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The Moral Challenge of Modern Science

Yuval Levin

A few years ago, in the course of a long speech about health policy, President George W. Bush spoke of the challenge confronting a society increasingly empowered by science. He put his warning in these words:

> The powers of science are morally neutral—as easily used for bad purposes as good ones. In the excitement of discovery, we must never forget that mankind is defined not by intelligence alone, but by conscience. Even the most noble ends do not justify every means.

In the president's sensible formulation, the moral challenge posed for us by modern science is that our scientific tools simply give us raw power, and it is up to us to determine the right ways to use that power and to proscribe the wrong ways.

The notion that science is morally neutral is also widely held and advanced by scientists. Indeed, many scientists wear their neutrality as a badge of honor, presenting themselves as disinterested servants of truth who merely supply society with facts and tools. They leave it up to others to decide how to use them. "Science can only ascertain what is, but not what should be," Albert Einstein said, "and outside of its domain value judgments of all kinds remain necessary."

This proposition seems at first perfectly reasonable. The universe, in its benign indifference, is as it is regardless of what we think is right, and it would seem not to pick sides in moral disputes. Science uses knowledge of the natural world to inform us or empower us, but what we do with that knowledge and power remains up to us.

The most common contemporary critiques of science on moral grounds, moreover, are actually critiques of some uses of technology, and so tend to support this view of science as a neutral tool. Our age of technology has taught us to be wary of the dangers of certain applications of science, as tools of manipulation, degradation, or destruction. Any Westerner would recognize the image of Dr. Frankenstein's monster gone wild, and we have all become accustomed, as well, to the specter of the nuclear mushroom cloud, the dread of biological or chemical attack,

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Yuval Levin *is a senior editor of* The New Atlantis *and a fellow at the Ethics and Public Policy Center.*

and the stench of industrial pollution. We have learned the hard way that Daedalus, the mechanic, can be a dangerous character. We also know that otherwise beneficial technologies can open up troubling ethical questions, and that these will only grow more vexing in the coming years as biology becomes increasingly a science of production just like physics and chemistry before it.

This has been clear from the start. It was Francis Bacon, a father of the modern scientific project, who said plainly that "the mechanical arts are of ambiguous use, serving as well for hurt as for remedy."

But Bacon answered his (and President Bush's) worry in terms that still suffice as a reply to the notion that technology's moral neutrality makes it dangerous. "If the debasement of the arts and sciences to purposes of wickedness, luxury, and the like, be made a ground of objection," Bacon wrote, "let no one be moved thereby, for the same may be said of all earthly goods; of wit, courage, strength, beauty, wealth, light itself and the rest." Anything can be turned to evil in the hands of evil men. This is not the most essential moral challenge posed for us by modern science.

The moral challenge of modern science reaches well beyond the ambiguity of new technologies because modern science is much more than a source of technology, and scientists are far more than mere investigators and toolmakers. Modern science is a grand human endeavor, indeed the grandest of the modern age. Its work employs the best and the brightest in every corner of the globe, and its modes of thinking and reasoning have come to dominate the way mankind understands itself and its place.

We must therefore judge modern science not only by its material products, but also, and more so, by its intentions and its influence upon the way humanity has come to think. In both these ways, science is far from morally neutral.

The Idealism of Science

The modern scientific project was not conceived or born as a morally neutral quest after facts. On the contrary, launched in the seventeenth century out of frustration with the barren philosophies of the European universities, modern science was a profoundly moral enterprise, aimed at improving the condition of the human race, relieving suffering, enhancing health, and enriching life.

Francis Bacon argued that a search for knowledge driven solely by "a natural curiosity and inquisitive appetite" would be misguided and inadequate, and that the true aim of a genuine science should be "the glory of

the Creator and the relief of man's estate." Man is in need of relief, Bacon suggested, because he is oppressed by nature at every turn, and through his science Bacon sought to master nature and thereby to ease suffering and empower humanity to act with greater freedom.

René Descartes, who stands shoulder to shoulder with Bacon among the fathers of science, had an equally moral purpose in mind. His mathematical science, he informs us in the *Discourse on Method*, aims not at neutral knowledge or the creation of frivolous mechanical toys, but principally at "the conservation of health, which is without doubt the primary good and the foundation of all other goods of this life."

This fundamental moral purpose has always driven the scientific project, and especially the very sciences President Bush referred to in his warning: biology and medicine. This moral purpose may be less obvious in the case of some other sciences, but it is no less significant. Modern science generally seeks knowledge for a reason, and it is a moral reason, and on the whole a good one.

Today, modern science is still driven by the moral purposes put forward by its founders, and often its very protestations of neutrality attest to this. Consider one recent example. In a much heralded assessment of the scientific and medical aspects of human cloning, published in January 2002, the National Academy of Sciences claimed to examine only the scientific and medical aspects of the issues involved while, as the report put it, "deferring to others on the fundamental moral, ethical, religious, and societal questions." This is a fairly routine example of the claim to offer only neutral facts, for judgment by others. But the study concludes by recommending that human cloning to produce a live-born child should be banned because it is dangerous and likely to harm the individuals involved. This, the report implied, is not a moral but a factual conclusion.

In truth, however, it is a conclusion that takes for granted the moral imperatives of the scientific project, and does not even think of them as moral assumptions. After all, why does the fact that a procedure is dangerous mean that it should not be practiced? Does the answer to this question not inherently depend upon a moral argument? Why, if not for moral reasons, do we care about the safety of human research subjects or patients? For that matter why, if not for moral reasons, do we wish to heal the sick and comfort the suffering? We all know why, and the researchers and physicians engaged in the pursuit of knowledge in biology and medicine know why too. One imagines many of them chose their occupation in large part precisely because they saw in science a way to help others, and they were right.

Science, and again I speak mostly but by no means exclusively of biomedical science, is driven by a profound moral purpose. This purpose does not itself emerge from scientific inquiry, but it guides, shapes, and directs the scientific enterprise in every way. By presenting itself as morally neutral, science sells itself far short.

Many of us nonetheless think of science as neutral because it does not match the profile of a moral enterprise as understood in our times. Put simply, science does not express itself in moral declarations. It is neutral in the very way in which neutrality is seen to be a good thing in a free liberal society: science does not tell us what to do. It takes as its guides the needs and desires of human beings, and not assumptions about good and evil. Our desire for health, comfort, and power is indisputable, and science seeks to serve that desire. It is driven by a moral imperative to make certain capacities available to us, but it does not enforce upon us a code of conduct. It can therefore claim to be neutral on the question of how men and women should live.

But a project on the scale of the modern scientific enterprise cannot help but affect the way we reason regarding that fundamental moral question. Modern science, after all, involves first and foremost a way of thinking. It is founded upon a new way of understanding the world, and of bringing it before the human mind in a form the mind can comprehend. In forcing the world into this form, science must necessarily leave out some elements of it that do not aid the work of the scientific method, and among these are many elements we might consider morally relevant.

Science forces itself to consider only the quantifiable facts before it, and using those facts it forms a picture of the world that we can use to understand and overcome certain natural obstacles. The more effectively the scientific way of thinking does this, the more successfully and fully it persuades us that this is all there is to do. The power and success of scientific thinking therefore shape our thinking more generally.

Only when we understand modern science primarily as an intellectual force can we begin to grasp its significance for moral and social thought. The scientific worldview exercises a profound and powerful influence on what we understand to be the proper purpose, subject, and method of morals and politics.

The Primary Good

As he wrote the earliest chapters in the story of modern science, Descartes had already grasped the nub of the matter. Determined, as we

have seen, that his new science should be directed to the advancement of health, the notoriously doubtful Descartes was awfully bold in describing health as, "without doubt the primary good and the foundation of all other goods of this life."

Surely the claim that health is *the* primary good has consequences well beyond the agenda of the scientist. Any society's understanding of the foundational good necessarily gives shape to its politics, its social institutions, and its sense of moral purpose and direction. How you live has a lot to do with what you strive for.

And health is an unusual candidate for "the primary good." It is surely an essential good—without health, not much else can be enjoyed. But Descartes' formulation, and the worldview of modern science, sees health not only as a foundation but also a principal goal; not only as a beginning but also an end. Relief and preservation—from disease and pain, from misery and necessity—become the defining ends of human action, and therefore of human societies.

This is a modern attitude as much as it is a scientific attitude. In the ancient view, as expounded by Aristotle, political communities were necessary for the fulfillment of man's nature, to seek justice through reason and speech. Man's ultimate purpose was the virtuous life, and politics was a requisite ingredient in the hopeful and lofty pursuit of that end. But Machiavelli launched the modern period in political thought by aiming lower. Human beings gather together, he argued, because communities and polities are "more advantageous to live in and easier to defend." The goals that motivate most human beings are safety and power, and men and women are best understood not by what they strive for but by what they strive against. His followers agreed. For Thomas Hobbes, relief from the constant threat of death was the primary purpose of politics, and in some sense of life itself. John Locke, a bit less morbid, saw the state as a protector of rights and an arbiter of disputes, with an eye to avoiding violence and protecting life.

This lowering of aims, then, seems to be as much a result of political as of scientific ideas. But it is no coincidence that Hobbes and Locke were not only great philosophers of modern politics but also great enthusiasts of the new science, just as Aristotle was not only the great ancient philosopher but also the preeminent scientific mind of the Greek world.

Aristotle saw in nature a repository of examples of every living thing in the process of becoming what it was meant to be. This teleology naturally informed his anthropology and his political thinking as well: he understood mankind by the heights toward which we seemed to be reaching. The

moderns, meanwhile, saw in nature a brute and merciless oppressor, always burdening the weak and everywhere killing the innocent. This dark view of life inspired them to aim first and foremost for relief from nature's tyranny. In that way freedom, another word for relief, became the aim of politics, while power and health became the goals of the great scientific enterprise. Rejecting teleology in both science and politics, they understood men by thinking about where they came from—the imaginary state of nature, or eventually the historical crucible of evolution—and not where they were headed.

Avoiding the worst, rather than achieving the best, is the great goal of the moderns, even if we have done a very good job of gilding our gloom with all manner of ornament to avoid becoming jaded and corrupted by a way of life directed most fundamentally to the avoidance of death. We have gilded it, above all, with the language of progress and hope, when in fact no human way of life has ever been more profoundly motivated by fear than our modern science-driven way. Our unique answer to fear, however, is not courage but *techne*, and so our fear does not debilitate us, but rather it moves us to act, and especially to pursue scientific discovery and technological advance.

This modern attitude runs to excess when it forgets itself—mistaking necessity for nobility and confusing the avoidance of the worst with the pursuit of the best. From the very beginning, the modern worldview has given rise to peculiar utopianisms of various stripes, all grounded in the dream of overcoming nature and living, at last, free of necessity and fear, able to meet every one of our needs and our whims, and able, most especially, to live indefinitely in good health. This brand of utopianism generally begins in a benign libertarianism, though at times it has ended in political extremism, if not in the guillotine.

But in its far more common and far less excessive forms there is much to admire in this peculiar response to the cold hard world, and we have in fact been very well served by this fearful and downward-looking view of nature and man. Avoiding the worst is in many respects a just and compassionate goal, because a society directed most fundamentally to high and noble ideals inevitably leaves countless of its people behind to face precisely the worst that human life has to offer. Modern societies, egalitarian and democratic, aiming first at relief, put up with far less misery than their predecessors and are far better at practicing genuine compassion and sympathy. And modern life, through modern science above all, has put an end to a great deal of pain and suffering and so has made possible a great deal of human happiness.

As we have done so, we have persuaded ourselves that fighting pain and suffering is itself the highest calling of the human race, or at the very least a foremost purpose of society. The moral consequences of this preeminence of health and relief are quite profound, if not always obvious. A society in pursuit of health is not necessarily a society that neglects the other virtues. On the contrary, the hunger for relief from pain tends to encourage charity and sympathy, and to reinforce the drive to equality, fairness, and fellow-feeling. Modern societies have been uniquely protective of the basic dignity and inalienable rights of individuals, and of human liberty. The pursuit of health does not necessarily encourage higher and more noble pursuits, but it also does not necessarily conflict with them. Thus, modern life, shaped as it is by the outlook of modern science, can generally coexist with the virtuous life, shaped by older, "pre-scientific" ideas and aspirations.

But in our time, more than any other in the modern period, we have begun to see the darker moral consequences of the preeminence of health. The pursuit of health does not *necessarily* conflict with other virtues and obligations, but in those cases when it does conflict with them it tends to overcome them. And so when the pursuit of health through science and medicine conflicts with even the deepest commitments of modern life—to equality, to rights, to self-government, or to protection of the weak—science and medicine typically carry the day.

This conflict between primary goods plays out in our contemporary debates about biotechnology—whether embryonic stem cell research, genetic screening of embryos, drug experimentation in developing countries, or any number of others. Almost any violation of human dignity or nascent life can be excused if it serves the purpose of advancing medical science or ameliorating physical misery. It is very hard for us to describe something higher than health, or more important than the relief of suffering, so when relief comes at a cost, even the cost of cherished principles or self-evident truths, we all too often pay up.

Moreover, if health and power over nature are the highest human goods, then surely science (as opposed to politics) must be the primary instrument of our fulfillment. Science, far more than politics, directs itself squarely to advancing those goods, and to the extent that politicians try to govern science, they may interfere with that great purpose. For this reason there has long been an inclination to see science as beyond the reach of politics—an inclination encouraged by the fathers of modern science, and one that has established itself firmly in our political mindset. This inclination is perhaps the most fundamental threat to self-government in

our time, and among the most profound moral challenges posed by the modern scientific project.

Science and Self-Government

There are, of course, different ways for politics to exert authority over science. To distort or hide unwelcome facts—that is, to manipulate the findings of scientific investigation for political ends—is surely an illegitimate tactic. But to govern the practice of scientific techniques that threaten to violate important moral boundaries is not only legitimate but in some cases essential. After all, science is not merely observation. A great deal of science is action, and some of that action (especially when human beings are acted upon) may threaten genuine harm. Politics exists to govern action, and so at times it must govern science. This is not always a controversial point. No one contends that protections of human subjects from violations of their rights in scientific research, for instance, are illegitimate. We argue, rather, about when they are appropriate and to what extent. Because such rules normally exist to serve the cause of safety, they are not deemed to be political or moral strictures on science, but of course that is exactly what they are, and their general acceptance proves the point that the governance of science is legitimate and necessary.

But when proposed limits are rooted in something other than safety or health—that is, something other than the very same cause science itself serves—they quickly become controversial. And even many limits grounded in a broader understanding of the protection of life tend to be soundly rejected if they place genuine limits on the advancement of health. The preeminence of health therefore not only shapes the goals of the scientific enterprise, but also limits the ability of politics to act in the service of other important goods. If the question is whether the advance of science or the authority of liberal-democratic self-government is to prevail, a shrewd gambler would be wise to bet on science.

The defense of scientific freedom in these instances generally takes the form of a defense of free inquiry, and the distinction between mere observation and action is too often ignored. Science, as the servant of the highest good, is deemed to be above politics, and described by its defenders as an agent of truth, not of action. Any subject on which science speaks or acts therefore comes to be seen as off-limits for policymakers informed by other kinds of analysis: by moral premises, or tradition, or religious or personal views, as if every question of public policy with any scientific dimension must be understood as a matter of pure science alone.

Eleanor Holmes Norton, the District of Columbia's delegate to the U.S. House of Representatives, gave voice to this view at a recent hearing about the use of the abortion drug RU-486. Observing that the FDA had said the drug was safe for women to use, Norton argued that this conclusion should end the debate, and she noted with regret

> the unmitigated politicization of the one area that Americans always held off from politics, and that is science itself. Whether Schiavo or creationism, renamed Intelligent Design, or stem cell research or, God help us, global warming itself, there are views floating around this Congress that essentially reach conclusions on these matters of huge scientific moment, based on their own personal beliefs.

Once science has spoken, Norton suggests, there is no longer any room for "personal beliefs" drawing on non-scientific sources like philosophy, history, religion, or morality to guide policy. "Is it safe?" is the only moral question that science alone can attempt to answer; and so long as it is safe, then all other moral concerns, all other grounds for the governance of science, are deemed illegitimate. Scientific judgment, with health as both the primary aim and only conceivable limit, is the final voice of authority.

Just as the preeminence of health challenges the basic liberal tenet of equality in the biotechnology debates (with embryonic life, for instance, treated as a tool that serves the future health of others), so this elevated view of the authority of science as the chief interpreter of truth poses a profound challenge to the basic liberal tenet of self-government. It delegitimizes other sources of wisdom about what is good and what is not.

Two great forces have been building their strength since the seventeenth century: public opinion and scientific knowledge. In an ideal world, our scientific knowledge of nature might inform the opinions of the common man, while the values of citizens might govern the reach of science. But it doesn't take a cynic to realize that conflict between these two great forces is inevitable. In principle, self-government allows the people to reserve the right to exercise their judgment as they wish, and so to respond to the latest pronouncements of science with a "so what?" and make decisions based upon those "personal beliefs" that Del. Holmes Norton so derisively dismisses. Public policy can and should be informed by all manner of influences. But in our time, on a great many questions, none can speak with the authority that science has. Representative Ted Strickland, Democrat from Ohio, spoke for many when in the course of a House of Representatives debate about human cloning in 2001 he said

that when it comes to issues that touch science, "we should not allow theology, philosophy, or politics to interfere with the decision we make." Not even politics can interfere in politics when science is involved.

Our Moral Forgetfulness

In part, the supposed supremacy of scientific authority is rooted in the fact that science builds its understanding cumulatively—so that it always knows more today than it knew yesterday. This is not, strictly speaking, how religion works, or in most cases even how philosophy works. Science is inherently progressive, and so gives us the sense that all other means of understanding must strive to catch up. Not far behind every new development in biotechnology is a well-meaning hand-wringer mouthing the all too familiar cliché that "science is moving so fast ethics just can't keep up."

But this is a profound misunderstanding. The ethical framework we need to deal with the challenges (and to make the most of the promise) of science and technology need not be developed in light of the latest scientific journal article. Its key components have been available to us for a very long time. They were discussed among the priests in the temple of Solomon three thousand years ago, debated in the markets of Athens in the fifth century B.C., preached by a Galilean carpenter to all who would listen, and they have been and continue to be refined, sharpened, and applied by some of the greatest minds of Western civilization ever since. Our problem is not that we are lacking in ethical principles, but rather that we are forgetful of them.

Modern science and technology stand to exacerbate and worsen this forgetfulness, both by taking away some of those things that now and then make us remember—the child whose potential is a great surprise to us, the limits that respect for others must place upon our vanity, the truths and lessons we can only learn by growing old—and by accustoming us to a mode of thinking and learning that always seems to know more today than it knew yesterday. Rightly enamored by the possibilities and achievements of forward-looking science, we are often blinded to the possibility of progress through remembrance and tempted to believe that we can rise beyond the limits and constraints that the past always seeks to remind us are necessary. This forgetfulness risks leaving us knowing much less than we knew yesterday, even about science.

Science, after all, is a human activity, even if it is one that addresses itself to the natural world. And our civilization has a deep and ready well of knowledge about how to understand and govern human activity. The

surest way to understand the role of science in our society, and the surest ground for governing science when necessary, is to resort to that knowledge of human nature and human affairs which is not itself scientific.

Scientific knowledge must of course inform our understanding of the human significance of what science is up to—we need to know what, for instance, the human embryo is in scientific terms in order to know how to regard it in human terms. But science does not resolve the question. It informs the decision, but it is that other great modern force, public opinion, itself informed by a wide array of wisdoms, that sets society's course. Some public defenders of science understand this, devoting great energy and resources to winning over the public to their view of the good, as we have seen in the public campaign for embryonic stem cell research. That view of the good, to put it simply, is that uninhibited scientific freedom and generous public funding for scientific research will give the public what it wants most: cures for nature's afflictions.

But the public, for all its hunger for cures, has other hungers as well. And while the public reveres science, it cannot look to science alone for guidance about what to desire and how to live. It must rely as well upon an array of non-scientific wisdom that is perhaps best understood as *tradition*. Tradition, too, is cumulative, but not in the simple sense in which scientific knowledge builds on itself. Tradition is the result of countless centuries of trial and error in human affairs, but it is deeply shaped by the simple fact that human beings always begin in the same place, born helpless and innocent, and always must be shaped and reared to rise from there. Tradition therefore cannot hope simply to build upon itself, because it must shape every generation from the same crude beginnings, regardless of how well its parents were shaped. Our institutions of tradition—cultural, civic, religious, and moral—are therefore always engaged in the Sisyphean task of education, and so are always in some sense doing the very same thing they have always done. They learn from those who have done the same thing in the past, but they are never free just to move on and do something different, unless they abandon the task of bringing children into the world, and thus abandon the future in the name of progress—a paradoxical shortsighted futurism that can only last one generation.

Our key social institutions are in this sense inherently conservative, and so they must remain. Stability and continuity, which hardly matter much in scientific knowledge, are essential to the cultural vitality of any society.

This is not to say that we do not learn new things about how we should live—that our tradition does not evolve and grow. It surely does, and always should, but it cannot do so in a simple and cumulative way. The

new things we learn in philosophy and ethics and religion do not supersede the old things we have long known. Modern astronomy has simply proven that what Aristotle theorized about the nature of the solar system was wrong. Modern philosophy will never be able to show any such thing with regard to what Aristotle theorized about the best way to live.

All of this is simply to say that there is more than one legitimate way to gain understanding. Our means of understanding and governing mankind are fundamentally quite different from our means of understanding and mastering nature. To understand nature takes ever-growing knowledge. To understand man takes the wisdom of the ages. That wisdom, as it builds, can be informed by scientific knowledge, but it can never be replaced by it. Science is a tremendously effective and powerful means of gaining knowledge about nature, and knowledge of nature is very important. But human beings and human societies are more than mere objects of nature, and so other things matter too.

Science, morals, religion, and philosophy are not merely different ways of answering the same questions, to be compared to each other based upon their answers. They are, rather, different ways to answer different questions. Modern science, in answering critical questions about the natural world, has brought us health, comfort, wealth, and power undreamt of in earlier ages. These great gains have understandably caused us to concentrate on the sorts of questions science can answer, and so in some measure to lose sight of those it cannot. In this sense, the moral challenge of modern science is a consequence of the power of science to define the questions we ask and the means we seek for answering them, sometimes flattening or deforming what we do and how we live.

If We Can Put a Man on the Moon…

By its very success and its impressive power, then, the scientific mindset convinces us that it is the path to the only knowledge worth knowing. We are quite rightly impressed by the effectiveness of scientific methods when applied to nature, and so the impulse to apply the same ways of thinking to non-scientific questions is nearly irresistible. If we can make such remarkable progress in our mastery of nature through science, why should we not make similar progress in our mastery of social, political, and moral questions through science? Science just seems to offer a more advanced way to reason than the old approaches to all of our difficulties.

It has seemed so since the beginning. The early boosters of science argued quite openly that scientific thinking would, and should, crowd out

other ways of thinking. In his 1794 *Sketch for a Historical Picture of the Progress of the Human Mind*, the Marquis de Condorcet notes that "the sole foundation for belief in the natural sciences is this idea, that the general laws directing the phenomena of the universe, known or unknown, are necessary and constant. Why should this principle be any less true for the development of the intellectual and moral faculties of man than for the other operations of nature?"

Half a century later, Auguste Comte, the father of modern sociology, argued that "the general situation of the sciences of politics and morals today is exactly analogous to that of astrology in relation to astronomy, of alchemy in relation to chemistry, and the cure-all in relation to medicine." With time, he hoped, morals would advance along the path toward more scientific methods. By offering the example of a new and spectacularly effective way of thinking, modern science would replace other ways of thinking, including traditional moral reasoning.

Early critics of science also noted this possibility, though of course with less enthusiasm. Jean-Jacques Rousseau, in his *Discourse on the Arts and Sciences* written in 1750, argued that the sheer multitude of objects to which the new learning turned its attention would tend to squeeze completely out of consideration those matters (like morals) to which it did not apply itself. Montaigne had seen this coming long before, and made the case with his usual terse flair: "the more that men only labor to stuff the memory, the more they leave the conscience and the understanding unfurnished and void."

These thinkers, writing early in the modern age, understood the power of ideas to mold our minds, and indeed they knew quite well that science may dominate the thoughts of men to the exclusion of other ways of thinking.

In our times, we are perhaps less inclined to recognize science as a set of ideas with aspirations to universality precisely because the scientific enterprise has been so successful. But the authority we cede to science, both as the servant of health and as the master of knowledge, weakens our allegiance to those other sources of wisdom so crucial to our self-understanding and self-government. Those other sources serve to ground our moral judgment, while science avoids or flattens moral questions, since it cannot answer them and rarely needs to ask them. Rather than as morally neutral, then, we might describe the modern ascendancy of the scientific worldview as morally *neutralizing*, crowding out our means of moral reasoning and sources of moral authority. For all its power, science risks leaving us morally and metaphysically impotent.

Science and Ethics

This puts President Bush's warning in a rather different light. As the ability of science to remake the natural world continues to expand, science itself, or at least our concession to its authority, has left us increasingly powerless to decide how best to use our novel mastery. The problem is not that our inventions might be used for both good and evil purposes, but that we denizens of the scientific age are at risk of becoming unable to distinguish between good and evil purposes. Moral imperatives, including especially those profound moral imperatives at the root of the scientific enterprise, are becoming clouded over just as the scientific enterprise begins to focus its attention most directly on the human animal itself.

This leaves science less capable of deciding how it should apply its power, and it leaves society less capable of properly directing the scientific project. Science from the outset has sought not only to know but also to do. The question is: To do what? Without resort to informed moral judgment the answer, which used to be "to do good," slowly comes to be "to do what can be done." In this way the means of science come to be confused with its ends, the progress of research becomes an end in itself, and we move from the imperative to seek the power to do what we know is good to the notion that whatever we have the power to do is good. "We have bricks, so let us build a tower," we say to one another in the scientific age. We have "spare" embryos, so let us make stem cells.

This has never been a very good argument for building a tower, and it is not an adequate justification for destroying human embryos for stem cells. But it has always been a hard argument to resist. As science becomes able not only to reach into the skies but also reach into the human genome and the sources of life itself, we are in greater need than ever of the very moral powers that the success of science has made weaker.

All of this, however, does not mean that science is immoral. Quite the contrary is the case, and this is vital to remember. The problem we confront is so vexing and difficult precisely because science can do so much good, and wishes and aims and attempts at every turn to do so much good. Our challenge is to keep science true to its original moral purpose, while not letting its approach to the world make us blind to moral meaning and judgment. To do this, we must come to understand science as a moral endeavor, a human project with discernible ethical purposes. Only if we see science in such terms, and if scientists themselves do too, can we begin the difficult task of assessing the moral goods at stake, and asking if the good that science can do is in every instance "the primary good and

the foundation of all other goods of this life," as Descartes so confidently asserts that it is. There will be many cases when it is deemed to be just that, but there will also be cases when scientific freedom and even scientific progress must be superseded by higher moral goods.

This, in the deepest sense, is the moral challenge presented to us by modern science: to advance the great moral good of relieving man's estate while remaining ever mindful of other, and perhaps greater, moral goods. It is a challenge to our sense of what matters most, to our commitments to equality and self-government, to our appreciation of the necessarily varied sources of wisdom and authority, and to our grasp of the right questions to ask.

The real challenge lies not in the tools that science gives us, but in the attitudes it forms in us. The trouble is not that technology can be used for both good and evil, but that people in the age of technology may have real trouble telling the difference between the two. The moral challenge of modern science is, like every genuine moral challenge, a hazard to the souls of men; and the danger that confronts us in the scientific age arises not from our tools or our machines but from our own assumptions and attitudes. When we allude to the "Brave New World" as shorthand for the inhuman technological dystopia that threatens our future if we fail to meet this challenge, we must be sure to remember the full Shakespearean exclamation from which Aldous Huxley drew his novel's title: "O brave new world that has such people in't!" It is not simply the age of modern science that should worry us, but the refashioned people in it.