

POLITICAL SCIENCE

The Bush Administration's war on the laboratory.

BY MICHAEL SPECTER

On December 1st, Merck & Company applied to the Food and Drug Administration for a license to sell a vaccine that it has developed to protect women against the human papillomavirus. HPV is the most common sexually transmitted disease in the United States; more than half of all Americans become infected at some point in their lives. The virus is also the primary cause of cervical cancer, which kills nearly five thousand American women every year and hundreds of thousands more in the developing world. There are at least a hundred strains of HPV, but just two are responsible for most of the cancer. Two others cause genital warts, which afflict millions of people. Merck's vaccine, designed to protect against those four strains, has been tested in thirteen countries, including the United States. More than twelve thousand women between the ages of sixteen and twenty-six were monitored for an average of two years. The results were conclusive: twenty-one of the women who received a placebo during the trial developed the cellular abnormalities that are associated with cancer and other illnesses. Not one of those in the vaccinated group did. Another vaccine, which is being developed by GlaxoSmithKline, promises to be just as effective.

Even in the age of molecular medicine, such unqualified successes are rare. "This is a cancer vaccine, and an immensely effective one," the Nobel laureate David Baltimore, who has served for the past eight years as president of the California Institute of Technology, told me. "We should be proud and excited. It has the potential to save hundreds of thousands of lives every year."

The vaccine is now under review by the F.D.A. and could be approved for use in the United States by June; what happens after that will depend largely on the Bush Administration's Advisory Committee on Immunization Practices.

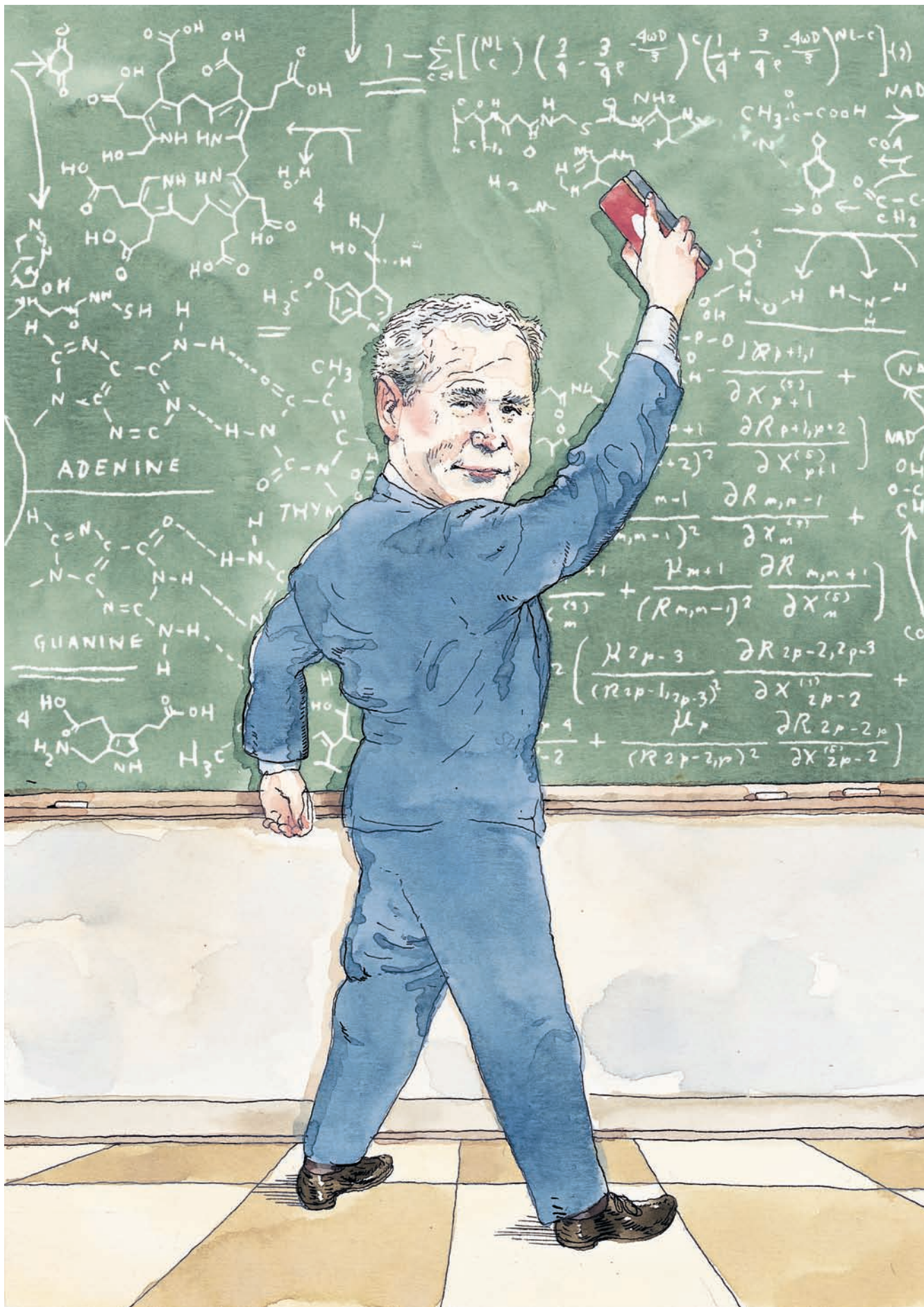
The committee's recommendations are not binding, but most states rely on them in determining which vaccines a child must receive in order to attend public school. To prevent infection with HPV, and to minimize the risk of cervical cancer, girls would need inoculations before becoming sexually active. The average age of first intercourse in America is under seventeen; to insure the broadest possible coverage, the vaccines would have to be administered much earlier.

Vaccinations for contagious diseases like measles and mumps are required before a child can enter public school. That won't be the case with the HPV vaccine, however. The Bush Administration, its allies on Capitol Hill, and the religious base of the Republican Party are opposed to mandatory HPV vaccinations. They prefer to rely on education programs that promote abstinence from sexual activity, and see the HPV vaccine as a threat to that policy. For years, conservatives have regarded the human papillomavirus as a kind of index of promiscuity. Many abstinence supporters argue that eliminating the threat of infection would only encourage teenagers to have sex. "I personally object to vaccinating children when they don't need vaccinations, particularly against a disease that is one hundred per cent preventable with proper sexual behavior," Leslee J. Unruh, the founder and president of the Abstinence Clearinghouse, said. "Premarital sex is dangerous, even deadly. Let's not encourage it by vaccinating ten-year-olds so they think they're safe." Senator Tom Coburn, Republican of Oklahoma, a family physician and a prominent leader among those who believe that abortion should be illegal, has argued repeatedly in Congress that since condoms can fail, the nation should stop relying on them so heavily. In 2004, he made his position clear when he testified about his experi-

ence treating patients who have been infected with HPV: "Studies have indicated for years that promiscuity was associated with cervical cancer."

Bush Administration health officials decline to discuss the vaccine while it is under consideration by the F.D.A. "I can't talk about that," Andrew Von Eschenbach said when I visited him at the National Cancer Institute, which he runs. "I would love to. But it just would not be appropriate." I had asked to speak to Von Eschenbach in his capacity as the acting commissioner of the Food and Drug Administration, a post that he has held since last fall, when his predecessor resigned suddenly. Von Eschenbach, a urological oncologist, is a friend of President Bush's from Texas, and spent twenty-five years at the University of Texas's M. D. Anderson Cancer Center. He is the first person in American history to oversee both an enormous federal bureaucracy that is responsible for discovering drugs and another, even larger agency that must approve those drugs.

Despite the official silence, the Bush Administration has been relentless in its opposition to any drug, vaccine, or initiative that could be interpreted as lessening the risks associated with premarital sex. It has made every effort to diminish the use of condoms as a method of birth control in the United States and throughout the world. Government policy requires that one-third of H.I.V.-prevention spending go to "abstinence until marriage" programs. Since George W. Bush became President, the United States has spent hundreds of millions of dollars on abstinence programs, and it has cut almost that much in aid to groups that support abortion and the use of condoms as a primary method of birth control. (Family-planning organizations in the developing world are denied U.S. grants if they so much as discuss abortion with their clients.) The Administration's op-



position runs so deep that at one point federal health officials replaced pages from a National Cancer Institute Web site with information that suggested, without evidence, that there might be a correlation between abortion and breast cancer.

Several years ago, the Centers for Disease Control removed a fact sheet about condoms from its Web site; the sheet disappeared for more than a year, and, when it was replaced, instructions on how to use condoms had been supplanted by a message denigrating them. The C.D.C. also removed a summary of studies that showed there was no increase in sexual activity among teenagers who had been taught about condoms. "They were the most horrific examples of manipulating science I have ever seen," a former senior official at the C.D.C. told me. "Abstinence is the only thing that matters to this crowd. They have even brought people to Washington from Atlanta"—where the C.D.C. is based—"just to lecture about the value of teaching abstinence. There were no scientific presentations, just

speeches." He asked not to be identified because he is dependent upon receiving government funds in his current job.

Nearly every group across the political spectrum supports abstinence as a first line of defense against sexually transmitted diseases as well as against unwanted pregnancies. But abstinence programs often fail. In one recent study, researchers at Columbia and Yale found that though virginity "pledge" programs helped many participants to delay sex, eighty-eight per cent of those who took such pledges and had sex before the end of the study did so before marriage. When it came to preventing sexually transmitted diseases, students in the programs fared no better than those in the control group. The study also found that students who promised to remain virgins were less likely to use contraception when they did have sex, and they were less likely to seek S.T.D. testing.

Two years ago, in one of the most contentious decisions in the history of the F.D.A., the agency rejected an application by Barr Pharmaceuticals to make the emergency contraceptive

Plan B—commonly referred to as the morning-after pill—available over the counter, after the members of its scientific advisory committee voted, twenty-three to four, in favor of permitting the switch. Agency officials said that they did not have enough information about how easier availability of the drug would affect adolescent girls. Last year, the F.D.A. again refused to approve the application, even after the company altered its proposal to address those concerns. The agency had never rejected a similar request against the advice of its scientific advisers and its own staff. "This just came from nowhere, and it was clearly not a decision that was made on behalf of women or families," Susan F. Wood told me. Wood, who was the director of the agency's Office of Women's Health at the time, quit in protest. "I felt there was no role—not just for me but for the people who have expertise. I lose a lot of battles; normally you go out and work to fight another day. But this time I just couldn't look in the mirror and live with myself." She was not the only scientist who felt that way: Frank Davidoff, the editor emeritus of the *Annals of Internal Medicine*, resigned as a consultant to one of the committees that voted to approve over-the-counter use of Plan B, saying that the agency had decided to place the pursuit of its moral agenda above the facts.

Religious conservatives are unapologetic; not only do they believe that mass use of an HPV vaccine or the availability of emergency contraception will encourage adolescents to engage in unacceptable sexual behavior; some have even stated that they would feel similarly about an H.I.V. vaccine, if one became available. "We would have to look at that closely," Reginald Finger, an evangelical Christian and a former medical adviser to the conservative political organization Focus on the Family, said. "With any vaccine for H.I.V., disinhibition"—a medical term for the absence of fear—"would certainly be a factor, and it is something we will have to pay attention to with a great deal of care." Finger sits on the Centers for Disease Control's Immunization Committee, which makes those recommendations.

"I never thought that now, in the twenty-first century, we could have a debate about what to do with a vaccine that



"Just don't be yourself."

prevents cancer,” David Baltimore said when we met in his office. Baltimore, a short, intense man, has spent much of his life studying the relationship between viruses and cancer. He stood up from the couch and crossed the room to his desk. “Politics plays a role in all these decisions, and so does belief,” he said. “I have no problems with that. But this is religious zealotry masked as politics, and it runs against everything that I as a scientist believe in, that I have devoted my life to. We are talking about basic public health now. What moral precepts allow us to think that the risk of death is a price worth paying to encourage abstinence as the only approach to sex?”

Since the Enlightenment, scientific enterprise has been defined by an ethic of independent inquiry and by reliance on data that can be observed, tested, analyzed, and repeated. The scientific method has come to shape our notion of progress and of modern life. Science largely dictated the political realities of the twentieth century. As Harold Varmus, the Nobel Prize-winning former director of the National Institutes of Health, pointed out in a recent speech, science won the Second World War—not just with the atomic bomb but with radar, quinine, and the spectacular advances in health brought about by the use of penicillin and other antibiotics. In 1944, the engineer and entrepreneur Vannevar Bush, who oversaw military research during the war, was described on the cover of *Time* as “The General of Physics.” The next year, as the war neared its end, he began to argue that if the United States was to retain its economic stability and military primacy the government would need to finance the basic research carried out at American universities.

The country has spent billions of dollars on research since then, and the investment has paid off. The U.S. became the most advanced nation in virtually every field of scientific endeavor, and today most researchers receive some form of federal funds—and are therefore subject to the government’s political will. (Public funding reflects political realities. For 2006, President Bush proposed an increase in spending on scientific research, but ninety-seven per cent of the increase will apply to two areas: weapons

development and space-exploration vehicles. This year, for the first time in thirty-six years, the budget for the National Institutes of Health, which doubled between 1998 and 2003, will be cut.)

In the past, political leaders and scientists of prominence didn’t care who voted for whom: either you were good enough to do the job or you were not. (Unless, like the nuclear physicist Robert Oppenheimer, you were suspected of supporting Communists.) Vannevar Bush was a conservative who opposed the New Deal, and not quietly. Yet President Roosevelt didn’t hesitate to appoint him, or to take his advice. In 1959, after Dwight Eisenhower created the position of science adviser, in the wake of Sputnik, the Harvard chemist George B. Kistiakowsky assumed the post. Jerome Wiesner, a Democrat who subsequently became president of the Massachusetts Institute of Technology, sat on the Science Advisory Committee—which met each month with Kistiakowsky and often with the President. When John F. Kennedy took office, Kistiakowsky and Wiesner simply switched roles. “In bringing scientists into the high councils of government, the presidential indifference to their politics and party affiliations reflected the belief that science and scientists were above politics,” Daniel S. Greenberg wrote in “Science, Money, and Politics” (2001), his invaluable exploration of the relationship between those three elements of America’s post-war success. “Scientists might consider themselves Republicans or Democrats, but, as politicians saw it, science was their true party affiliation—and scientists saw it that way, too.”

During the early years of the Cold War, the country’s scientific goals—winning the space race against the Russians, for instance, and eliminating deaths caused by infectious diseases like polio—were clear, so science and politics never seemed to clash. That began to change in 1964, when Barry Goldwater ran for President against Lyndon Johnson. Nearly a hundred thousand researchers, appalled by Goldwater’s declared willingness to deploy nuclear weapons on the battlefield, formed a group called Scientists and Engineers for Johnson. Scientists grew more demonstrably political throughout the Vietnam War, and by

1973 Richard Nixon, outraged by academic opposition to the antiballistic-missile system and other Administration programs, abolished the position of White House science adviser. (The job was reinstated by Gerald Ford, who also created the Office of Science and Technology Policy to advise the White House on scientific issues.)

If the nuclear age was difficult to understand or to accept, the molecular age has been even more so. As our knowledge about the genetic underpinnings of human life has deepened, the controversy surrounding much of the research has increased. The more we know about how human life develops, the more we seem to wonder when it truly begins. There is something decidedly unsettling about our ability to place genes from flounder into strawberries (to protect them from the cold), or to create clones of sheep, or to construct a puppy from a few cells of another dog’s ear. Eventually, in all likelihood, we will be able to grow spare organs and store them in refrigerators to use as replacement parts when ours wear out. Despite the uncertainties, both George H. W. Bush and Bill Clinton supported the Human Genome Project, which identified the twenty thousand genes in our DNA and determined their chemical composition. Both invested heavily in the fundamental research that has followed.

From the start of his first term, George W. Bush seems to have been guided more by faith and ideology than by data in resolving scientific questions. He is hardly the only President to ignore the advice of federal scientists. To some degree, they all have. In 1998, for example, Clinton refused to lift a ban on federal funds for needle exchange—even after he was urged to do so by Harold Varmus, at the N.I.H., and Donna Shalala, his Secretary of Health and Human Services. In siding with his drug czar, Barry McCaffrey, who said that it would send the wrong message to children, Clinton acknowledged that he was making the decision against the recommendation of his scientific advisers. Yet George Bush, unlike Clinton and many other Presidents, appears to view science more as a political constituency than as an intellectual discipline or a way of life.

On issues ranging from population control to the state of the environment, and from how science is taught in the



“Go with two-iron, Kemosabe—distance in desert not what it seems.”

classroom to whether Iraq’s research establishment was capable of producing weapons of mass destruction, the Administration has repeatedly turned away from traditional avenues of scientific advice. In 2003, when the Environmental Protection Agency tried to loosen standards regulating mercury pollution, sections of the proposed rules were lifted directly from industry documents. Last year, the White House acknowledged that Philip A. Cooney, the Administration official who once led the oil industry’s efforts to prevent limits on greenhouse gases, had repeatedly altered government climate reports in order to minimize the relationship between such emissions and global warming. Over the protests of federal scientists, the Administration has opened thousands of acres of pristine national forest to logging, supported drilling for oil in the Arctic National Wildlife Refuge, and weakened central provisions of the Endangered Species Act. In December, the E.P.A. proposed new rules governing the Clean Air Act which ignore the advice of its own staff, the recommendation of the agency’s scientific advisory committee, and evidence from thousands of recent studies.

In March, 2001, just after Bush took office, the Administration withdrew American support for the Kyoto Proto-

col on climate change, saying that it would impose an unfair and unbearable financial burden on the U.S. economy. In the face of an overwhelming consensus that burning fossil fuels is a principal cause of global warming, a hundred and sixty countries accepted new limits on their use. The U.S., by far the world’s most profligate consumer of energy, was one of only two industrialized nations to refuse. (Australia was the other.) At the time, Bush promised, “My Administration’s climate-change policy will be science-based.” Last year, despite pleas from hundreds of groups, and pressure from prominent allies like British Prime Minister Tony Blair, the Administration declined to alter its policies, agreeing, at a G-8 summit in Scotland, only to open “a new dialogue” on the subject.

The Bush Administration has worked tirelessly to control the speech and movements of American scientists. In 2004, the Department of Health and Human Services issued a policy forbidding researchers to lend their expertise to the World Health Organization (or to travel to international scientific conferences) without the department’s permission. William R. Steiger, a special assistant to the Secretary, told government scientists that if they wanted to act as consultants in meetings of the World Health Orga-

nization they would first have to agree to advocate U.S. policy. The practical implications were both chilling and farcical. That year, the department, saying that it needed to reduce the number of scientists attending international meetings, prevented more than a hundred and fifty government researchers from travelling to the International AIDS Conference, which was held in Bangkok. Department officials said they wanted to save money; their decision came after the organizer of the conference refused a request by the U.S. to invite the evangelist Franklin Graham to give a speech promoting faith-based solutions to the AIDS epidemic. If an American scientist wants to attend a meeting at the Pan American Health Organization’s office in Washington, just a fifteen-minute subway ride from the N.I.H. campus, in Bethesda, Maryland, he must seek permission at least four weeks in advance.

In January, James Hansen, one of the government’s most highly respected climate experts, said that the Bush Administration has made several efforts to prevent him from speaking publicly since a recent lecture in which he called for the immediate reduction of greenhouse gases. “This Administration has tried to restrict the very elements of scientific success: free and open inquiry,” said Margaret A. Hamburg, who was a commissioner of health in New York City under both David Dinkins and Rudolph Giuliani and worked in the Clinton Administration as a senior health-policy adviser. “You can’t do science without understanding that theories are public and views often clash. You resolve differences by experiments and research, not by toeing the line.”

John H. Marburger, the President’s science adviser, sees the restrictions more as a matter of good government than as an issue of free speech. “Many practices in government agencies have changed with the Administration,” he told me. He also pointed out that when American scientists deliver papers at AIDS conferences and in other disciplines where social problems intersect with medical research, they are presenting not simply data but also, often, a point of view that should reflect U.S. policy. “This Administration is more management-oriented than others,” he said. “In some cases, there has been a feeling that the ship could be run in a tighter

fashion. I have no problem with that. . . . I understand the need to impose more restrictive controls on things like travel to conferences which are not entirely technical. The Department of Health and Human Services is dealing with a lot of societal issues that are multidimensional—like AIDS.” (It took President Bush nearly eight months to settle upon Marburger, a well-regarded physicist and a former director of the Brookhaven National Laboratory. Unlike his predecessors, he was given neither the customary title of assistant to the President nor office space in the White House.)

In the Bush Administration, many types of scientific analysis and research are proscribed almost wholly on religious grounds. When the National Cancer Institute’s director, Von Eschenbach, appeared at a highly technical conference on soft-tissue cancers in 2002, one of the slides he presented in his keynote address surprised many in the audience. It said simply, “We live in a country blessed by God.”

On December 20th, federal district judge John E. Jones III, a Republican who was appointed by Bush, issued a scathing decision against the Dover, Pennsylvania, school board, which had attempted to require that “intelligent design” be taught in science classes alongside the theory of evolution. Intelligent design is a school of thought that suggests that life is too complex to be ascribed to evolution and therefore that animals must have been created by a supernatural “designer.” There is no evidence, no theory that could be interpreted as scientific proof. Judge Jones’s ruling was not ambiguous, but opposition to Darwin remains pervasive, and schools in dozens of states still teach students about natural selection and biological evolution as if they were little more than educated guesses. President Bush has addressed intelligent design just once in public, saying that he believed “both sides ought to be properly taught.” Activists who argue that educators should “teach the controversy” quickly seized on his deeply ambiguous words to bolster their cause. Even Marburger, who said that he was “extremely gratified” by the Dover decision, could not offer a fuller explanation of the President’s position. “That was all he has said,” Marburger noted. “It was a fairly cautious statement.”

When matters involve religion and the

boundaries of life, the President has never wavered. In 1998, Terri Schiavo’s husband, Michael, asked that her feeding tube be removed, igniting a legal war with her parents that eventually turned into a national conflict. Last March, after the tube was removed for the third time, Congress passed an “emergency measure” that attempted to force the courts to review the Schiavo case and require that the feeding tube be reinserted. President Bush signed the bill, and when the Supreme Court—for the sixth time—declined to hear the case, he spoke out in favor of what he referred to as the “culture of life.” (When Schiavo died, an autopsy supported her husband’s contention that she was unaware of her condition and incapable of recovering. Within days, Jeb Bush, the governor of Florida, ordered a state prosecutor to investigate whether Schiavo’s husband had purposely delayed calling an ambulance when she fell ill, in 1990. Bush produced no evidence, and his actions alarmed even his Republican allies. The investigation was quickly dropped.)

There are hundreds of advisory committees attached to scientific institutions in the United States. They are usually filled both by experts and by representatives of the public, and, while they

do not make policy, they do oversee most decisions. Since President Bush took office, some of the most politically sensitive committees have been dissolved. Others have been transformed into platforms that the Administration can use to pursue its social goals. When members of such boards do speak out against White House policies, they have even been removed. (In 2004, the White House dismissed Elizabeth Blackburn, a renowned cell biologist at the University of California at San Francisco, from the President’s Council on Bioethics. Blackburn is a supporter of human embryonic stem-cell research. Diana Schaub, who teaches political science at Loyola College, in Baltimore, was then named to the committee. Schaub has compared the harvesting of stem cells to slavery, and once said in a speech, “Every embryo used for purposes of research is someone’s blood relative.”)

“I am very respectful of faith, belief, and any principled stance on abortion,” Steven Hyman, the provost of Harvard University and a professor of neurobiology at Harvard Medical School, said recently when we met in his office in Harvard Square. Hyman was appointed to run the National Institute of Mental Health during the Clinton Administration and remained in his job after Bush



took office. He is still troubled by what he saw as the intrusion of church onto state territory. "The first inkling that things were different under Bush was when I put in a slate for my national advisory council," Hyman said. "I got a call from one of the people I had nominated and he said, 'Steve, is this normal? I was just called by somebody saying he was a White House liaison to the Department of Health and Human Services. He asked me whether I made political donations, and if so to whom, and who did I vote for?'"

Hyman said that he had "no context" in which to understand this kind of inquiry. It turned out to be an experience that others had shared. "People went to Marburger to complain about it and his answer was pretty much 'What are you guys complaining about? This is normal.'" (Marburger recently told me that he doesn't think scientists should be asked whom they voted for. He has also said, however, that "it's perfectly acceptable for the President to know if someone he's appointing to one of his advisory committees supports his policies or not.") Hyman disagrees. "This is not normal," he said. "It has never happened in anybody's memory at N.I.H., and, frankly, the guy who called me was a molecular biologist. I swear to you that there is no such thing as right-wing or left-wing molecular biology." Hyman became increasingly disturbed by the effects of what he saw. "It wasn't just politics, it was an unyielding bias," he said. "They were asking people if they believed in needle exchange"—which, like Clinton, President Bush has always opposed. "As a scientist, the answer has to be *I believe in data.*" The data showing that shared needles are the most efficient way to spread H.I.V. are compelling. So are the data showing that needle exchange does not turn people into heroin addicts. "Asking the question 'Do you believe in needle exchange?' is a real violation of science. It so happens that needle exchange is a good public-health measure. And we need also to understand that there are issues in society that will trump scientific information. For many people, this is one of them. That is a political decision, and I have no problem with politicians



making it. But that is a terribly unfair question to put to a scientist."

In 2001, Hyman attended the World Health Assembly in Geneva. The assembly, an annual event in which the United Nations establishes its global health priorities, focusses on a particular issue each year. That year, the topic was mental health. "We took as part of the official delegation an anti-abortion activist who lobbied the United Nations," Hyman said. "She was our representative of nursing. Normally, you would have brought a person from the American Nurses Association." The Bush approach to global health, which emphasizes "evidence-based" risk-reduction strategies such as fidelity for married couples, has been difficult for many countries to understand. (The Administration never cites a failure rate for abstinence programs, which is many times higher than the failure rate of condoms.) "Our attitudes toward birth control and condom use are very problematic in the face of a

SADDENING

Saddening, worse, to read in "Frost at Midnight" Coleridge's ecstatic hymn to his newborn, Hartley, for whom he imagines "... all seasons shall be sweet," and to find in the biographies how depressingly their relationship deteriorated when the boy was grown: the father struggling between his dependence on opiates and the exertions of his recalcitrant genius, the son trying to separate from the mostly absent but still intimidating father.

Their final contact has Hartley, a neophyte poet himself—he'll never attain stature—abandoning his father in the street, Coleridge in tears, not knowing, as though he were a character in one of the more than minor tragedies he might have written if his life had evolved more fortuitously, how to begin to reconcile his unspoken suffering with his son's, how to conceive of healing the hurt both had to have felt before each reeled back to his respective isolation.

The myth was already in effect then—Wordsworth's doing?—that creativity like Coleridge's thrives best in seclusion. Even Coleridge, though his poem takes place with his son beside him and friends sleeping yards away, speaks of "... that solitude which suits abstruser musings" So generations of writers go off to the woods, to find ... alcohol—Schwartz, Lowry, too many others to mention—depression, or even—Lowell, one hates to say it—wife-abuse.

global pandemic of AIDS," Hyman said. "The woman was affable enough, but I just do not think that people who are lobbyists ought to be representing the United States and involved in formulating global health policy."

The next morning, I went to the Boston University School of Public Health to talk with Gerald T. Keusch, who is the associate dean for global health. From 1998 to the end of 2003, he served at the N.I.H. as the director of the Fogarty Center, which concentrates on international health. In the two years after he took the job, Keusch had seven openings on his advisory board and he nominated seven people to fill them. "In each case, they cleared N.I.H. in three weeks and went to the Secretary of Health and Human Services to be formally appointed," Keusch recalled. "Within another month, Donna Shalala had signed all seven letters. No questions. They were the people I wanted, and, as director, it was my responsibility to pick them." When George Bush took

Coleridge in fact was rarely out of some intimate situation for five minutes in his life, sharing his friends' houses and tables, and there's the scene, saddening, too, worse, of the poet imploring the captain of the ship ferrying him home from Malta to administer an enema to unclog the impacted feces of his laudanum-induced constipation. Daily stuff for Coleridge—he hardly remarks it, poor man, poor giant—excruating for us, spoiled as we are, sanitized, tamed . . .

But what does the life—dope, shit, neurosis, fathers, or sons—have to do with anything anyway? Think of innocent Clare, twenty-eight years in insane asylums, and isn't there some *fairness*, you might think, some *justice*, but letting yourself think that, there's nowhere to go but bitterness, and how regret that deluge of masterpieces to rejoice in? Coleridge, anyway, at the end found fulfillment, and Clare, too, if not fulfillment, then something, perhaps acceptance; even Hartley, too, something.

I was there once, in that cottage, a pack of ill-lit rooms, at the very spot, beside the hearth, where the poem was made— (“ . . . the thin blue flame . . . that film which fluttered on the grate . . .”) You could still sense something in that comfortless cell resonating with youth and hope, which, almost on his deathbed, Coleridge wrote, “. . . embracing, seen as one, were love.” Outside, the glorious sea, the hills: easy to understand hoping to stay in such a world forever, and the qualm to tear yourself away.

—C. K. Williams

office, the Fogarty board had four new openings. Normally, three appointments to the board of twelve went to public figures and the rest to experts in various fields of international public health. “I asked for Dikembe Mutombo”—the N.B.A. basketball star—“as my public figure,” Keusch said. “He has a foundation in Zaire and a real sense of the issues around H.I.V. I also wanted to appoint Torsten Wiesel”—a former president of Rockefeller University, who, in 1981, received the Nobel Prize in Medicine—“and Geeta Rao Gupta, who runs the International Center for Research on Women, and has worked extensively on issues involving abortion.” His other nominee was Jane Menken, a highly regarded demographer who is now at the University of Colorado. She specializes in fertility, and has often worked in Bangladesh, which until recently had one of the highest birth rates in the world. “For weeks, and then months, I heard nothing from the department about these appointments,” Keusch said. “I thought

they would simply be routine. Finally, after eight months, I got a message saying they would accept Dikembe but were rejecting the three others. No explanation. No note. Nothing.” Keusch was incensed, and he insisted on meeting with the people at H.H.S. who handled the decisions.

“I was told that Torsten was rejected because he has signed open letters that were critical of the President,” Keusch went on. “Geeta was rejected because her organization is not opposed to abortion—which, we should not forget, is legal in the United States. And Jane Menken sat on the board of the Alan Guttmacher Institute”—which has always emphasized family planning and endorses the use of condoms. “That is literally what was said to me. Then I received a bunch of C.V.s in the mail. One of them was from a professor emeritus of economics at an obscure college in California that I had never heard of. His entire publication record consisted of pieces in the *Christian Science Monitor* and a Catholic monthly that took

politically charged positions. That was typical of the calibre: there was nothing scientific, nothing peer-reviewed.” Keusch spent the next three years at war with the H.H.S. He had to nominate twenty-six people to find seven whom the department would accept. “The Administration simply made it impossible for me to do the job I was hired for. In the end, I left and they won.”

The U.C.L.A. Institute for Stem Cell Biology and Medicine is tucked into the university's medical complex—a useful location, since all significant medical research today is collaborative. Molecular biologists, cancer experts, hematologists, even chemists and physicists have joined in the attempt to fulfill the immense promise of stem-cell biology. Few scientific endeavors have generated greater expectations (or hype). Embryonic stem cells are the biological equivalent of a blank check. Soon after birth, almost every human cell is programmed to serve a single purpose: white blood cells don't become red blood cells and neurons don't become bone cells. But that comes later. In the first days after an egg is fertilized, a cluster of about a hundred cells form into a hollow ball known as a blastocyst. At that stage—before they specialize—stem cells can be turned into any tissue or organ in the body. By harvesting and growing them, scientists hope to replace damaged cells with a healthier supply produced by patients themselves. The immune system is trained to reject foreign invaders, which is one of the central problems with transplants, but these cells wouldn't be foreign and therefore shouldn't be rejected. None of this is possible yet—there are enormous obstacles—but the almost unlimited potential has electrified scientists throughout the world.

“There have been three developments in my scientific lifetime that you could look at while they were happening and say, ‘This is really big,’” Owen Witte, the stem-cell institute's director and a noted microbiologist, said. Research by David Baltimore and Witte helped lay the foundation for development of the first genuinely successful cancer therapy targeted directly at the function of a protein, the leukemia drug Gleevec. “The first, without a doubt, was molecular biology,” Witte said. “We didn't call it that

at the time, but it was a revolution. Absolutely mind-boggling. Second, this whole understanding of viruses and what causes human cancer. The third is genomics." He paused for a moment and smiled almost wistfully. "And stem cells are the fourth. It's the same palpable feeling of excitement when you understand that this will let you make a model for a disease. That you can study its variability and investigate how a cell develops. Then you can use those cells as therapeutics and design and test new treatments. It's a sea change. All my work in my lab is related to disease—and now we have this tool. And that is when science moves forward, when you have a new tool."

Most stem cells used in biomedical research come from spare embryos generated by in-vitro fertilization. However, extracting stem cells from the embryo destroys it, and in 1996 Congress prohibited the government from supporting such research. President Clinton avoided making any decisions on whether such work was morally acceptable until 1999. ("He completely punted on the issue," John Marburger told me.) Just before leaving office, Clinton came out in favor of "some" federal support, but few scientists were willing even to apply for funds until they were certain that their work could continue in the next Administration. Stem-cell research was one of the first major issues

that Bush addressed, and in August, 2001, he announced that he would not permit federal funds to be spent to create new cell lines or to carry out research with them. Scientists were outraged at a decision that they believed did not adequately reflect the will of the American people and that could prevent the country from pursuing research in areas like cancer, diabetes, and Parkinson's disease, all of which might benefit human health at least as dramatically as antibiotics.

Bush tried to find a politically acceptable compromise, saying that research could continue on those lines which existed as of that day, "where the life-and-death decision has already been made." This, he said, would allow scientists to "explore the promise and potential of stem-cell research without crossing a fundamental moral line." His decision changed the dynamics of the way at least some major medical research is financed in the U.S.—shifting it from the federal government to those states and private institutions which have chosen to support such research. California was the first to revolt, passing a ballot measure in 2004 to allocate three billion dollars to create the Institute for Regenerative Medicine. Proposition 71 received nearly two-thirds of the vote; several other states have also moved forward with legislation and, along with major private or-

ganizations, have provided new sources of funds.

Yet, even where money is available, the research has been hindered by federal restraints. At places like Harvard University, Memorial Sloan-Kettering Cancer Center, in New York, and U.C.L.A.'s stem-cell institute, researchers have been bound by red tape since the President's decision. Every dollar spent on stem cells must be segregated from research financed with public money. "Our best young scientists, who should be thinking about their experiments, have to be very clear about which pencils they can touch and which they can't," Steven Hyman told me. "Who would want to operate in those conditions?" A modern laboratory requires equipment—electron microscopes, centrifuges, cell fractionators, and powerful computers—that costs millions of dollars, and those tools are routinely shared, except with people working on stem cells. "If we have a postdoc working on a stem-cell project and he needs to spend half an hour a week using a DNA sequencer or something else that costs a hundred thousand dollars, we cannot let him use one owned by the university," Hyman said. "We might even have to buy a new one."

There are other complications. "If we discover something exciting in a stem-cell lab and we want to test it with materials in another lab, or use it in an experiment, we can't unless those experiments and those labs have no federal money attached to them," Owen Witte said. "Then, there is the infrastructure. If portions of this building were constructed with federal dollars—it is the rare building on a public university campus in the United States that is not—"we would be proscribed from using it, even from establishing specially segregated labs." Witte added that it was not even clear whether the results of private stem-cell research could be published in a scientific journal that receives federal funds or whether that information could then be used in other experiments by scientists who receive federal support (or work at places that do). "It is an incredible encumbrance, and it has hurt us in every possible way," he said. "If you really want science to succeed, it needs a bit of unfettered creativity. If you regulate it and restrict it and wrap it in chains, you are taking away the very essence of what science is supposed to do."



"I'd like to go somewhere with warm water, balmy breezes, and no extradition treaty."

President Bush identified sixty cell lines in 2001 that he considered morally permissible to use for experiments, and that number was later expanded by government officials to seventy-eight. Witte laughed at those figures. "There aren't thirty," he said. (The Bush Administration frequently contends that the lines that existed in 2001 are sufficient for current research needs. James Battey, the director of the National Institute on Deafness, has been assigned to monitor the state of stem-cell research. At a congressional hearing held to determine last year's budget appropriations, Battey was asked whether existing cell lines were sufficient for researchers in the United States. His answer, which strained the bonds of English usage, has been posted on more than one laboratory bulletin board: "It is difficult to argue that a greater number of available lines, with more potential functional diversity, would be detrimental to the research effort.")

Witte, a soft-spoken man who clearly prefers looking through a microscope to engaging in political machinations, was dressed casually in blue corduroy pants and a jean jacket. His gray hair is short and he has an easy smile, yet when he talks about the ban his facial muscles begin to clench. "If you are interested in early development, if you are interested in cell biology, if you are interested in how cells develop—this edict tells you that you may not think outside of a previously held point of view. You may not build bridges or learn anything beyond what is known. Science is a progressive field and each step leads to the next. The idea that this is enough for you guys, that nobody is going to have a new idea, that nobody is going to do it better—that is antithetical to progress and science."

Witte and most of his colleagues are aware that, too often, the promise of stem-cell science gets confused with reality. Embryonic stem cells have been advertised as cures for nearly every ailment of mankind. So far, at least, they cure nothing. (Nor has it helped that the work of Hwang Woo Suk, the South Korean scientist who had claimed to have cloned human cells—a major step toward the goal of converting a patient's cells into new tissue that can be used to treat diseases—was recently found to have been fabricated.)

Witte's lab often concentrates on

bone-marrow transplants—a cure for many ailments. The technology has been established and it works, but it is not available to everyone. Marrow needs to match genetically and there is always a shortage, particularly among certain ethnic groups. Scientists are convinced that stem cells can change that. "There are examples in the literature of a cell that can be programmed to become a pancreatic cell or a liver cell," Witte said. "That is exactly what we want." Sugar, for example, is broken down by the hormone insulin, which is produced by special cells in the pancreas. People develop diabetes because those cells have been destroyed. "Now, to be able to make a pancreatic cell from a stem cell," Witte said, "that is exciting. But the more important question is 'Can you make ten to the ninth of them?'" (Ten to the ninth is the scientific notation for the number one billion.) "Because that is what we would need to make it work as a therapy. We need engineers who are experts in large-scale cell culture and other specialists. So, yes, the immediacy of this has been oversold. Absolutely. But that doesn't mean I am not excited." He went on, "Yet it simply cannot be done without a greater ability to grow a variety of stem-cell lines. Diseases usually involve many genes. You cannot study them with a random selection of cells that just happen to have existed in August of 2001."

We walked over to his lab to look at one of the "Presidential cell lines." (Each has a specific genetic fingerprint, so it can be easily identified.) Witte introduced me to Shuling Guo, a Chinese molecular biologist on the institute's staff. Shuling led me to a microscope and told me to look at a slide that she had placed beneath it. "There it is," Witte said, "the giant ethical controversy staring you in the face." I seemed to be looking at a bunch of little soccer balls packed together. "What you are seeing are thousands of human stem cells," Shuling said. Her job is to turn them into red blood cells. "Look carefully," she told me, as the cluster slowly started to become visible. "Can you see a dot of red?" I did. In fact, I saw three little red pinpoints. "The cells are sucking iron out of the environment and making hemoglobin—a vital protein that ferries oxygen to cells around the body. 'If you suffered from a fatal anemia, we should

be able to cure it. But we have maybe five red cells there. We need to figure out a way to make five billion."



The war over the ethics of using embryos in research has proved costly to American medicine. Not only has it slowed the pace of progress but for the first time other countries have moved ahead of the U.S. The United Kingdom, for example, has established several centers for stem-cell scientists. The ban has also discouraged researchers from contemplating careers in what would otherwise be considered the most exciting area of medicine. Nobody disputes the promise of stem-cell research, yet the moral complications that surround it are also real, and unlikely to soon disappear. The questions are nearly impossible to answer: Is breaking open a two-day-old stem cell murder? Is it possible to harm a blastocyst—something without nerves or human qualities? What about discarding embryos that have been left over at in-vitro-fertilization clinics instead of using them for research? People who oppose stem-cell research often describe embryos as potential human beings. "Like a snowflake," President Bush said in his 2001 speech, "each of these embryos is unique, with the unique genetic potential of an individual human being." Yet for many Americans it is difficult to feel the same compassion for people who don't yet exist as for those who do. According to repeated polling, a majority of Catholics, Protestants, and evangelical Christians believe that stem cells from embryos should be used for research, yet there is no consensus on the question of when life begins, or on the relative value of embryos and living human beings.

"You have to separate moral questions from the questions of science," C. Everett Koop said when I asked him recently if he could think of any way to resolve this issue. Koop is the most famously right-wing man ever appointed to a senior position in the Public Health Service. He will be ninety this year, and he has been out of government for nearly two decades, but he remains active, and runs an institute named for him at Dartmouth College's medical school. In 1981, when President Ronald Reagan nominated him to the position of Surgeon

General, Koop was a noted pediatric surgeon from Philadelphia with the beard of Abraham Lincoln and a strident history of opposition to abortion. Even today, his 1979 book, "Whatever Happened to the Human Race?," remains a touchstone for those who are opposed to legal abortions. But he had no public-health experience. Surgeons General are usually confirmed quickly and then instantly forgotten—before Koop, few Americans could have named one. No public-health official in American history has generated more controversy. Liberals on Capitol Hill denounced Reagan's choice for what it was: a blatant attempt to place ideological fealty over the demands of public health. The battle over Koop's confirmation dragged on for nearly a year, but in the end he took his position at the head of the Public Health Service.

Koop then proceeded to alienate nearly every supporter he had on the religious and political right. To fight the growing epidemic of AIDS, he recommended a program of compulsory sex education in the schools, and argued that children should be taught how to use condoms. He campaigned vigorously against smoking in public spaces, enraging tobacco companies. When President Reagan asked him to prepare a report on the psychological effects of abortion, conservatives finally felt certain of the result. Yet, after meeting with activists on both sides, and reviewing hundreds of scientific publications, Koop declined to say that abortion was always more damaging than the alternative. He even refused to issue a report, telling the President that there weren't enough data to support either "the preconceived notions of those pro life or those pro choice." The Administration, once again, was shocked. "You know, I never changed my stripes during all that time, and I still haven't," Koop said. "What I did in that job was what any well-trained doctor or scientist would do: I looked at the data and then presented the facts to the American people. In science, you can't hide from the data.

"I have been away for some time, and I am more of a spectator now," he went on. "But stem-cell research is as volatile as any subject can get. People are completely driven by their beliefs or their

desires. Not the facts. Scientists have hyped it, and often they act as if there were no ethical considerations at all. That is not true. But you have to weigh the facts, and this Administration doesn't seem to take that approach. One thing that I have learned is that belief doesn't change reality."

The problems facing American science have not been created by a single politician or party: they reflect a fissure in society which has grown wider as science has edged closer to the roots of life itself. "I have never seen as much tension between science and society," Alan Leshner, the chief executive officer of the American Association for the Advancement of Science, told me. "Some of it is religion and some of it is ideology. But science is now encroaching in areas that are too close to core human values. And it makes people afraid." Leshner was the director of the National Institute on Drug Abuse from 1994 to 2001. "Let's look at behavioral genetics. In the old days, when we talked about there being genes for schizophrenia, everybody said, 'Wow. We have to find that.' Now we know it's broader. Maybe we won't need a gene for schizophrenia; instead, it makes more sense to talk about types of schizophrenia. Fine. Then we move to where we are now: looking for individual symptoms, some of which are normal personality traits taken to the extreme—like cognition. So now we have to study the genetics of cognition. Well, cognition is intelligence. And when you say, 'Let's go back and study the genetics of intelligence,' people go batshit.



"And then that's the end of it," he said. "What we are seeing is the empowerment of ideologues who have the ability to influence the course of science far more than ever before. They say, 'I don't like the science, I don't like what it is showing,' and therefore they ignore it. And we are at a place in this country today where that can work. The basic integrity of science is under siege."

The United States now educates fewer scientists every year. In 2005, seniors in American high schools performed below the average of twenty-one countries on a test of general knowledge of mathematics and science—and in ad-

vanced courses the U.S. was close to the bottom. Federal research investments are shrinking as a share of the U.S. economy—just as other nations are increasing theirs. In this year's State of the Union speech, President Bush acknowledged that we need to educate more scientists to remain competitive. (He then went on the road to tell students that they ought not think of researchers as the "nerd patrol.") But China and South Korea are raising basic research budgets by ten per cent each year. This year, America's will drop by one half of one per cent. In 2004, more than six hundred thousand engineers graduated from Chinese universities. In India, the number was three hundred and fifty thousand. In America, the figure was not quite seventy thousand. For the first time, the United States now imports more high-technology products than it exports. In fact, the U.S. share of such exports has fallen in the past twenty years, from thirty per cent to seventeen per cent. Rather than make up for the loss of trained scientists by increasing immigration, however, the country since September 11, 2001, has invoked harsher restrictions than ever before.

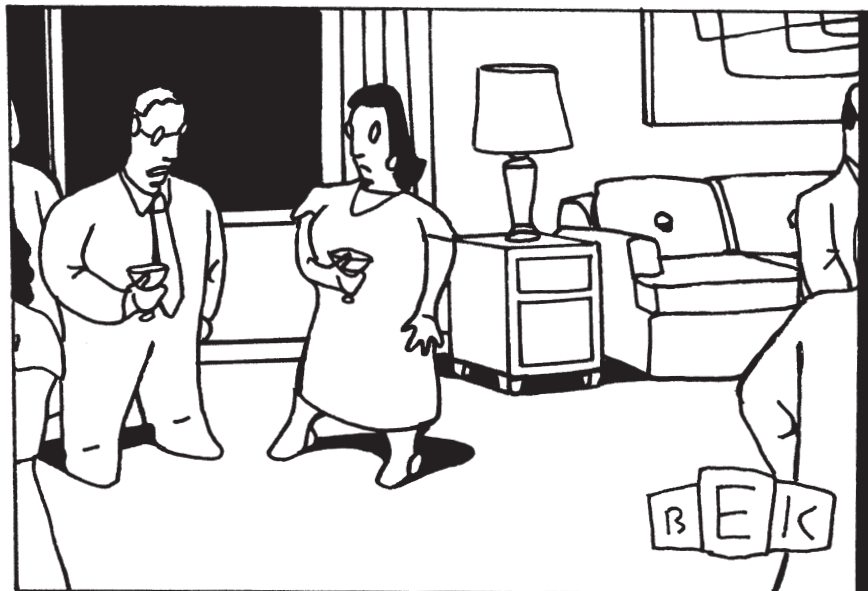
"My friends in the European Union are ecstatic," Leshner said. "Between the visa problems—preventing the best students from China and India from entering this country to study or work—and the stem-cell ban, our competitors are just in heaven. While we are restricting research, the E.U. is working hard on ways to increase mobility. They are welcoming scientists from other countries. They are not fools."

Late last year, the American Museum of Natural History mounted the most significant exhibit ever devoted to Charles Darwin. After returning from his voyage on the *Beagle*, in 1836, Darwin waited more than two decades before he published "The Origin of Species." As Michael Novacek, the museum's provost of science and the curator of its division of paleontology, put it when we walked through the exhibit, "Charles Darwin was a creationist when he stepped onto the *Beagle*. And he was completely aware of how his new theory would be received when he got off." In 1871, Darwin published his second book, "The Descent of Man," in which he attempted to explain his view of how

humans had evolved from other animals. That book's assertion that humans were related to monkeys became one of the most inflammatory ideas in the history of science. It remains so today, particularly in the United States. For the past two decades, polls have shown consistently that more than half of all Americans believe that humans were created directly by God. A similar number don't believe that we share a common ancestor with apes. And only twenty-two per cent say that we evolved from an earlier species.

In Judge Jones's December ruling on intelligent design in Pennsylvania, he excoriated the Dover school board for requiring teachers to tell students that evolution is no more than a theory. He wrote that such an action "presents students with a religious alternative masquerading as a scientific theory, directs them to consult a creationist text as though it were a science resource." Judge Jones found that intelligent design is nothing but creationism with a fancy name. His argument was cogent and powerful, but will it matter? Perhaps, but for the Darwin exhibit in New York—coming eighty years after a twenty-four-year-old high-school teacher named John Scopes was put on trial in Tennessee for teaching the theory of evolution—the American Museum of Natural History failed to find even a single corporate sponsor.

Science is powerful, and it can seem miraculous. Clearly, it has transformed the way humans live, and for centuries the general view has been that science is neither good nor bad—that it merely supplies information, and that new information is always beneficial. That simplistic view makes less sense every year. The products of our most successful experiments often fill people with dread. The atomic bomb—not to mention experiments by Nazi doctors or those carried out in the United States on black men with syphilis—has demonstrated why that fear is not wholly without reason. Nor are conservatives or Christian activists the only people to misuse data or take advantage of their complexity. There are certainly risks associated with growing genetically modified products, yet, after billions of doses have been consumed, there has never been a documented case of a person dying from eat-



"I don't have a lot of edge—I just hate you."

ing one. That has not prevented leading environmentalists from working to ban them. Nuclear energy is another idea to which liberals have been slavishly opposed, refusing to apply common sense to science, or to compare risks and benefits in any meaningful way.

Americans want to believe in "nature" in part because they have so often felt misled by science. A book called "Natural Cures 'They' Don't Want You to Know About," by Kevin Trudeau, has been on the top of the best-seller lists for almost a year. The author promises that those who read to the end will "know categorically, absolutely, with a hundred per cent certainty that there is a natural cure for your disease and you will know exactly what to do to cure yourself of your disease and remain healthy for life—all without drugs or surgery." Clearly, the Bush Administration alone is not responsible for America's fear of progress. But it has widened the gulf between truth and belief immensely.

When I went to see Andrew Von Eschenbach, in his office on the N.I.H. campus, to discuss his leadership of the cancer institute and the F.D.A., he didn't want to talk about data or the policies of the Administration. But he did share his vision of a medical future so "profound" that he calls it the "molecular metamorphosis." He said, "It doesn't change one thing—it changes everything, and the

future will look no more like the past than a butterfly looks like a caterpillar." Von Eschenbach is a pleasant and self-effacing man, and he told me, as he has often told others, that this new approach to medicine will help "eliminate suffering and death due to cancer by 2015." I asked him how we could accomplish such a remarkable feat—after all, the war on cancer has been waged for decades with only moderate success. "We are going to morph the current reality into the new reality and that will go on over the next ten years," he said.

Many of Von Eschenbach's colleagues are convinced that such unrealistic statements will weaken the position of science as the preëminent force of progress in modern society. In a recent commentary published in the journal *Cell*, Paul Nurse, a Nobel laureate and the president of Rockefeller University, addressed Von Eschenbach's statements about cancer treatment directly. They "cannot be justified even as a statement of aspiration," he wrote, "because when we fail to deliver, as we surely will...we will lose the confidence of both the politicians and the public." He then turned to a much larger question, the future of American science: "Present policies are set to damage a whole generation of young research workers, and the negative impact on recruitment of the next generation of scientists will be seen for years to come." ♦