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The Waxing and Waning of Faith in Science

Those of us who grew up during the 1950s and early 1960s can still vividly recall the seemingly unbridled enthusiasm that society displayed toward science and technology. Sunday supplements, radio, television, and newspaper advertisements, television and radio shows, world's fairs, comic books, popular science magazines, newsreels, and, indeed, virtually all of popular culture heralded the vision of a golden age to come through science. One popular Sunday evening program sponsored by Dupont featured Ronald Reagan promising – with absolutely no irony – "better things for better living through chemistry," a slogan that evoked much hilarity during the drug-soaked 1960s.

In an age where TV dinners were symbols of modern convenience, rather than unpleasant reminders of cramped airplane trips, nothing seemed beyond the power of science. The depictions of science-based utopia – perhaps best epitomized in the Jetsons cartoons – fueled unlimited optimism that we would eventually all enjoy personal fliers, robotic servants, the conquest of disease. Expanding population? No problem – scientists would tow icebergs and desalinize water to make deserts bloom. The Green Revolution and industrialized agriculture and hydroponics would supply our nutritional needs at ever-decreasing costs. Computer gurus such as Norbert Wiener promised that cybertechnology would usher in "the human use of human beings." We would colonize the asteroids; extract gold from the sea; supply our energy needs with "clean, cheap" nuclear power; wear disposable clothing; educate our children according to sound

"science-based" principles; conquer disease and repair nature's deficiencies and mistakes. "City planning," based in science, would create utopian "communities." Vestiges of this science-dependent vision have endured into the twenty-first century. Drug companies promise the design of individually targeted drugs and treatments based in biotechnology. The biotech industry still trumpets an end to famine and nutritional deficiency by way of genetic manipulation. The information technologies expand exponentially. But one no longer finds the unqualified social optimism in a science-driven future, and expressions of faith in such a future ring hollow. (Indeed, *that* vision became the stuff of numerous nostalgia coffee-table books at the advent of the millennium, perhaps because of our awareness that such a world view was born of a never-to-be-recaptured innocence and naïveté.)

One can certainly argue that our disappointments are a function of a vision too naïve and a set of unreasonable expectations regarding what science can do. Further, social reflection on increased human knowledge and its attendant control over nature well before the scientific revolution has been unrelentingly plagued by the question of whether humans have the wisdom to manage such increases in knowledge. The Tower of Babel story; the legends of Icarus and Daedalus; the Talmudic account of those rabbis who sought Cabbalistic knowledge and found only madness, apostasy, and ruination; and the story of the Golem and the Sorcerer's apprentice out of control all bespeak deep-rooted fears about advancing human knowledge and control over nature not being unequivocal goods. Indeed it is not an accident that the Bible's first moral lesson concerns the fall resulting from eating of the apple resulting in true knowledge.

With the advent of the scientific and industrial revolutions, these cautionary tales increased and intensified, with Mary Shelley's *Frankenstein* a vibrant symbol of modern concerns and, indeed, of contemporary concerns, given the endless and unabating proliferation of variations on the Frankenstein story pervading popular culture in the twentieth century.

Those reflections suggest that – even amid the most Pollyana-ish enthusiasm about science that pervaded American culture from the 1940s to the 1960s – there was a dark dimension and an ambivalence about human ability to manage proliferating knowledge and the power it conferred. And thus, even as we dreamed the Jetsonian future, we

were never blinded to the strong suspicion that there could also be monsters. For this reason, our world-view of science as curer of ills and slayer of dragons was quick to shift in the face of evidence that not all was as promised.

Beginning in the 1960s, traditional American anti-intellectualism (of the sort that dismissed Adlai Stevenson's presidential candidacy because he was an "egghead") began to direct itself toward science and technology (the two have never been clearly distinguished in the American public's mind, in part because science is often promoted in terms of the technology flowing from it). "Better living through chemistry" was belied by air and water pollution. One river in Ohio – the Cuyahoga – was in fact so infused with chemical waste that it could be set on fire! People became aware that industrialization was a mixed blessing; the factories that created wealth and jobs fouled the air and water, giving flesh to William Blake's gloomy and prophetic description of them as "dark satanic mills." The automobile and the network of roads that carried it, initially the archetypes of technological blessing, became major sources of social disappointment, as cognizance of urban air pollution and traffic snarls grew. By the late 1960s, eight-lane highways and eight-lane gridlock became a favorite butt of jokes, as did the "smog" they engendered.

The growth of environmentalism in the late 1960s contributed to the demise of earlier scientific optimism. What were traditionally seen as boundless natural resources to be exploited at little cost by technology in pursuit of wealth and the science-based good life were now seen to involve hidden costs, from toxicity of air and water to loss of species and degradation of ecosystems.

The rapid growth of environmentalism, incidentally, must be viewed along with civil rights and feminism as one of the remarkably rapid and dramatic twentieth-century changes in social ethics that few anticipated. I recall a 1965 poll of 1964 graduates conducted by Phi Beta Kappa at the City College of New York, wherein the graduates were asked to rank the major problems confronting American society. Of all the hundreds of respondents, only one person listed environmental despoliation as an issue. Yet by 1969, the first massively supported Earth Day marked this major change in social gestalt, a perspective that has been enhanced, rather than diminished, by the passage of time, to the point that over 60 percent of Americans count themselves

as "environmentalists," and "evil industrial polluters" have become an action movie cliché. So powerful, in fact, is the environmental mindset that it trumps even personal freedom and property rights, historically bedrock American values, as when concern about "secondhand smoke" leads to legislated antismoking bans, and concern about endangered species of any sort, not only "charismatic mega-fauna," can hold up land development (*vide* the snail darter and the Preble's jumping mouse). A rancher friend of mine was banned from haying part of his land because he might bale a jumping mouse, though none had been found on his property.

Naïve beliefs about biomedical science conquering disease and biomedical scientists as dragonslayers have given way to cynicism about the motives of scientists, drug companies, and the medical establishment and the embracing of magic-think via "alternative medicine." This disillusionment has been fueled by multiple factors: the exposure of iatrogenesis in modern medicine by critics such as Ivan Illich;[1] the failure of medicine to concern itself with quality of life and its tendency to increase life at all costs regardless of suffering; the attendant failure to control pain in the terminally ill for fear of "addiction"; the failure of the much-touted "war on cancer" to defeat cancer (though it did augment basic biological knowledge); the periodic flip-flops by the medical community on what constitutes a "healthy diet"; what I have called the "medicalization of evil," as when child abuse, youth violence, gambling, obesity, and alcoholism are labeled diseases by the medical community, a move that blatantly defies common sense; and the revelations about cavalier scientist treatment of human and animal research subjects. These have collectively eroded the view of biomedicine as a moral science, and set what we shall shortly call the common sense of science at loggerheads with ordinary common sense.

One highly touted techno-scientific advance was the so-called green revolution: the attempt to increase crop yield by use of scientific principles. A parallel movement in animal agriculture led to the change in that field from seeing itself as based in animal husbandry – care for animals – and instead as animal science – defined in textbooks as "the application of industrial methods to the production of animals." These congruent developments, initially met with public enthusiasm,

[1] See Illich, *Medical Nemesis*.

have in fact become identified in the public mind with generating Frankensteinean results from scientists' hubris. Modern agriculture is now widely seen as being based in avaricious petrochemical consumption and thus as not "sustainable"; as being thereby a major cause of air and particularly water pollution; as relying on economies of scale that lead inexorably to corporate domination of agriculture and to the loss of family farms and rural communities; as degrading farm labor; as putting small operators and farm workers out of business; as eroding food quality and increasing dangers coming from the food supply by reliance on herbicides, pesticides, hormones, and antibiotics; as depleting the land and hurting the animals; and as generating monoculture.

At the same time, public confidence in scientific reassurances has precipitously diminished as a result of an apparently endless list of scientific prognostications gone afoul. The escape of "killer" bees, the *Challenger* disaster, Three Mile Island and Chernobyl, blackouts and brownouts, manipulation of scientific data by cigarette companies, thalidomide, Fen-Phen, Vioxx, the University of Pennsylvania head-injury videotapes of baboon abuse, and the well-publicized cases of people hurt and killed in research have all diminished our faith in "trust me – I'm a scientist" and nurtured the resurgence of the Frankenstein view of scientist as dangerous, whether through misguided good intentions (Dr. Frankenstein's intentions were to augment life), incompetence, corruption, or simply biting off more than he or she can chew.

Another factor associated with diminished confidence in science is the advent – or resurgence – of a mystical streak in society. (I use the phrase "associated with" because it is difficult to tell whether the draw of the occult is a cause or an effect of diminished faith in science, or perhaps both cause and effect.) The key point is that, for whatever reason, beliefs inimical to a skepticism forged in science have reached epidemic proportions. Thousands of educated women now affirm a belief in Wicca, the primary manifestation of witchcraft, allegedly an ancient body of wisdom suppressed by male domination. Millions pursue astrology, unfazed by either its predictive failures or its vacuity ("Your life will change"). Millions of others sport crystals or minerals for their "positive energy." Most impressively, "alternative" medicine and alternative veterinary medicine are thriving – according to the American Medical Association, in one year the U.S. public spent

$29 billion on such unproven therapies whose efficacy, safety, and batch consistency remains unproven and usually untested. It seems that if a putative treatment modality comes from Asia, it is particularly valued – witness the huge success of acupuncture, acupressure, and Reiki. Treatments that violate all known laws of science flourish anyway; witness the resurgence of homeopathy or Bach flower essences, where substances are diluted to the point where they are chemically incapable of any biological activity, or the "healing touch." Others, such as magnet therapy, flourish despite having been demonstrated to show no effect.

Cults, sects, and hermetic traditions are a growth industry, as are books on allegedly magic texts of the "The Kabbalah and You" ilk. Perhaps most astounding is the resurgence of exorcism among both Catholics and Protestants, as well as among some psychiatrists, who admonish all of us to mark the difference between mental and behavioral problems that represent genuine illnesses, versus the easily mislabeled cases of *demonic possession* with which mental illnesses may be confused![2]

In my mind, however, the most critical factor leading to social disenchantment with science has been the singular failure of the scientific community to engage the myriad ethical issues emerging from scientific activity. This is particularly problematic in an age that is suffused with ethical concern, a situation that paradigmatically characterizes the United States during the last half-century.

There is an ancient curse that is most appropriate to the society in which we live: "May you live in interesting times." From the point of view of our social ethics, we do indeed live in bewildering and rapidly changing times. The traditional, widely shared, social ethical truisms that gave us stability, order, and predictability in society for many generations are being widely challenged by women, ethnic minorities, homosexuals, the handicapped, animal rights advocates, internationalists, environmentalists, and more. Most veterinarians now realize, to take a very obvious example, that society is in the process of changing its view of animals and our obligations to animals. Laboratory animal veterinarians have probably seen the most clearly articulated evidence of such a changing ethic, but it is also patent to any companion

[2] Cuneo, *American Exorcism.*

animal practitioners, food animal practitioners, or zoo veterinarians who take the trouble to reflect on the new social expectations shaping and constraining the way they do their jobs.

It is very likely that there has been more and deeper socio-ethical change since the middle of the twentieth century than has occurred during centuries of an ethically monolithic period such as the Middle Ages. Anyone over forty has lived through a variety of major moral earthquakes; the sexual revolution, the end of socially sanctioned racism, the banishing of IQ differentiation, the rise of homosexual militancy, the end of "*loco parentis*" in universities, the advent of consumer advocacy, the end of mandatory retirement age, the mass acceptance of environmentalism, the growth of a "sue the bastards" mind-set, the implementation of affirmative-action programs, the rise of massive drug use, the designation of alcoholism and child abuse as diseases rather than moral vices, the rise of militant feminism, the emergence of sexual harassment as a major social concern, the demands by the handicapped for equal access, the rise of public suspicion of science and technology, the mass questioning of animal use in science and industry, the end of colonialism, and the rise of political correctness all are examples of the magnitude of ethical change during this brief period.

With such rapid change come instability and bewilderment. Do I hold doors open for women? (I was brought up to do so out of politeness, but is such an act patronizing and demeaning?) Do I support black student demands for black dormitories (after I marched in the 1960s to end segregation)? Am I a bad person if I do not wish to hire a transsexual? Can I criticize the people of Rwanda and Bosnia for the bloodbaths they conduct without being accused of insensitivity to cultural diversity? Do I obey the old rules or the new rules? Paradoxically, the appeal to ethics and the demand for ethical accountability have probably never been stronger and more prominent – witness the forceful assertion of rights by and for people, animals, and nature – yet an understanding of ethics has never been more tentative, and violations of ethics and their attendant scandals in business, science, government, and the professions have never been more prominent. There is probably more talk of ethics than ever – more endowed chairs, seminars, conferences, college courses, books, media coverage, journals devoted to ethical matters than ever before – and yet, ironically,

most people probably believe that they understand ethics far less than their progenitors did. Commonality of values has given way to plurality and diversity; traditions are being eroded; even the church is no longer the staunch defender of traditional ethical norms.

Thus ethics is in the air; "ethics sells," as one textbook salesman crassly put it to me. "Applied ethics" courses, virtually nonexistent in the 1960s, are a growth industry and saved many philosophy departments during the mercenary 1980s. Indeed, the rise of medical ethics, and particularly of medical ethics "think-tanks," was, at least in part, a self-defense move to protect the medical community. Historically accustomed to not being questioned, the medical community found itself dealing with a public that, thanks to television and other media coverage, was fairly well versed in issues of medical ethics.

Unfortunately, medical ethics, which in my view has been very establishment-oriented and tame, must still be seen as exhibiting moral sophistication compared with science in general. (One of my friends, a pioneer in medical ethics in the 1970s, explained bitterly that medical ethicists tamely focused on "high visibility" issues such as pulling the plug on the irreversibly comatose Karen Ann Quinlan, while totally avoiding the far more important issue of fee for service.) For, by and large, the research community has failed abysmally to engage virtually any ethical questions flowing from its activities. For example, issues that were manifest to the general public in biomedical research – invasive and abusive use of human and animal subjects – were essentially invisible to the research community. One can search scientific journals, conferences, textbooks, and the like and find almost no solid discussions of the ethical issues raised by experimentation. When the research community did finally engage the question of animal research in the early 1980s, upon its realization that much-dreaded legislation was a real threat, it did so in a highly emotive way that was in fact not that far from the style utilized by its antivivisectionist opponents, with frankly outrageous claims that any constraints on animal use would unequivocally forestall medical progress and harm the health of children. This was in turn a reflection of the view that ethical issues can be approached only emotionally, never rationally, which was rife in the scientific community.

We shall elaborate on these issues and the mentality that led to their mishandling as we proceed through our discussion. For now, it

suffices to point out that the research community's mind-set on ethics is still largely unchanged, despite the lessons that should have been learned from the animal experimentation issues in the 1980s. The area of biotechnology provides a profound – and troubling – current example of the way in which the scientific community fails to engage ethical issues, which in turn leads to public rejection of the science or technology in question, for bad reasons. This has occurred with genetic engineering, genetically modified foods in Europe, cloning, and stem cell technology. This, in turn, gives further evidence that willful ignoring of ethical issues is one of the major reasons for public disenchantment with science.

Any new technology will create a lacuna in socio-ethical thought, and the newer and more powerful the technology, the greater the vacuum. Will a given technology improve our lives or degrade them? In what ways? Which aspects of the technology need to be controlled, regulated, accepted, or rejected to assure that it is a force for good, not for ill? Will it erode or enhance our autonomy? So it is surely incumbent upon those who develop a technology and best understand its strengths and limitations to help society think such issues through. If they fail to do so, the ethical implications vacuum may be filled by doomsayers: political, religious, or other vested interests who may totally distort, exaggerate, or minimize the issues occasioned by the technology and induce in society fear that leads to irrational rejection of the technology or to naïve enthusiasm that leads to imprudent acceptance of it.

This is exactly what happened with biotechnology, leading to its summary rejection in Europe and to lesser but significant social concern in the United States. The research community totally failed to articulate the ethical implications of cloning, genetic engineering, genetically modifying food, BST (bovine somatotropin) use in cattle, developing biomedical animal models for human genetic diseases, and so on, leaving a vacuum in social thought. Religious leaders and apocalyptic doomsayers such as Jeremy Rifkin immediately filled that lacuna with worst case but meaningless slogans – genetic engineering is against God, cloning is against nature, biotechnology has man "playing God" or usurping his role, and so on, illustrating what I have called a Gresham's law for ethics: bad ethics driving good ethics out of circulation, analogous to Gresham's realization that "bad money"

in circulation (e.g., valueless paper deutsche marks) leads to hoarding of "good money" (e.g., gold). No one will pay a debt with gold if they can pay with near-valueless currency.

Research funding was displaced by public fear; laws were quickly passed against cloning. Leaders of the regulatory community steadfastly refused to mandate labeling of GM foods, affirming that they do not differ from normal foods save in the "process" of formation – the product is the same. No one discussed ethics rationally, since the research community tends to believe that one cannot do so, and the other side didn't try to – it was doing fine with sloganeering. Regulators strongly downplayed the risks of biotechnology while ignoring excellent research showing that ethics was of far greater concern (at least to the European public) than risk. The net effect? Substantial portions of the European Community are dead set – and powerfully – against genetically modified foods, and the U.S. public cannot yet see the enormous power for good potentially inherent in biotechnology, the most powerful technology ever devised. Even Monsanto, which spent a fortune on developing and marketing BST for increasing milk production, failed to consider the ethical dimensions of the technology as perceived by final milk consumers, rather than by producers. In our discussion below, we explore many of these neglected ethical issues in depth. If we do not produce a generation of scientists who can think in ethical terms and lead public ethical discussions of science, we may lose countless real benefits of scientific advances, as well as public support of science.