, not the organ itself. Others are studying to see if such cells may be the “seeds” of organ-specific cancers. While much basic research is underway and will be needed for a long time,⁹ we live in a social context that advocates for haste in moving to human trials. Whether these studies will yield additional sources of stem cells that can be used for therapeutic purposes will be uncertain for quite a while.

Nor are long-term tissue cultures of embryonic or adult tissue an easy answer. Prolonged culturing can result in cells with distorted metabolism, resulting in a mutated clone, which would be recognized as a cancer or a chimaera. It is suspected that cleavage stage cells are able to differentiate into ANY tissue, depending on their position. However, they may also form teratomas, inappropriate clumps of tissue within an organ—fully formed teeth in a brain or heart, for instance.¹⁰ Or a tumor may form. The control factors that place differentiated cells *only* into the proper organ are still being investigated.

We need to recognize that the outpouring of fascinating basic research understandings does *not* mean cures are imminent. Optimistic projections from researchers and new-story-seeking media play down the long-term study needed in order for there to be confidence in the long-term outcome. Researchers, health care providers, and governmental regulatory agencies must be *sure* that no harm will be done by the proposed treatments and that such treatments will be safe and efficacious.

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Two leading researchers and proponents of embryonic and stem cell research say in the June 2004 *Scientific American*,¹¹ “Patients are buoyed by reports of the cells’ near-miraculous properties, but many of the most publicized scientific studies have subsequently been refuted, and other data have been distorted in debates over the propriety of deriving some of these cells from human embryos.”

Commercial and Ethical Interests

When we—scientists, technologists, policy-makers, and many others—work with living (or post-living) materials or organisms, we run the risk of *commodification*, that is, treating an entity as a unit to be manipulated and assigned monetary worth. We can think of our bodies as an assemblage with many “replaceable” parts. But plainly we do not regard a person we cherish with such disinterest. Nor are we, as religious people with stewardship for the Earth and its creatures, dispassionate about human suffering worldwide or about environmental degradation that leads to suffering of other species. We see the whole and the parts. When we talk about research use of cells that may, under suitably chosen circumstances, form the generation of humans that follows us, the concerns are particularly complex and disturbing. But the dialogue is growing.

Advanced Cell Technology (ACT) of Worcester, Massachusetts, announced the “creation” of the world’s first cloned human embryo on November 24, 2002—and offspring cells that potentially will become the source of many more hES. The company’s top scientists have been forthcoming in publication¹² and in presentations to an undergraduate and public audience, for example answering the invitation of a local Roman Catholic college to come and make a presentation. Also, this company, perhaps canny as well as courageous [and, we assume, principled], invited formation of their own Ethics Advisory Board (EAB). Although a private company is not required to set up such an EAB, its members commented: “But in our experience, the company heeded our advice *whenever our resolve was clear* [italics added]. It may have done so out of a combination of motives—perhaps respect for the process the company helped set up, perhaps a genuine need

for guidance through novel issues, perhaps the realization that, if the board were ignored, it had the power to embarrass the company.”¹³

Difficult dialogue and conflict seem inevitable between professions with different primary values. The ACT board experienced strong differences of approach between their ethics committee and that of the company’s legal staff. It became clear that separating a (legal) waiver of rights of the donor to benefits from the product (i.e. any treatments that might result from the donated tissue) had to be pursued separately from (ethical) procedures to obtain informed consent from the donor to experimental procedures on the donor and on the donated parts. The EAB wrote, “One goal should be a series of ‘best practices’ guidelines to help each board effectively accomplish its work and to enhance public trust.”¹⁴

The biotechnology industry, like the biomechanical and pharmaceutical industries before it, includes companies moving from start-up research toward clinical trials and product-release. They are increasingly sensitive to public scrutiny and responsive to public interests. Geron Corporation in California and Advanced Cell Technology are two effective examples.¹⁵ The EAB at each is publishing its process and reasoning for public scrutiny in professional journals. The pro-choice movement would do well to follow and participate in this sort of engagement with industry.

Honoring the Cells That Are Gifted: Respecting What We Destroy

We began with the concern that our national debate exhibits simplistic “either/or” reasoning, which states that either human stem cell research is wrong because human life is precious, or human stem cell research is good for the advance of knowledge and medical cures for human suffering. Can we get beyond the “either/or” arguments, and instead find a way to regard human stem cells as *both* worthy of respect *and* useful tools toward potential cures for serious human diseases?

Daniel Callahan, co-founder of the premier Hastings Center, insightful ethicist, and advisor to deliberating legislators, stated his puzzlement in thinking about how an embryo can *both* be “entitled to profound respect” *and* used “in deference to the requirements of research.” One suggestion (heuristic and discussion-provoking,

I presume) was that destruction or study of embryos is best justified by “simply stripping them of any value whatsoever.”¹⁶

While reflection on this stark proposal is *both* appropriate to philosophers’ style of rational discourse, *and* unlikely to change public opinion or governmental policy, it helps us understand the dilemmas of a dualistic choice, which would require us to set aside strongly-held value positions.

There is an endless array of questions in the standard literature about framing the concept of *worth*. Does the embryo have moral standing, from which follows a requirement of respect? Does moral status increase with gestational age? Does an embryo that originates from in vitro fertilization have lower moral status than one originating from intercourse? Is an embryo developed from fertilization in a petri dish more parallel to an animal bred purposefully for laboratory research? (While we may pause at the thought of human embryos compared to white lab rats, the trends of current usage appear to lead there.)

Is lab parlance that names killing experimental animals and tissues as “sacrificed” an expression of respect?

Some commentators say, in such an irresolvable situation, “continue to reframe the problem until a question can be asked whose answer will incorporate all of the pertinent values.”¹⁷ That is, change the question. Other philosophers examine definitional processes using clusters of traits or criteria rather than rank-ordering. Indeed, as Meyer and Nelson point out, philosopher Mary Anne Warren suggests seven principles, both intrinsic and relational, which contribute to judging an entity’s moral status.¹⁸

The concept “respecting what we destroy” clarifies the hES issues, I believe¹⁹. Meyer and Nelson define this thusly, “An agent evinces *moral* respect, however, when she [sic] sincerely considers and actually treats an entity as worthy of some degree of deference, reverence, or regard.”²⁰

Their argument suggests that moral respect is shown in two ways:

- 1) what the moral agent does or refuses to do;
- 2) what attitudes the agent displays to the respected object, how the agent *behaves*.

I read their analysis as adding a third criterion:

- 3) The research must be “legitimate research —research, that is, that utilizes sound scientific methodology and design and possesses the reasonable promise of generating significant knowledge, whether theoretical or practical in nature.”²¹

Regarding the actions of the moral agent:

Meyer and Nelson point out that, if we assume the origin of many stem cells for research will be “extra” embryos developed during IVF, then “gamete sources [i.e. the sperm and egg donors] have a genuine moral connection to their embryos.”²² As Prof. Barbara Katz Rothman has argued and documented for at least 30 years, people do have hopeful and bonded feelings about a planned pregnancy, even as they wait for the results of genetic testing to see if this particular embryo and fetus carries a genetic disease.²³ Her studies support the criterion that “discarded embryos,” extra embryos, and stem cells derived from them have been conceived with some, sometimes a large, degree of moral respect.

Regarding the attitudes and behaviors of the agent toward the object: Respecting what one destroys should include behaviors such as an attitude of regret, and some sense of loss, conjoined with some display of that regret and acknowledgment of loss. “Even the gains reaped through its destruction do not preclude honest and open acknowledgment of the regret and loss one feels about it.”²⁴

Meyer and Nelson give examples of respectful practices:²⁵ Native American respect for animals hunted as food; Japanese [Buddhist] Mizuko kuyo statuary images that are part of women’s memorial services for their aborted fetuses; young American writer Naomi Wolf’s advocacy of Jewish mystical tradition practices of *tikkun*, or mending; dissection of human cadavers by medical students (this author would add, when followed by memorial services of thanks for knowledge and skill gained).

Regarding the legitimacy of the scientific research: The criteria of legitimate science, methodology and analysis properly carried out, are usually tested by competition for grants, research papers at professional meetings, and peer review in the publication process. More than a few people of faith, both laity and ordained, have careers in these domains.

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Respecting the Donor: Providing a Context of Religious Community

While we have focused on the embryo as the source of stem cells for medical research, we must not forget to honor the women who are the source of the embryos, and do so in the context of seeing women as moral agents.

Beverly Wildung Harrison, Professor of Christian Ethics, wrote, "From the standpoint of a woman's experience, a more basic and prior moral question operates: 'What am I to do about the procreative power that is mine by virtue of being born female?'"²⁶

Some of the questions we might ask include: how should the religious community accompany a woman who is thinking through the ethics of creating embryos that could yield embryonic stem cells? She might say, "Here's an ad in the student newspaper. If I answer this ad and donate ova to this fertility clinic, will I earn enough money to pay next semester's tuition?" or, "My husband and I have an infertility problem. Suppose I undergo assistive reproductive techniques? Should I urge that we donate any extra embryos to medical stem cell research, or offer them to another woman who wishes to become a birth mother?"

There are many ethical issues regarding the role of women in this important area of research. While we cannot address them thoroughly here, we raise them as issues in need of further thought and attention. For example, should women be paid for donating eggs for research? If so, how do we safeguard against the exploitation of women of lower economic circumstances? These are just some of the issues that warrant further discussion and exploration among scientists, ethicists, and theologians. We need to place the "stem cell debate" within the context of the wholeness of peoples' lives and to involve their communities in the discussions.

There are many different opportunities for addressing the quandaries of human stem cell research. People of faith and religious leaders can find places to be present: for researchers and medical personnel; for policy planners and social activists; for health care advocates and lawyers working out "best practices." It is important for clergy, theologians, and ethicists to become educated about the scientific facts of stem cell research and to educate (or facilitate the education of) their congregants, so that discussions can take place from a base

of knowledge. Further, clergy can become involved in ethics advisory boards for research institutions and corporations. And clergy and progressive religious leaders need to be in the forefront of framing and shaping the debate before the public, in the media, and before our elected officials. The clergy can speak in terms of the moral agency of women, and the need and capability to balance a respect for the embryo with the promise of basic research with potential for helping others. Each has a role in our work for the common good, using the gifts provided by God, Earth, and human beings of good will.

Endnotes

¹ Note: Celebrities, participants, and patient-advocates urge research using embryonic stem cells, optimistically expecting great benefits against human disease and injury, in the near future.

Recall the son of former President Reagan, who died of Alzheimer's disease in 2003, urging the Republicans' political convention to support stem cell research.

Recall Christopher Reeve, who developed a Foundation for Paralysis, including stem cell research to cure spinal cord injury. He told an interviewer, basic research and applications would take longer than his life span, and he acknowledged, liberal religion had become "a moral compass" in his latter years.

The "Superman" actor became quadriplegic due to a spinal cord injury in 1995. In the nine years before his death, he demonstrated that, though paralyzed, some sensation and motion could be restored by exercise. He died on October 10, 2004, of cardiac arrest and systemic infection secondary to the chronic spinal cord injury.

The interview with Christopher Reeve appeared in the October 2004 Reader's Digest and was reprinted on-line at <http://www.rd.com/content/openContent.do?contentId=13712>.

² The Ethics Advisory Board of a for-profit company that developed the world's first cloned human embryo believes "that a halting first step has been taken toward a new era of 'regenerative medicine'" (Green, Ronald M., Kiel Olsen DeVries, Judith Bernstein, Kenneth W. Goodman, Robert Kaufmann, Ann A. Kiessling, Susan R. Levin, Susan L. Moss, and Carol A. Tauer. "Overseeing Research on Therapeutic Cloning: A Private Ethics Board Responds to Its Critics." Hastings Center Report 32, no. 3, (2002): 27-33.)

³ Note: For the past 40-50 years, human biology has experienced great periods of discovery, then lulls until some new technology, some new tool, made possible new or reconfigured questions. E.g. in the 1950s, there was much study of the ability of a newt (water salamander) to regenerate a lost arm or tail. Funding was justified on the basis that we might understand cancer better, or we might be able to restore the arm of a person damaged in an industrial accident or while cutting the lawn. We reached dead-ends in the study of regeneration, but learned about the roles of stress and pituitary hormones on tissue growth.

Now, with new tools, the same questions are being reexamined. Electron microscopy, tissue and organ culture, biochemical analyses, DNA sequencing and making of vast numbers of copies—such biological and medical advances raise bioethical and societal dilemmas that were not issues before. Many of the questions for analysis, however, are not all that different. They are religious and ethical questions.

⁴ True, humans have provided exceptions to the usual intercourse-fusion of egg and sperm if contraception is not in place-embryo formation. Procedures such as in vitro fertilization move fertilization to the laboratory. Among assisted/manipulative technologies, a sperm can be injected into an egg, or two egg cells can be fused, or a body-cell nucleus can be injected into egg cytoplasm. More “new ways to make a baby” are promised.

⁵ In vitro fertilization (IVF) has developed as a growth industry during the last 25 years, a response to a rising rate of infertility—in both females and males. There is far less funding for study of the environmental and genetic causes of rising infertility.

The first two IVF-generated children (after many experiments with a low rate of conception), Louise Joy Brown in England and Sarah Carr in the United States, have graduated from high school.

Now one in 150 babies annually in the United States originate with such assistive reproductive technologies (ART, formerly called Manipulative Reproductive Technologies, MRT). About 1 million children worldwide have been conceived using ART procedures since 1978.

See data in Schultz, Richard M. and Carmen J. Williams. “The Science of ART” *Science* Vol. 296: 2188-2190, 21 June 2002.

⁶ Chapman, Audrey R. *Unprecedented Choices: Religious Ethics at the Frontiers of Genetic Science*. Minneapolis MN: Fortress Press, 1999.

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⁷ Holden, Constance. “Versatile Cells Against Intractable Diseases.” *Science* 297: 500-502, 26 July 2002. News Focus feature.

See also Chien, Kenneth R., Alessandra Moretti, and Karl-Ludwig Laugwitz. “ES Cells to the Rescue.” *Science* Vol. 306, pp. 239-241, 8 October 2004. This is an analysis of a research article in the same issue, which is:

Fraidenraich, Diego, Elizabeth Stilwell, Elizabeth Romero, David Wilkes, Katia Manova, Craig T. Basson, Robert Benezra. “Rescue of Cardiac Defects in *Id* Knockout Embryos by Injection of Embryonic Stem Cells.” *Science*. Vol. 306, pages 247-252, 8 October 2004.

⁸ Kline, Ronald M. “Whose Blood Is It, Anyway?” *Scientific American*, Vol. 287, 8 pages, April 2001. Reprinted in *Scientific American*, “The Frontiers of Biotechnology,” pp. 20-27, 2002. Original citation not stated.

⁹ Lanza, Robert and Nadia Rosenthal. “The Stem Cell Challenge,” *Scientific American*, Vol. 290, No. 6 (June 2004): pages 92-99.

See also the Ethics Advisory Board of Advanced Cell Technology company (Green, Ronald M., Kiel Olsen DeVries, Judith Bernstein, Kenneth W. Goodman, Robert Kaufmann, Ann A. Kiessling, Susan R. Levin, Susan L. Moss, and Carol A. Tauer. “Overseeing Research on Therapeutic Cloning: A Private Ethics Board Responds to Its Critics.” *Hastings Center Report* 32, no. 3, (2002): 27-33.)

¹⁰ Lanza, op cit. p.94

¹¹ *Ibid*, p.93

¹² Cibelli, Jose B., Robert P. Lanza, and Michael D. West. “The First Human Cloned Embryo.” *Scientific American*, Vol. 288, 8 pages, January 2002. Reprinted in *Scientific American* “The Frontiers of Biotechnology” (2002), pp. 12-19. Original citation not stated.

¹³ Green, op.cit., 27-33

¹⁴ *Ibid*, p. 23

¹⁵ *Ibid*, 27-33; and Geron Ethics Advisory Board (Lebacqz, Karen. Michael M. Mendiola, Ted Peters, Ernie W.D. Young, and Laurie Zoloth-Dorfman). “Research with Human Embryonic Stem Cells: Ethical Considerations.” *Hastings Center Report* 29, no. 2 (1999): 31-36.

Clergy and progressive religious leaders need to be in the forefront of framing and shaping the debate before the public, in the media, and before our elected officials.

- ¹⁶ Callahan, Daniel. "The Puzzle of Profound Respect." *Hastings Center Report* 25, no. 1 (1995): 39-40.
- ¹⁷ Hoskins, Betty B. and Helen Bequaert Holmes "When Not to Choose." *Journal of Medical Humanities and Bioethics* 6, no. 1 (1985): 28-37.
- ¹⁸ Warren, Mary Anne. *Moral Status: Obligations to Persons and Other Living Things*. Oxford: Oxford University Press, 1997. Also cited in Meyer and Nelson, 21, page 17.
- ¹⁹ Meyer, Michael J. and Lawrence J. Nelson. "Respecting What We Destroy: Reflections on Human Embryo Research," *Hastings Center Report* 31, no. 1 (2001): 16-23.
- ²⁰ *Ibid*, p. 17
- ²¹ *Ibid*, p. 21
- ²² *Ibid*, p. 21
- ²³ Rothman, Barbara Katz. *The Tentative Pregnancy: Prenatal Diagnosis and the Future of Motherhood*. New York, Viking, 1986.
- Also see:
 _____ *Re-creating Motherhood: Ideology and Technology in a Patriarchal Society*. New York: W.W. Norton, 1989.

_____ *The Book of Life*. Boston: Beacon Press, paper back edition, 2001.

Hardback is titled *Genetic Maps and Human Imaginations: the Limits of Science in Understanding Who We Are*. New York: W.W. Norton, 1998.

²⁴ Meyer and Nelson, *op.cit.*, p.20

²⁵ *Ibid*, pp. 19-20.

²⁶ Harrison, Beverly Wildung. *Our Right to Choose: Toward a New Ethic of Abortion*. Boston: Beacon Press, 1983, page 9.

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The Religious Coalition for Reproductive Choice, founded in 1973 by people of faith, is the national organization dedicated to preserving reproductive choice on religious grounds. RCRC members are national groups from 15 denominations and faith traditions including the Episcopal Church, Presbyterian Church (USA), United Methodist Church, United Church of Christ, Unitarian Universalism and Reform, Conservative and Reconstructionist Judaism and Catholics for a Free Choice and other independent religious organizations. A non-partisan, non-profit education and advocacy organization, the Coalition includes the Clergy for Choice Network, Spiritual Youth for Reproductive Freedom chapters, The National Black Church Initiative, state affiliates throughout the nation, and individuals committed to reproductive and religious freedom.

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