

the minerals problem or the proposed solutions. In the first place, according to Tim Mahoney of the Sierra Club, only one-fourth of public lands—mainly parks and military reservations—are closed to mining. Although miners claim that costly and burdensome regulations are what prevent them from going into wilderness areas, Mahoney maintains that all the areas with a significant mineral potential were excluded by Congress from protection when the wilderness areas were designated.

Miners and environmentalists also differ on the degree to which our mineral resources are known. The latter contend that no big surprises await explorers, the former that we still "don't know what's out there" until we do some digging. As improving technology and rising prices make the mining of lower and lower grades of ores feasible and cost-effective, our reserves are not only not shrinking,

they are expanding, miners contend.

Directly linking mining to national security affords a powerful lever to those who want to open more public lands for exploration. Watt and his allies believe that increased self-sufficiency in minerals means more security, more jobs, and an improved balance of payments. Economic arguments are not so often heard on the other side. For instance, Landsberg of RFF warns that "this current wave could lead us the wrong way." That is, if everyone buys the idea that foreign supplies may be jeopardized by a Russian "resource war" against the United States, this country may embark on a program that is needlessly costly—in terms of both money and environment—to become more self-sufficient. Furthermore, we could prematurely deplete domestic supplies that might better be saved for the day when foreign supplies are no longer available.

Even before the last election, Congress was getting into the mood to do more about strategic minerals. Last year it passed the National Materials and Minerals Policy, Research and Development Act of 1980, which reiterates the intent of a law passed 10 years earlier. The law, which basically tells the government to organize a minerals policy and encourage private enterprise, did not have any money attached to it, and its intent was pretty much submerged under specific legislation passed in the 1970's.

The public mood is riper now than it was 10 years ago. Corporate America has noticed the trend, and oil companies are starting to buy up minerals concerns. The obvious danger is that, with strategic minerals finally getting some long-sought attention, restrictions on mining in public lands may be put aside in the name of national security.

—CONSTANCE HOLDEN

Ethical Risks in Biomedicine

Theologian Richard McCormick maps areas where science may be asked to yield to moral values

Richard McCormick, S.J., a moral philosopher at the Kennedy Institute of Ethics, Georgetown University, recently published a book of essays on dilemmas created by new medical technology. *How Brave a New World?*,* which is Catholic without being the word of the Church, is an attempt to bring established theological wisdom to bear on technical issues and to find compromises where doctrine and scientific interest clash. It may serve as a guide to moral attitudes that will dominate the federal health establishment in a conservative era.

McCormick has had an influence on policy himself. He is consulted from time to time by federal policy-makers caught in medical quandaries, and he has advised litigants in such difficult trials as the one which gave the parents of comatose Karen Ann Quinlan the right to disconnect her life-support equipment. (McCormick advised in favor of unplugging it.) McCormick also served on the government's short-lived Ethics Advisory Board. It was created by Joseph Califano, former secretary of the agency then known as Health, Education, and Welfare (HEW), now Health and Human Services (HHS).

In his own new book (see *Science*, 10 April), Califano refers to McCormick as "an ethicist well versed in the abortion controversy." Califano tells how he telephoned the theologian early in 1977 just minutes before he had to face his Senate confirmation hearing. He wanted to know whether he could remain faithful to his Catholic convictions and at the same time administer an agency that paid for abortions through Medicaid. McCormick reassured the worried secretary-to-be that he could distinguish between personal beliefs and public duty in good conscience and administer the law as written. The advice helped Califano respond to a grilling by Senator Mark Hatfield (R-Ore.).

Few institutions endure in Washington. Califano, the Ethics Board, and HEW are gone from government. But the work of the Ethics Board survives in the form of a list of recommendations to HEW on how to deal with proposals for research on human embryos created in the laboratory. One of the rules the board suggested with regard to in vitro fertilization said that research could go forward on embryos created in the lab, provided they not be kept alive more

*Doubleday & Co., New York, 1981.

than 14 days after fertilization. After that they presumably become too human to be considered research material. If the embryos are to be kept alive and transferred to a mother for gestation, the board said the embryos would have to come from the sperm and ovum of a lawfully married couple. There were many other suggested rules, none of which has been put into effect.

Although the Ethics Board spelled out its decisions in some detail, not much has come of its work. For one thing, the board has been superseded by a new authority, the Presidential Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research, born of legislation introduced by Senator Edward Kennedy (D-Mass.). The new commission has a larger territory and a vaguer purpose than the board did. No one is required to heed its advice, whereas under the old system the Secretary of HEW was expected to respond. Second, this experiment in moral government has faltered because the work of the old Ethics Board has not yet found a secretary of HEW or HHS willing to endorse it. Califano ignored it. Patricia Harris asked for more comment. And now President Reagan's HHS sec-

retary, Richard Schweiker, seems uninterested in what was done before him. As a result, no one is risking trouble and the government is not offering to support research in this area.

In exploring ethical issues, McCormick relies heavily for insight on Catholic doctrine and on a close analysis of arguments presented by fellow ethicists. His peers include secular philosophers and enunciators of traditional Protestant and Jewish doctrine. The emphasis is on tradition, and for this reason the book may have an application beyond the special discipline which spawned it. The new Administration, to the extent that it seeks any outside moral guidance in making decisions on medicine, will rely heavily on traditional views such as those McCormick articulates.

Reagan and Schweiker have indicated clearly that where federal laws or programs clash with traditional values, the government will defer to tradition. As far as abortion is concerned, deference may mean more than a policy of laissez-faire. The Reagan Administration may support laws that lend government authority to certain moral prohibitions. Schweiker has said already that the government will cease to pay for abortions, even in cases

the scientists' best protection against mob moralism. He did not use those words, but said, "We should not be seen as hostile enforcers [of moral rules] but as the best defenders of the medical profession or of research into illness. . . ." The idea is that ethicists who examine and challenge new medical techniques are also able to reassure the nontechnical world that nothing dangerous is happening.

McCormick's own views reflect a fundamental sympathy with established doctrine. He also seems disenchanted with modern society. McCormick writes, for example, that the chief reason priests must be flexible in dealing with parishioners is that our "highly pragmatic, technologically sophisticated, and thoroughly pampered culture" leads people to think that a moral stance which brings about hardship is erroneous. Or as he puts it in another essay on abortion, ethicists should not limit their criticism to specific medical practices, but they should chasten a "culture that, it can be argued, is comfort-bent, goal-oriented, technologically sophisticated, sexually trivialized, and deeply secularized."

Here are some sample insights. On abortion, the author leaves little room

tions only when it involves self-defense, just warfare, capital punishment, or indirect killing.

In practical terms, McCormick suggests that priests should try to grapple with the cultural pressures that push people to have abortions. In dealing with public policy, he says, one should avoid the courts, for they are arbitrary and authoritarian. "The matter should be decided for the present through the state legislatures, where all of us have an opportunity to share in the democratic process."

Cloning, the reproduction in a laboratory of an entire organism from a single cell, seems to fall far beyond the pale if used for human reproduction. McCormick suggests this without actually saying it. As he points out, cloning of humans is still a science fantasy, not a real possibility at present. Ethicists are let off the hook for now. Cloning, if it ever can be made to work for humans, has the potential to undermine the sacred institutions of marriage and parenthood. McCormick writes that it is "important that the hard questions be asked 'in advance of the use of reproductive technologies,' for the danger is that 'we will identify the humanly and morally good with the technologically possible.' And that is exactly what he does: he publishes a list of sharply critical, but unanswered questions about cloning.

McCormick regards in vitro fertilization of the human ovum as risky for similar reasons. Although the procedure may be used constructively, McCormick would impose four conditions before agreeing to consider it ethically sound. He would require: (i) that the sperm and ovum be those of a husband and wife, (ii) that the number of embryos created and discarded be no larger than the number lost in the natural fertilization process, (iii) that the likelihood of creating fetal abnormalities be no greater than in "normal procreation," and (iv) that there be no intention to abort the fetus if an abnormality does occur.

The concern about marriage also affects McCormick's outlook on the practice of artificial insemination. Like others in the Church, but not all, he blesses the procedure if the sperm and ovum come from a husband and wife. In addition, Church ethicists have said the semen must be "obtained in a licit (non-masturbatory) way." However, if either sperm or ovum comes from "outside the marriage," then the undertaking is considered morally wrong. Why? Because using third-party genes tends to break the integrity of the marriage, dilute the

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of rape or incest. This decision would affect the poor who use Medicaid. Presumably private aid and pro bono help from physicians could compensate for this cutback of funds.

Beyond this, however, there is a move in Congress to outlaw abortions altogether by passing a federal law declaring that human life begins when the ovum is fertilized. The purpose of this campaign is to extend to a "person" in the womb all the protections of the Constitution's Bill of Rights, starting at the moment of conception. It is too soon to know whether Reagan will endorse this campaign.

McCormick offers himself as a sort of mediator between the religious establishment and the technological world. He values medical innovation; his father was a surgeon and president of the American Medical Association. In talking to *Science*, McCormick suggested that specialists in ethics like himself are

for interpretation. As he sees it, the morally correct position is that human life, being the foundation of all other human good, should never be sacrificed except to save human life "or its moral equivalent." The latter is not defined. Human life begins at conception, McCormick feels certain, or, quoting Paul Ramsey of Princeton, "at least from 'the time at or after which it is settled whether there will be one or two or more distinct human individuals.'" Twinning takes place 10 to 14 days after conception. Thus, to have an abortion after this initial period is wrong. McCormick finds it impossible to draw a line marking the beginning of human life at any later time, although he says "Some people think you're not a person until you have a Ph.D. from Harvard." An exception to the rule against abortion should be made only when to do so is to choose the lesser of two evils. For reference, he mentions that life taking is tolerated in other situa-

couple's physical and emotional investment in the child, make adultery seem less heinous (perhaps even more natural), and foster a "stud-farming mentality."

McCormick says the general wisdom of the Church in these matters is more interesting to him than the "knock-down arguments" on specific issues. In dealing with new reproduction technologies, McCormick's greatest concern is that Americans are developing a consumer attitude toward children. He imagines a

couple sometime in the future walking into a hatching center to choose their child's eye and hair color, sex, height, and so on. "Some people already talk about the right to have a healthy child. Maybe soon we'll hear about the right to have a smart child." The attitude is disturbing, McCormick thinks, because it signals a profound change in the way people regard childbearing. A steely utilitarianism is creeping into an act that should be based on simple love.

"It is easy to see how we have deper-

sonalized the dying process," McCormick says. "We isolate the patient behind a wall of tubes and medical equipment" in an attempt to conceal the human agony of death. Is it not possible that childbearing could become just as dehumanized? McCormick's overriding concern is to see that people remain the master of technology in medicine in all circumstances—from childbearing to dying—and that the mechanization of human functions be held to a manageable level.—ELIOT MARSHALL

High-Cost Lemons in the U.S. Arsenal

Experts suggest that current weapons flaws are caused by technological overcomplexity and the absence of industrial competition

The Navy has equipped each of its most advanced ships with a sophisticated radar system that tracks several targets at once and automatically fires the ship's weapons. But it works only 60 percent of the time, because of random failures of its 40,000 parts. The rest of the time, the ships are virtually defenseless.

The Air Force has developed a jet fighter, the F-15, that flies faster and better than any other jet fighter in the world. But it sits on the ground a lot, because of engine troubles and a shortage of spare parts. The Air Force says that only about 60 percent of its F-15's are capable of flying a real mission at any time.

The Army's tank-killing helicopter, the Cobra, uses highly effective guided missiles that each cost \$6700. But the system that fires and targets these missiles breaks down repeatedly, causing the missile to veer in the wrong direction. The rotor on the helicopter itself frequently breaks down because of faulty bearings.

On the eve of a major buildup in weapons procurement by the Reagan Administration, several recent reports are calling attention to the Pentagon's current practice of buying costly arms that fall dramatically short of expectations. Shoddy workmanship, skyrocketing costs, and unreliable operation characterize many current weapons programs. Prospective costs of the 47 largest programs rose by \$48 billion just between October 1980 and 1 January, only partly because of inflation.

The government now buys fewer, more complicated items that ultimately need expensive redesign and the sort of care and maintenance that is impractical in wartime. The Department of Defense (DOD) will soon spend millions of dollars, for example, to repair some submarines, including the Trident, and some M1 Army tanks, in use for about a year. (The submarines have unsatisfactory welds and the tanks have drive train problems.) The cost of the M1 has more than doubled in the last 5 years, to about \$2.6 million for each tank. A recent report by the General Accounting Office (GAO) offers the following examples of problems with other current weapons systems: "a tank hatch that a soldier, clothed for winter, cannot fit through; aircraft test equipment that causes more problems than it solves; and a handheld missile that, when fired, startles the person that fires it, resulting in misses."

So numerous are the deficiencies in current weapons programs that most observers now realize the situation is not susceptible to short-term solutions. The Reagan Administration, while boosting defense procurement by \$20 billion, or 40 percent, has promised to examine the process from top to bottom. The review is to be directed by Frank Carlucci, the undersecretary of defense. Responding to complaints that most weapons contracts are filled by large firms with little incentive to keep costs low, Defense Secretary Caspar Weinberger says that "we will have to strengthen and revitalize our industrial base, and this will produce significant cost-savings." Mean-

while, the House Appropriations Committee has appointed a special panel to examine defense procurement and to examine whether weapons are now so complex that they frustrate all attempts at reasonable operation.

There will be plenty to study. In addition to defects in the weapons already mentioned, maintenance and operations problems have beset a major Army self-propelled howitzer, the Air Force plane designed to attack submarines, and the existing Army M60 tank. Huge cost overruns have hit a number of new weapons programs, including an Air Force laser-guided missile, a sophisticated antisubmarine system, the Navy F/A-18 attack plane, and the new Army Blackhawk helicopter. Each incorporates state-of-the-art military technology.

There are almost as many schools of thought about what to do as there are faulty armaments. The prevailing view at the Pentagon has for years been that any deficiencies in battlefield weaponry are primarily deficiencies of supply—that Congress has not supplied enough money to design the weapons correctly or to purchase the required number of spare parts. Meager budgets since the close of the Vietnam War have forced the military services to concentrate on modernization at the expense of readiness to fight—a phrase that translates as purchasing new weapons while paying insufficient attention to what it takes to keep them operating. Major General John T. Chain, Jr., the director of operations and readiness for the Air Force, told *Science*