ditioning, says Wikler. He notes that it is virtually impossible today to find such a regimen in existing narcotics rehabilitation programs.

The heavy odds that an addict will relapse has made some scientists postulate that there are long-term, perhaps even permanent, physiological changes that may contribute to recidivism. Observations by Himmelsbach and others suggested that effects of addiction persisted beyond the initial withdrawal period, and Martin and his colleagues have found evidence of what they call a "protracted abstinence syndrome." With opiates and synthetic opiates the abstinence syndrome appears to have two phases. The familiar, overt physical withdrawal signs are gone in perhaps a month. There are a number of signs that users of morphine and methadone suffer serious, if less easily recognized, effects for up to 6 months after withdrawal. Notably, a long-term, increased response to pain stimuli has been recorded in both animals and humans. "We have reason to believe," says Martin, "that a protracted abstinence syndrome may exacerbate some psychiatric defects in psychopathic personalities."

Asked to define the "addict psychopath," a term which appears with some frequency in the literature, Martin says that it means those addicts—and a lot fit the criteria—who, when tested, show an elevation on a scale used to indicate psychopathic personalities. With addicts, common characteristics tend to be immaturity, poor self-image, and an inability to delay self-gratification. The relation between the protracted abstinence syndrome and the relapse syndrome is obviously important and is one of the things Martin and his staff will continue to work on.

The Role of Prisoners

There are plenty of other things for the center to carry on with, but the world outside the ARC is changing. At a time when experimentation with human subjects is under sharpening scrutiny, the use of prisoner volunteers in narcotics research can be expected to turn up on the critics' agenda. The ARC has so far not come under serious attack, and Martin says that ARC's careful procedures in selecting volunteers, in having outsiders review study proposals, and in maintaining high standards for patient management should allow the center to operate comfortably under the National Institutes of Health's new guidelines on protection of human subjects.

Unquestionably, however, increasing pressures will be exerted on ARC from several directions. Human rights advocates will, predictably, take up the case of prisoner volunteers, who form one of the categories of subjects with whom the problem of consent is especially complicated. On the other hand, criticism is already being heard that narcotics research using human subjects should be permitted in other places besides Lexington in order to break a "monopoly" which has restricted the scope of narcotics research.

Certainly, studies of the era of the Eddy dispensation should enrich the sociology of science. And narcotics research is now in the process of being "opened up" in a number of ways. Whether this will fundamentally affect the ARC seems doubtful, even though many professionals in the field of addict treatment and narcotics research have conflicting feelings about the use of prisoner subjects in addiction studies. Typically, they will express reservations about using prisoners as "human test tubes," as one psychiatrist put it, but at the same time they acknowledge that the work at ARC is "necessary." Narcotics research at the ARC and elsewhere is one of those sectors of science where there is rather wide agreement on ends, but where it is necessary to keep a watchful eye on means.

—JOHN WALSH

Genetic Erosion: Crop Plants Threatened by Government Neglect

The Bible has long told us that we shall reap what we sow, but for more than a decade plant geneticists have been warning government officials that we may not be able to reap anything at all unless we save.

Specifically, scientists have been advocating the preservation of plant genetic resources—the seeds of plant and food crops from which new crops are developed and existing ones are protected against disease—through a systematic, comprehensive, and international network of seed banks, or seed storage centers. But the warnings have gone largely unheeded. Most nations have not developed seed banks, and the U.S. National Seed Storage Laboratory is overcrowded, understaffed, and sorely in need of funds.

Despite recent manifestations of increased concern about seed conservation, a U.S. Department of Agriculture (USDA) study issued last month warns that "The [genetic resource] situation in serious, potentially dangerous to the welfare of the nation, and appears to be getting worse rather than better."

During the last decade, urbanization, economic development, and major advances in crop production have hastened the disappearance of thousands of genetically varied strains of plants and crops, products of thousands of years of evolution. In the mid-1960's, the so-called Green Revolution began to spread through vast reaches of agricultural land in Latin America, Asia, and the Mediterranean nations, bringing harvests of new "miracle" wheat and rice strains that promised to forestall global food shortages. In countries where the new, high-yield grains have become established, they have rapidly supplanted the native varieties. Many of these native varieties have not been collected and preserved and are dying out. No one knows how many may have become extinct. Thus, the array of strains on which future plant breeding depends has been dangerously narrowed, resulting in what plant geneticists call "genetic erosion." Moreover, mass planting of a single strain of rice or wheat creates genetic uniformity, which, in turn, makes the crop more susceptible to an epidemic.

The United States and other nations have been given ample warning of the

dangers of relying heavily on too narrow a genetic base. In the 1840's, the infamous potato blight in Ireland resulted in the death of 2 million persons. In 1916, red rust destroyed 3 million bushels of wheat in the United States and Canada. A fungus devastated the Bengal rice crop in 1942, and tens of thousands of people died of hunger. In 1970, an epidemic of corn blight in the United States destroyed 15 percent of that genetically uniform crop.

There have already been disturbing signs of weakness in new miracle grains in several countries. H. Garrison Wilkes, a member of the Rockefeller Foundation's Maize Germ Plasm Committee, claims that the high-yield rice IR-8 is demonstrating susceptibility to a virus carried by green leafhoppers because of its limited resistance to insects.

Despite the ever-present danger of crop epidemics, which is made more serious by any degree of genetic uniformity, most governments, and the research foundations most prominent in promoting the Green Revolution, have taken little serious action in response to the warning signals.

The Green Revolution is not the sole cause of accelerated genetic erosion. Economic development and technological progress have played a significant role. Quentin Jones, a national coordinator of the USDA's Plant Introduction and Narcotics Division, points out that urbanization and the concomitant growth of highways, airports, and city sprawl account for much destruction of the wild and semiwild ancestors of modern crops.

The construction of the Aswan Dam, for example, displaced many villages and resulted in the loss of valuable feed strains. Widespread hunger caused by the Nigeria-Biafra civil war, says John Creech of the USDA's Agricultural Research Service (ARS), caused Biafrans to consume the base of their plant diversity. "In the Mediterranean [countries]," said Creech, "even the restoration and cleaning up of ruins for the benefit of tourists has led to plant genetic losses." Even seeds that have been gathered and stored in seed banks and private collections are often lost, as was the case in central Africa when an immense collection of millet seed, an important staple in African diets, was thrown out when its owner died.

Many plant geneticists, however, blame national governments for neglecting the dangers of plant genetic erosion because of their attitude that a wide variety of seed plasm will always be available.

According to Creech, genetic plant resources have traditionally been assigned low priority. "The attitude toward seed conservation has been one of reaction; if we need rare strains to breed a stronger variety of grain in the event of an epidemic, we go and collect it. We have felt that we can always go to the country of origin and get them." Increasingly, however, plant exploration missions are discovering that the desired seed can no longer be found. The displacement of native strains by high-yield seeds is certainly a result of development, but the failure to preserve these native strains is attributable to the laissez-faire attitudes of developed nations.

The feeble interest of the United States in genetic banking is especially surprising, according to Creech and Jones, in view of the nation's historic leadership in agriculture. Although the United States has long been the earth's preeminent breadbasket, they point out that it has always been a have-not nation as far as native plant resources are concerned. Since the Colonial era, many plant varieties have been brought to the New World by European settlers. All of the grains that supplanted the native grasses of the American prairies, for example, were imported or developed from imported stock. Moreover, plant introduction and exploration were among the first activities of the USDA when it was created more than 100 years ago. Since then, more than 400,000 varieties of seeds and plants have been introduced in this country.

At present, the ARS is responsible for national plant exploration, introduction, and conservation. It operates four regional plant centers and the National Seed Storage Laboratory at Fort Collins, Colorado, on an annual budget of less than $1 million. According to Jones, the four regional stations maintain working collections of about 100,000 seed samples, many of which are duplicates of the 85,000 samples on record at the Fort Collins center. The National Seed Storage Laboratory is responsible for seed introduction, classification, evaluation, and conservation. In the laboratory's 11 storage rooms, seeds are regenerated and maintained for future needs of private and government-employed plant breeders throughout the country. Periodically, the seeds are run through germination tests to determine their degree of viability.

The $100,000 annual budget of the laboratory, however, has not changed in the 15 years since it was established. Dorris Clark, assistant director of the laboratory, said that the center desperately needs an increase in federal funds. "We've been limping along," said Clark, "struggling to maintain our present effort." Although USDA officials anticipate what they term a "substantive" increase in funding for the laboratory in fiscal 1975, they do not yet know how large the increase will be.

An attempt to computerize existing samples at Fort Collins and the regional centers is also under way, but Jones said that budgetary constraints have severely limited the effort. Computerization involves not only the listing of current seed catalogs, but the cross-indexing of seed characteristics, an invaluable aid to plant breeders seeking seeds of a certain variety. At present, however, the ARC can only afford to devote 1 man-year of effort per year to the task. At this rate, Jones estimates, computerization of the current collections will take many years. In the meantime, valuable genetic plasm may be lost or floating around in one of the five centers.

Two recent reports have criticized government inaction in the area of plant genetic resources. The first, issued last year by the National Research Council of the National Academy of Sciences (NAS) examines the extent to which essential U.S. crops have become genetically uniform and, as a result, vulnerable to epidemics. It concludes that "most major crops are impressively uniform and impressively vulnerable" (*Science*, 25 August 1972). The academy study finds that genetic uniformity was primarily responsible for the 1970 corn blight epidemic and points out that the same kind of uniformity has been introduced into commercial varieties of sorghum, millet, sugar beet, onion, wheat, and other major crops. Two types of pea and nine strains of peanut, for example, comprise 95 percent of their respective crops in the United States.

The second report, issued last month by a USDA subcommittee on genetic vulnerability and the National Association of State Universities and Land Grant Colleges,* builds upon the NAS

*"Recommended actions and policies for minimizing the genetic vulnerability of our major crops." Report of an ad hoc subcommittee of the Agricultural Research Policy Advisory Committee of the USDA and NASULGC, November 1973.

study, describes the present situation as "dangerous and deteriorating rapidly," and recommends a series of actions to protect the nation's plant resources. Briefly, the report calls for the establishment of a National Plant Genetic Resources Commission, the development of a national master plan for seed-conserving resources, and an immediate increase in federal funding for the seed conservation effort.

"The genetic variability upon which man depends for future breeding programs is being eroded and lost almost everywhere in the world," states the report, "and we are not taking adequate steps to salvage the material before it disappears. Furthermore, we have lost substantial portions of the germ plasm collections accumulated in the U.S. in the past and more are being lost every year."

Haphazard, Unsystematic Effort

The report concludes that, although considerable work has gone into genetic resource management, "the effort has been too haphazard, unsystematic, and uncoordinated and has never received the high priority it deserves among the many agricultural research programs. The situation is serious, potentially dangerous to the welfare of the nation, and appears to be getting worse rather than better."

The report vigorously criticizes the U.S. plant programs for failing to mesh in any significant way with international organizations, which currently are conducting some of the most ambitious and promising research and preservation efforts.

Among these groups, the United Nations' Food and Agriculture Organization (FAO) has been the traditional leader in the drive to interest nations in cooperative conservation of genetic resources. In 1961, FAO sponsored the first major technical symposium on plant exploration and introduction. Since 1967, the FAO Panel of Experts on Plant Exploration and Introduction has met annually to make recommendations. Last February, FAO's O. H. Frankel, generally considered the dean of genetic resource conservation, issued the first worldwide survey of existing genetic resources, in which strains threatened with extinction were identified. In addition, FAO recently sponsored with the Soviet Union a school in Leningrad to train persons from developing countries in plant exploration. Although the U.S.S.R. is not a member of FAO, it is, nevertheless, a leader in the field of plant genetic resources and has carefully collected and preserved many of its native seeds.

The Rockefeller Foundation has also become more concerned recently about plant genetic erosion. Although the foundation has granted funds for seed conservation since the 1940's, Rockefeller officials acknowledge that the funds spent on genetic resource conservation in the past have constituted a tiny percentage of the funds allocated to developing and promoting the Green Revolution. In 1970, however, the foundation took the decision to increase its appropriations for genetic conservation from a previous annual level of less than $50,000 to $350,000 a year for 3 years. At the same time, the foundation established scientific committees to review genetic erosion in wheat, rice, sorghum, and maize products, since these crops account for nearly one-half of the world's tilled acreage.

Rockefeller has been working in this area mainly through the Consultative Group on International Agricultural Research (CG), a consortium of 29 nations, foundations, and international agencies whose purpose is the mobilization of long-term financial support for international agricultural research. In 1972, a CG committee put together the first concrete proposal for a global network of ten genetic resource centers and a central coordinating committee. At a meeting last month in Washington, D.C., the CG endorsed the establishment of a 14-man International Board for Plant Genetic Resources and decided to allocate a minimum of $300,000 to $500,000 to finance the body. Although Communist nations are not members of the CG, the Soviet Union will probably be asked to participate on the board. Since many of the CG donors expressed interest in contributing funds toward the establishment of the board, the U.S. government will not contribute financially next year. The United States will, however, be contributing to the $2 million annual program for plant genetic resource conservation approved by the U.N. Conference on the Human Environment held in Stockholm last year. The Stockholm conference, acknowledging the need for coordinated international effort, endorsed the CG's concept of a worldwide board and regional centers.

The CG's proposed board is viewed by many as the most encouraging international development. The board will probably be officially constituted in February 1974, when the CG subcommittee meets again. Lewis M. Roberts, associate director for agricultural sciences at the Rockefeller Foundation, said that the board would be the first major, systematic effort toward achieving concrete international action in the field. "It's easy to write articles, hold conferences, and scream about the dangers of plant genetic erosion," Roberts said in a recent interview, "but it is far more difficult to get the private, national organizations to commit themselves seriously to constructive, immediate action. Each day we delay, valuable resources are lost."

—JUDITH MILLER

Judith Miller is the Washington correspondent of The Progressive.

Bevan to Leave AAAS

William Bevan, executive officer of the AAAS, is planning to return to academic life next September, at which time he will have completed 4 years with the association. The board of the AAAS was told of this decision at its meeting last month.

Before joining the AAAS, Bevan made clear that he contemplated a term of only 3 to 4 years. "I have begun to meet my personal goals and it is time to be moving on," he says. Bevan will probably return to research—his discipline is experimental psychology—but has not made any definite decisions on a new job.

While at the AAAS Bevan's major task has been the successful democratization of the association's governing structure. He has also presided over an expansion of AAAS activities in issues involving science and society.

Before becoming executive officer of the AAAS Bevan was vice president and provost of Johns Hopkins University.—N.W.