

problems such as storage, disposal and prevention of accidents must be solved first.

The unpublished chapter on recycling stresses the need for incentives for reusing many items that become trash. The unpublished case study of the Delaware River Basin is critical of industry and land development plans along the shore, but praises the Delaware law that bars new substantial industry along the state's coastline.

The report estimates that it will cost about \$287 billion in the decade of the 1970's to clean up the environment—an estimated 2.2 percent of the gross national product. This includes expenditures by business as well as government. The report concludes: "Neither this year nor next will we be able to provide a general statement about whether environmental quality has improved or deteriorated. The environment encompasses too many factors to be so easily characterized." □

Australia yields possible oldest vertebrate print

Footprints of an extinct genus of animal thought to be the oldest trace of a vertebrate yet found on the planet have been discovered in southeastern Australia by scientists at Monash University, Melbourne. Geologic and plant-fossil evidence puts their age in Devonian times—possibly more than 350 million years—says James Warren, professor of zoology at Monash.

Warren and his colleagues are linking the prints, made in igneous rocks, with the wedge-shaped prints of the *ichthyostega*, fossilized remains of which were found in Greenland before World War II. Spaces between the footprints and the rolling method of motion suggested the Australian creature fitted the pattern of the *ichthyostega*—a fresh-water animal about three feet long, with gills, a blunt head, long thin tail and up to four or five toes on each of the four feet.

The footprints were discovered by Norman Wakefield of Monash during a botanical survey in the upper reaches of the remote Genoa River area of East Gippsland in Victoria. The fossil evidence there indicates the creature was living in a now-vanished swampland area and made the prints when it was forced to cross new soft rock during geologic upheaval to search for fresh water and food. Announcement of the find was delayed until the print-bearing rocks were removed to safety.

Warren says the evidence associating the prints to the Greenland *ichthyostega* is fairly strong and so has implication in linking Australia to the Northern Hemisphere land mass in the Devonian Age—or previously. □

U.S. crops: Genetically vulnerable to disease

Agricultural research and modern methods of farming have greatly increased the yield of crops in the United States. Corn yield per acre has risen threefold in the past four decades. But we pay a price for the greater efficiency. The price is uniformity and with uniformity comes the constant threat of blights or epidemics that may wipe out an entire year's crop.

The severity of the corn blight of 1970, which wiped out 15 percent of the nation's corn crop for that year, can be directly traced to the genetic uniformity of the corn, says the National Academy of Sciences' Committee on Genetic Vulnerability of Major Crops, in a report issued this week. The committee, headed by James G. Horsfall of Connecticut Agricultural Experiment Station, reviewed the causes of recent crop epidemics and assessed the vulnerability of the major crops in the United States.

The corn plants of America had been inbred and crossbred until they were "as alike as identical twins." When a pathogen evolved that could attack that strain of corn, virtually all corn in the nation was susceptible.

A review of 14 major U.S. crops showed that most are "impressively uniform genetically, and impressively vulnerable." For example, 96 percent of the pea crop is devoted to only two varieties of peas.

The uniformity of crops is the result of pressures from all sectors. Consumers want uniform, inexpensive produce. To squeeze the most out of each acre, the farmer resorts to the highest-yield varieties and uses machines to

Crop	Value (millions of \$)	Major Varieties	Acreage (percent)
Bean, dry	143	2	60
Bean, snap	99	3	76
Cotton	1,200	3	53
Corn	5,200	6	71
Millet	-	3	100
Peanut	312	9	95
Peas	80	2	96
Potato	616	4	72
Rice	449	4	65
Sorghum	795	-	-
Soybean	2,500	6	56
Sugar beat	367	2	42
Sweet potato	63	1	69
Wheat	1,800	9	50

NASA

A few strains dominate some crops.



NASA

Uniformly bred, uniformly blighted.

plant and harvest. To plant by machine he needs seeds that are uniform in size. Such crops as tomatoes must ripen at the same time, since the machine used to pick them cannot distinguish between ripe and green tomatoes. "And so it goes," says the report, "uniformity—always uniformity."

Breeders try to develop strains resistant to disease and have succeeded to a certain extent. But there is always the danger that a parasite will evolve or be imported for which the plants have no defense.

Most of the great epidemics of the past century have been caused by exotic pests that originated far from the crop they ultimately destroyed. French grapes were attacked by parasites from North America; chestnut blight and Dutch elm disease came from the Orient. It must be assumed that a pest anywhere in the world is a potential threat to a large and uniform crop.

The committee recommends a "watchdog system" to guard against future epidemics. Overseas laboratories could be used to test plants such as cotton and sorghum against insects and parasites at breeding stations in the tropics where these plants originated. Offshore laboratories could study the susceptibility of American crops to exotic pests. The last defense would be a quarantine at the borders.

The United States should not depend entirely on these measures, however. "If uniformity be the crux of genetic vulnerability, then diversity is the best insurance against it." The report calls on scientists to maintain a backup system in the form of gene pools, collections of plants and seeds with a wide variety of genetic characteristics. Breeders should be constantly on the lookout for new sources of genes in mutations and wild varieties.

National efforts to maintain a gene

pool currently take two forms. The Plant Introduction Service of the Department of Agriculture collects plants from around the world, catalogues them and screens them for viruses. The National Seed Storage Laboratory in Colorado maintains seeds in cold storage. Finally, the committee recommends a form of technology assessment—a national monitoring committee to warn of potential hazards of new or widespread agricultural practices.

In a sense, technology was responsible for the 1970 corn blight. What is needed now, says the committee, is "technology assessment." The benefits of developing crops that can be efficiently harvested must be balanced against such undesirable side effects as vulnerability to epidemics. □

When floods strike: A review of forecasts

The painful lesson of Hurricane Agnes was that the nation's system for predicting and protecting itself against floods needs serious examination.

The cost of Agnes, announced last week by the Office of Emergency Preparedness, was 118 human lives and over \$3 billion in damage. Agnes dropped an estimated 25.5 cubic miles of water on the eastern United States—one-fourth of the volume of Lake Erie.

Also last week, Robert M. White, director of the National Oceanic and Atmospheric Administration, asked the National Advisory Committee on Oceans and Atmosphere to review and

evaluate the nation's flood forecasting and warning program and its performance during Agnes' floods. NACOA, chaired by William A. Nierenberg of the Scripps Institution of Oceanography, has been in existence for just a year. This is the first such study NACOA has tackled. A five-man ad hoc working group headed by William D. Carey, vice president of Arthur D. Little Co., is now working out the procedures for the study. The review may be completed in a couple of months.

The floods in some areas had just barely peaked when the first complaints about flood prediction were voiced. Rep. H. John Heinz (R-Pa.) alleged that in the Pittsburgh area, riverside communities were not warned of impending floods until 4 a.m. on June 23, "only four hours before the flooding reached the critical stage. Due to the lateness of the hour, citizens were totally unaware of the situation."

In response to these charges, the House Government Activities Subcommittee held hearings on June 29. What became apparent in the course of the hearings was that where warnings came too late the fault lay at least as much with local communities as with the National Weather Service. A Weather Service spokesman had previously said that its forecasters had, in most cases, given 12 hours' warning, but that they had no way of telling how and whether the warnings reached the public (SN: 7/1/72, p. 5).

Where disaster preparedness is concerned, says Heinz, "The states have taken little or no initiative in meeting their responsibility to their citizens." He points out that the Disaster Relief Act of 1970 provides Federal grants to the states to develop disaster preparedness plans, but fewer than one-third of the states have taken advantage of it. Though the maximum available is \$250,000, Pennsylvania requested only \$14,850. "Furthermore, many of the states participating in this program have formulated plans which exist only on paper." For example, Pennsylvania has applied for a Federal grant for a plan approved by OEP but implementation of the plan, says Heinz, is "totally inadequate." One of the provisions of the Pennsylvania plan is for a public warning system for each city, borough, town and township. Yet at the subcommittee hearings, Weather Service witnesses said there were no means available to them in the Pittsburgh area to alert the public to the flood danger.

Last Thursday Heinz introduced a bill making it mandatory for states to develop and maintain disaster preparedness plans. The plans would have to be in accordance with Federal standards to be formulated and enforced by OEP. The bill contains sharp teeth: any state

Death with dignity: The debate goes on

The ability to prolong life brings with it the ability to prolong dying. In using his skills, a physician may thus actually be inflicting unnecessary suffering on a terminally ill patient. In an emotional example of this dilemma, Arthur E. Morgan, former president of Antioch College in Yellow Springs, Ohio, cried as he told how nurses forced his dying wife's jaws apart to make her eat. Morgan's statement was among those taken last week by the Senate Special Committee on Aging during three days of hearings on the problem of dying with dignity.

Many of the witnesses testifying insisted that death, like life, should be achieved with maximum dignity. "It is clear beyond question that a time comes when it is no longer appropriate to continue extraordinary means of support for the hopelessly unconscious patient," said Henry K. Beecher of Harvard Medical School.

Walter W. Sackett, a physician and member of the Florida House of Representatives, explained that the concept of "death with dignity" implies permitting a person to die a natural death without the application of all the heroic modalities known to modern medicine. "Euthanasia or mercy killing has nothing to do with this philosophy, he stresses, because those terms imply the application of some positive method of ending a life. Estimating that 75 percent of the nation's doctors practice "death with dignity," Sackett has introduced a bill in the Florida legislature that would make their activities legal. Similar bills are under consideration in Wisconsin, Utah, Hawaii and Montana.

Sackett's bill would allow a competent person to create a document

(a living will) asking that he be allowed to die under the existence of certain circumstances. In the absence of such a document, a relative would be allowed to signify to the physician that heroic measures not be applied. Or, in the case of an individual with no known relatives or guardian, Sackett's bill would allow three members of any recognized hospital to make the decision.

Laurance V. Foye Jr., director of Education Service for the Veterans Administration, warned that the living will would convert a possibly fatal outcome into a certainly fatal one. He considers the phrase "death with dignity" to be obscure and believes the philosophical and humanitarian arguments used in favor of letting a person die with dignity are medical problems. These problems, he said, "relate directly to the responsibility and decisions of the physician in his relationship with his patient. . . . If a physician withholds maximum effort from patients he considers hopelessly ill, he will unavoidably withhold maximum effort from an occasional patient who could have been saved. This approach and concept cannot be fostered or condoned, legally or otherwise."

Legal acceptance of the "death with dignity" philosophy is not likely to come out of the Senate hearings, at least not in the near future. Sen. Frank Church (D-Idaho), committee chairman, said, "We are not floating trial balloons on proposals for Government action. We realize that we have a long way to go before we can even begin to think about changes in public policy, if indeed such changes should prove to be desirable."