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Prologue

The Dogs Bark but the Caravan Moves On

The Arab proverb in the chapter title offers a concise yet profound statement on the current state of stem cell research.[1] Despite many years of heated social and religious debates over the use of human embryos in embryonic stem cell research, it remains an undeniable fact that the caravan of stem cell science is proceeding at an unrelenting pace around the world. This situation is fascinating in and of itself. On one interpretation, the proverb may represent a fatalistic stance toward stem cell research, where progress in this direction is nothing but an inevitable stage within a naturally unfolding history of science.[2] Or one may interpret it as suggesting the opposite point: that people's economic interests have driven permissive social and scientific ideologies that feed and are conducive to those very same interests.[3]

There is a grain of truth in each of these extreme views. In spite of much controversy, stem cell research continues to advance for several reasons. First, the term *stem cell research* encompasses a very wide range of scientific activity related to many different cell types: multipotent (adult) stem cells; embryonic stem cells and their direct derivatives; and somatic (body) cells that have been bioengineered to take on the pluripotent properties of embryonic stem cells – that is, their capacity to become any

[1] This proverb appears in Marcel Proust's *Remembrance of Things Past*, vol. 1 (1913, 497).

[2] This position echoes a Hegelian view of history as the unfolding of universal Reason through the actions of men: "What is actual becomes rational, and the rational becomes actual" (Hegel 1821, 390).

[3] This position is characteristic of Hegel's iconoclast, Marx. "Morality, religion, metaphysics, all the rest of ideology and their corresponding forms of consciousness thus no longer retain the semblance of independence. They have no history, no development; but men, developing their material production and their material intercourse, alter, along with this their real existence, their thinking and the products of their thinking." (Marx 1845, 154–5).

type of cell in the human body.[4] Thus the caravan of stem cell science is composed of many parts and, as I argue in Chapter 2, it must progress together as a whole. Second, stem cell science – especially pluripotent stem cell research – has proven to be of high scientific interest, unfolding previously inaccessible mysteries about human development, genetics, degenerative diseases, and tissue regeneration. As a consequence, groundbreaking discoveries in pluripotent stem cell research have motivated attempts to translate basic stem cell knowledge into practical applications for targeted drug development, new diagnostics, and novel therapeutics for patients with intractable medical conditions – the aims of which carry considerable potential commercial appeal. Without its significant intrinsic and instrumental scientific value, stem cell research would never have garnered legions of support from politicians and policy makers, scientists, and patient advocates; neither could it have ever received such large amounts of public and private funding at all levels: state, national, and international. However, institutional and government support for stem cell research has also driven the need to articulate stem cell–specific regulatory structures to provide social boundaries around stem cell science and, in so doing, facilitate its progress. Thus, multiple interpretations of the Arab proverb are possible as it pertains to stem cell research, and each of these interpretations seems plausible.

In this prologue, I explain the overall approach of this book and introduce its two major themes.[5] I will not rehearse the embryo debate that has dominated stem cell ethics for the past decade. Although the embryo debate is interesting for religious and philosophical reasons, there are major opportunity costs to focusing on just this aspect of the ethical discourse over stem cell research. It is time to move beyond the embryo to a much wider array of ethical issues in basic stem cell science and clinical translational research in which there are potential ethical costs to individuals whom everyone would agree are full moral persons with rights and interests. Both sides of the embryo debate must pay close attention to where the caravan is going and the factors that might influence its direction and speed.

There are those who would argue that one cannot fully appreciate the depth of controversy surrounding the stem cell field unless one begins with the abortion debate sparked by *Roe v. Wade* in 1973 and the

[4] I explain all of these terms in detail in Chapter 2.

[5] Throughout this book I follow the academic philosopher's convention of using the terms *ethical* and *moral* synonymously.

uproar over fetal tissue research in the 1980s, both of which preceded and impacted the development of policies around human embryonic stem (hES) cell research. However, these are characteristically American political-cultural scars, and retracing these old wounds will do little to illuminate the reasons why stem cell research as a whole continues to be ethically sensitive in countries with much more liberal social attitudes toward abortion. To truly understand the origins of the ethical sensitivities of stem cell research within the United States and abroad, one must go back a great deal further to the postmedieval rise of modernity and the emergence and impact of science beginning in the seventeenth century.

Why, some may ask, is it necessary to situate the ethics of stem cell research against the background of these much more expansive historical contexts? I believe many of the deep ethical controversies surrounding most forms of stem cell research today are recapitulations of broader social uncertainties generated by major scientific advancements. Many current ethical disputes in stem cell research appear to be echoes of a familiar clash between two different mind-sets: a premodern faith in a natural world order and a modern enthusiasm for scientific creativity. From its beginnings in the seventeenth century, science has had the capacity to evoke wonder and unease simultaneously. The field of bioethics has emerged in the past several decades as a way to cope with the social tensions caused by science. Because this book is about bioethics about as much as it is about stem cell research, it is appropriate that we set the right contextual tone by retracing the major trains of thought that have influenced the stem cell field and the ethical frameworks of contemporary bioethics. Thus this chapter is meant to serve as a prologue in the most traditional sense of the term. I offer in the next section a background discussion of the scientific worldview that is implicit in all stem cell research. Understanding this embedded *Weltanschauung* is crucial if we want to appreciate the roots of many stem cell controversies today. After discussing the intellectual connections between modern science and the ethics of modernity, I explain in later sections how secular bioethics attempt to provide a means for dealing with the social impacts of stem cell and other scientific advancements.

The Rise of Science and the Ethics of Modernity

The foundations of modern science were laid in the early seventeenth century when Johannes Kepler (1571–1630) and Galileo Galilei

(1564–1642) confirmed and advanced the astronomical revolution begun by Copernicus some fifty years earlier (Westfall 1999). Later, Isaac Newton (1642–1727) developed the path set forth by his predecessors with his breathtaking systemization of astronomy and dynamics, which permanently removed all traces of Aristotelian animism from the physical world.[6] According to the Newtonian worldview, matter was essentially lifeless and subject only to external causes that were material. The solar system, once having been spun into motion by God, had no further technically explanatory need for His divine intervention. Although modern quantum theory has rejected large swaths of Newtonian physics, it is important to recall just how deeply the scientific revolution represented a rejection of all major currents of medieval thought. Modern quantum theory has done nothing but harden this ideological repudiation.

The seventeenth century was also a time of extraordinary advances beyond astronomy. Improved tools for scientific observation permitted not only more precise viewings of the starry heavens through the telescope, but also extensive explorations of the microscopic world through the compound microscope. Before long the Newtonian Man found himself occupying an uncertain place somewhere between the cold, vast, clockwork universe above and a previously unseen microenvironment oblivious to the gaze of human eyes below.

New scientific observations continued to belie the long-held view of the Middle Ages that all things had a divine purpose involving mankind. Now everything, including the human body, could be understood without the need for religious metaphysics. William Harvey (1578–1657) discovered the closed-circuitry of blood circulation, which he described in terms conducive to a mechanical biology further elaborated by René Descartes in his *Discourse on the Method*.[7] Robert Hooke (1635–1703) observed a piece of cork under a microscope and saw that it was composed of veinlike channels and pores. Hooke was the first to use the biological term *cell* to describe these intricate structures (Westfall 1999). Later, the "Father of Microbiology," Anthony van Leeuwenhoek (1632–1723),

[6] Newton was also greatly influenced by Muslim physical theorists who developed many similar ideas of dynamics during the Islamic Golden Age of the eighth to sixteenth centuries. My use of the caravan metaphor is meant to allude in part to the connection between the Western scientific revolution and the Middle East.

[7] The full title of Descartes's work is *Discourse on the Method of Rightly Conducting One's Reason and Seeking the Truth in the Sciences* (1637). Historians of science widely acknowledge this as the first popular comprehensive articulation of the scientific method. Writing in French rather than Latin, Descartes intended to aim his anti-Aristotelian treatise to a broad, nonacademic audience.

used his improvements on the microscope to observe spermatozoa and to discover unicellular organisms. No one at the time conceived of the possibility that Leeuwenhoek's tiny organisms bore any relation to the cells that Hooke found in plants. It was not until twentieth-century molecular genetics, built on the foundations laid by Darwin and Mendel, that the apparent heterogeneity of nature could be explained using the common language of DNA, not divine creation.

With the steady rise of scientific belief systems in the seventeenth century came a corresponding decline in ecclesiastical authority (Russell 1945). Although early scientists such as Newton and his intellectual cohorts were pious men, their activities were profoundly disconcerting to the religious orthodoxy. In addition to the truism that Man was ousted from the center of the heliocentric universe, the scientific revolution signaled a radical shift in what thoughtful persons were willing to accept as the justificatory grounds for their beliefs. The authority of science revealed itself to be a very different creature from the authority of the Church, as the former was intellectual and evidence based, while the latter was authoritative and faith based. Unlike medieval religious dogma, which laid down a complete system of beliefs that was accepted as indubitable and incorrigible, science offered piecemeal and tentative conclusions that were always subject to doubt and modification. While medieval dogmatists were persons of unshakeable faith, even in the face of countervailing facts, the scientific mind was skeptical and called for probabilistic evidence.

One should not conclude, however, that the scientific mind-set left its adherents feeling completely helpless. Rapid advances in the theoretical and practical sciences, while humbling to mankind's position in the universe, had the cumulative effect of imparting a notion that one could exert greater human control over the physical world. This newfound sense of scientific power in the seventeenth century was met with the arrival of early liberal individualism as characterized by the political philosophy of John Locke (1632–1704) and others who promoted the ideals of enlightened self-interest and conditional governmental authority.[8]

[8] Locke, *Second Treatise of Government* (1690). Locke argued in his second treatise that civil government was based on a social contract and not something established by divine authority. The *raison d'être* of government was the mutual advantage of men, especially with respect to the protection of their private property interests. Locke wrote his second treatise while operating with a group of conspirators led by the first Earl of Shaftesbury to resist the sovereign. Locke's work provided the theoretical justification for the Whig Revolution and the installation of William and Mary in 1689.

The ideological movement of philosophical liberalism valued property rights, commerce, industry, and democracy. It was, at heart, a brand of political and ethical antiauthoritarianism that stressed the importance of self-governance, individual rights, liberty, and reason – values that resonated harmoniously with the scientific ethos of the nascent modern era.[9] Like the physical world, long-standing social and political institutions and traditions also came to be viewed as malleable according to the dictates of human rational power.

The emerging ethics of modernity stood in sharp contrast to the natural law tradition of medievalists like St. Thomas Aquinas (1226–74). According to Aquinas and the scholastic moral theologians of the Middle Ages, God was the giver of the natural law through His divine providence and in accordance with His eternal plan (Aquinas 1274). Mankind is able to understand the precepts of natural law through reason and act freely on them. The precepts of natural law directed all rational beings to pursue their good as God had planned.

Within Aquinas's paradigmatic natural law theory one can detect two crucial differences that separate the medieval natural law tradition from the ethics of modernity. First, because the precepts of natural law are an aspect of divine providence, it is possible for an action to be morally wrong regardless of whether individuals freely consent to it or whether the act produces no appreciable harms to the parties involved. Actions can be wrong simply by virtue of being "unnatural" as determined by God's wisdom and grace. According to the ethics of modernity, however, the moral worth of human actions was to be determined by the voluntary and rational autonomy interests of individuals and/or the balance of measurable harms and benefits produced. In the moral judgment of the moderns, then, it would be conceptually incoherent to assert that an action or state of affairs could be wrong if no rights were violated and no physical or psychological harms were suffered. In the absence of either source of wrongfulness, an action would have to be judged purely on prudential, aesthetic, or perfectionist grounds.

Second, God's existence was absolutely necessary for the medieval natural law tradition because it was God's divine plan that gave the precepts

[9] This harmony was no mere coincidence. Locke studied philosophy and medicine at Oxford, and his scientific talents led to his election to the prestigious Royal Society in 1668. At Oxford he was mentored by the mechanical philosopher Robert Boyle, who, with the help of his assistant Robert Hooke, built an air pump that led to the formulation of Boyle's law. Thus the easy convergence of science and the ethics of modernity should come as no surprise, because Locke's social philosophies and epistemology sprang from a mind trained to think scientifically.

of natural law their normative force.[10] God, while present in the minds of many early modern ethical theorists, was not philosophically necessary in order to make modern ethical theories internally consistent and plausible. Unlike medieval ethics, the ethics of modernity was focused around rational self-governance and the psychological/behavioral inclinations of all human beings.[11] Like the god of Newton's universe, the god of modern ethical systems could be viewed as having little else to do outside of imbuing human beings with reason and the passions and leaving them to rule themselves. This shift toward conceptualizing ethical standards in terms of rational human behavior marked a new surge in secular ethical thinking, one that still characterizes most academic moral philosophy today.

Thus the seventeenth century was bookended by the emergence of scientific thinking and the development of modern philosophical thought. Between these two epochal intellectual movements lay the old scholastic worldview of the medievalists slowly losing its grip of influence. The dogs barked but the caravan of modernity moved on. The strict exclusion of psychic forces from physical nature and the consequent theoretical dispensability of God from modern moral philosophy were among two of the most important legacies of seventeenth-century thought.

Power and Uncertainty

However, the intellectual legacies of early modernity had to be purchased at the price of people's sense of security in their epistemic beliefs and moral judgments. We still bear the weight of these intellectual costs several centuries later, even in our thinking about stem cell research. Like the Newtonian Man who found himself occupying an uncertain place between the vast universe above and the microenvironment below, modernists today find themselves on a lifeboat with very few permanently fixed planks. To their right are the premodern faithful still operating

[10] There are nontheistic natural law theorists, e.g., Philippa Foot (2001), who ground the precepts of natural law in a vaguely Aristotelian conception of human flourishing. It bears pointing out, however, that nontheistic natural law theories are consistent with what I am calling here *modern secular ethical theories*, because being avoidably prevented from full human flourishing counts as a type of harm and is thus morally wrong from a modernist's point of view.

[11] Each of these approaches was epitomized in the eighteenth century by the moral philosophies of Immanuel Kant and the utilitarians. Although utilitarianism has never been a theistic moral doctrine, Kantianism and neo-Kantianism today are usually treated as secular theories.

under a natural law tradition that frames all scientific and social issues under the lens of a theistic worldview. To their left are the postmodern relativists who doubt whether any moral and scientific conclusions have objective authority beyond a tribal circle of like-minded cultural players.[12]

Besides warding off philosophical attacks from both sides, the modernists must also negotiate a host of indeterminacies within the ethics of modernity. Modern ethical theories tend to define morally right actions in one of two ways: either an action is right because it corresponds to people's moral rights and duties (deontological ethical theories) or because it produces the greatest balance of benefits over harms for those affected (consequentialist ethical theories). Although each of these ethical approaches has the advantage of providing a common moral language within modern pluralistic societies, they also leave plenty of unanswered questions.

First is the issue of how these two approaches relate to one another, because consequentialism and deontology offer a plausible account of morally right actions, so plausible that modern ethicists often shift from one approach to the other when deliberating over complex ethical issues. On one view of this interactivity, people's rights constitute a moral floor below which consequentialist ethical justifications must never dip. To put the point another way, rights trump considerations of overall ethical utility (Dworkin 1978). For example, it would not be morally acceptable to credit a famous scientist for an important discovery made by his student even if doing so would greatly elevate its acceptance and scientific impact. The student has a basic right to be treated fairly and not have her work plagiarized. According to another view, however, it is consequentialism that sets a moral ceiling on the deontological approach by limiting the extent of people's rights. On this view, rights are not absolute in the sense that they must be respected in all circumstances. This limit-setting approach finds its most well-known articulation in John Stuart Mill's Harm-to-Others Principle, which maintains that personal liberties should

[12] For a comprehensive critique of all varieties of relativism see Allen Wood (2002). Philosophical postmodernists may criticize my analysis in this chapter by questioning my implicit acceptance of modern concepts such as ethical justification and scientific and historical knowledge. I will not engage in a debate here about the merits of postmodern modes of thought. Jürgen Habermas (1987) has advanced a scathing critique of philosophical postmodernism whereby he argues that postmodernist arguments characteristically presuppose the very concepts they seek to undermine and in that way are guilty of a performative contradiction.

be respected to the point at which their exercise would lead to serious harms to identifiable individuals (Mill 1859). For instance, patients have a right to refuse medical interventions, unless they suffer from highly infectious diseases that pose a grave and immediate public health threat to others. Deontological and consequentialist moral views cannot stand completely in isolation from one another, for people's rights and the overall good matter in our everyday moral judgments. But rights often come into conflict with efforts to promote the greatest total benefits, and it remains an open question as to which of these two ethical approaches ought to set limits on the other.

Second, there are serious philosophical indeterminacies within each of these modern ethical approaches. For example, deontologists must offer an account of how to balance conflicts among people's rights. When two or more rights clash (as they so often do in difficult moral dilemmas) how does one determine which of these rights is more "fundamental" and thus should take precedence? Consequentialists, too, must struggle with ambiguities. For instance, a proposed action may produce large benefits in the near term but far fewer benefits later, while an alternative choice may produce fewer benefits now but greater benefits in the future. How far into the horizon of future possibilities should a consequentialist look in determining the moral worth of a specified act? Furthermore, how is she supposed to decide which of her proposed alternatives is most likely to have its believed effects, good and bad? How should one compare different possible outcomes, especially when they relate to different domains of value?[13] And how should the consequentialist demarcate the relevant circle of individuals affected by each alternative choice? Given these and other indeterminacies, the real-world impacts of a consequentialist's ethical choices can be notoriously difficult to prognosticate.[14] All of these indeterminacies will come into play when we examine the various ethical controversies concerning stem cell research.

[13] I explore this particular problem, which I call the *incommensurability problem*, in greater detail in Chapter 7.

[14] It should be pointed out that, on a consequentialist moral approach, it is not enough simply to believe that an action is likely to produce beneficial effects. Technically, according to consequentialism, an action cannot be determined to be right or wrong until its effects have actually been produced; thus in all cases the consequentialist must attach the moral value of an action retrospectively. This is a counterintuitive account of our everyday moral judgments, because most people believe that actions are either right or wrong at the time in which they are performed, not that actions must be determined to be right or wrong in hindsight, as consequentialism requires.

These uncertainties embedded in secular ethics should come as no surprise, because uncertainty has proven to be one of the key defining characteristics of modernity. The modern world, built on the seemingly unshakable foundations of science and enlightened rationality, has turned out to be a surprisingly unpredictable realm. Geological disturbances of thought triggered by scientific advances at the bedrock continue to unsettle the inhabitants of the modern age. Periodic seismic shifts in what persons took for granted as the *terra firma* of their beliefs have provoked a desire among many to return to a premodern view in which our tilting world can be righted by the steady hand of a beneficent god. United by their common anxiety, some theists and nontheists have joined in the call to halt scientific activities deemed to be "unnatural" and fundamentally destabilizing. In contrast, the response of the moderns has been to embrace the redemptive uses of their newfound scientific powers, thus rechanneling the seismic impacts of science into a protective armor to defend mankind's vulnerabilities. This capacity of science to evoke fear and wonder simultaneously, to unsettle and empower, has always been an ineliminable element of modernity. So it is within the context of these dueling forces originating in the seventeenth century – power and uncertainty – that the science and ethics of stem cell research must be analyzed.

Stem Cell Research: New Science and Old Tensions

Stem cell science is ethically controversial for many of the same reasons that make other paradigm-shifting science controversial. All forms of controversial science tend to disrupt the categories we use to organize the world around us. Stem cell research has taught us in very short order that our long-standing beliefs about human development and biological potentiality must be revised. Biologists had held for centuries that the developmental process by which a single cell (zygote) becomes a complete human being was a one-way street. The primitive stem cells of the developing embryo were thought to differentiate down different pathways to form specialized cells that remain in their specialized state until the day they die. But now stem cell science is teaching us how to control and even reverse this developmental process. We are learning that all of our specialized cells are malleable and can be transformed into any other cell type (see Chapter 2). Stem cell science has repaved the developmental process into a two-way street where scientists can direct cells to travel from a stem cell state to a specialized state and vice versa. We