for the manner in which drugs are distributed, Dissen says, "that's strictly a private matter. We don't sell it. If people want to come here and sell and buy it, that's their business. Drugs here serve the same function as alcohol in a cafe. They're not necessary for people to get together and have a good time, but they help create a nice atmosphere." He added, "You don't need coffee for breakfast, but it's better with it than without it."

Though the legal status of the clubs is uncertain, they have been accorded some status in the politics of the city through the establishment of advisory boards that theoretically supervise their affairs and represent them in dealings with the city authorities. Sitting on one of these boards is a 30-year-old graduate in theology, Gerard C. de Hass, author of a book on contemporary youth, called *The Unforeseen Generation*, and secretary of a large private youth organization. "If you take the drugs out of the clubs," he said, "the kids won't come, and then we'll be back to the situation that we had when the Provos were driving the city government crazy. The authorities know that. The police remain ambiguous. Like all police, they'd like to crack down on it. But the mayor runs the police." Though some observers say that "hard" drugs are in plentiful though relatively inconspicuous use, De Hass doubts this. "Some heroin, amphetamines and LSD are around," he said, "but not very much." As for the extent of pot consumption, he said that last April checks were made with all the dealers in the city and it was concluded that they were handling a supply sufficient for about 20,000 to 30,000 regular users. Others estimate that the numbers are probably smaller than that. According to Herman Cohen, a researcher at the University of Amsterdam, the figure is more likely around 10,000. "The increase in use," he says, "has not been great since 1960. Numerically, it is not a serious problem." Nor, if surveys on these matters are to be believed, are the clubs very important channels in Amsterdam's drug supply system. According to a survey taken earlier this year, only 7 percent of the visitors to one club said that it served as their principal source of supply.

Though Europe's popular press delights in telling garish tales of Amsterdam's newly flourishing sin centers, many visitors come away with the impression of an essentially joyless scene. Huge, gloomy, and hot, with little dancing or conversation going on, the clubs are nightly jammed with vast crowds of lost-looking young people, many sitting by themselves, or silently in groups. Many puff on something or other, but then many do not. The club staffs estimate that about 50 percent partake of drugs, but, in terms of whether they are enjoying themselves, there is no visible difference between users and nonusers. Turned on or not, they mostly look turned off.

Anya Meulenbelt, the social worker, recalls that recently permission was received for about 300 young visitors to bed down for the night at one of the clubs. "We were afraid there was going to be an orgy and then photographers and police would come running in and that would be the end of the clubs. But they all just quietly went to sleep."

It would seem that, if there need be any concern about the social and political implications of the Netherlands' experiment in relatively unrestricted traffic in soft drugs, it should come from the left and not from the right.

—D. S. GREENBERG

Warm-Water Irrigation: An Answer to Thermal Pollution?

Eugene, Oregon. Electric utilities in the Northwest, as well as elsewhere, have been finding it difficult to announce plans to build a nuclear plant without stirring criticism that the proposed plant might cause major environmental problems. Fear of thermal pollution has often been enough to bring out opposition. Now, however, some Oregon utilities are thinking positively about the heated effluents that their power plants will discharge. They hope to show that these effluents can benefit farmers. It is even being suggested that eventually systems may be developed whereby heated effluents will serve agriculture as they are being cooled for recycling through the power plant.

Two utility-financed projects to test or "demonstrate" the beneficial uses of heated water on croplands are actually under way in Oregon, although some people opposing the siting of nuclear power plants in the Willamette Valley suspect that the sponsors' interest in the projects springs largely from public relations motives. The Eugene Water and Electric Board (EWEB), with the cooperation of seven local farmers, this past spring began a warm-water irrigation project near here on a 170-acre tract lying within a bend of the McKenzie River. The goal is to demonstrate that warm water (being obtained in this case from a Weyerhaeuser paper mill) can be used to stimulate and enhance plant growth and to protect fruit trees from killing frosts. Water not used on crops is discharged from a blow-valve, its temperature thus being reduced by evaporation to that of the ambient air before it hits the ground and trickles off back into the McKenzie.

The utility has invested $475,000 in the project, which it says will continue even if an application now pending before the Federal Water Pollution Control Administration for a $1.1-million, 3-year grant should be rejected. According to W. A. Cawley, FWPCA's acting director of water quality research, his agency is interested in the utility's proposal and is likely to support it if an acceptable project budget can be worked out. The agency has received no other proposals on the use of warm water in agriculture, and EWEB believes its project is unique.

The Pacific Power and Light Company (PPL) is supporting a small project at Oregon State University (OSU) to see if growing seasons cannot be lengthened and crop yields increased by warming the soil with buried electric cables. The cables simulate what could be a network of pipes carrying heated water from power plants. Larry L. Boersma, an OSU soils scientist who

designed the project last year with PPL's encouragement, believes that some day there may be agricultural enterprises relying on the availability of heated water from such plants.

"Such a development could occur on several scales," Boersma says. "It might consist of only one farm, the operator of which could call for warm water when needed. The power plant still would have an independent cooling system. The farmer would be a customer purchasing heat for his land as he would purchase fertilizer. It might also consist of several large food factory type operations, including greenhouses, using all available heat, thus eliminating the need for an alternate cooling system."

The Atomic Energy Commission, which has been under attack by conservationists and some members of Congress for failing to take thermal pollution problems into account in the licensing of nuclear power plants, is eager to see beneficial uses found for thermal discharges. Glenn T. Seaborg, chairman of the AEC, has praised the EWEB venture, appearing in a film about the project which was produced recently under the sponsorship of Oregon's State Department of Economic Development. Ernest B. Tremmel, director of AEC's division of industrial participation, also is enthusiastic. "I consider the project one of the most pioneering and forward-looking ever undertaken in this country," he told *Science*.

Hanford Project at Standstill

Last year the AEC itself had a part in trying to get an ambitious warm-water irrigation project under way. Its Richland (Washington) Operations Office, together with the state of Washington and two AEC contractors, Battelle Northwest and Douglas United Nuclear, drafted a proposal for a $2.6-million project that would use the effluent from the Hanford works' nuclear-fired steam-electric plant. Funding from power companies or other sources has not yet been found, however, and the project is at a standstill.

Promoters of warm-water irrigation think it fitting that experiments and demonstration projects be done in the Northwest. This region has millions of acres of potentially irrigable land and a rising demand for electric power which will have to be met by construction of steam plants now that few hydropower sites remain undeveloped. Futhermore, many of the region's rivers have valuable fishery resources, and state and federal pollution-control agencies will not allow EWEB or other utilities to draw cold water from a salmon stream such as Willamette River and then dump it back as a heated effluent.

Cooling lakes or large evaporative cooling towers can provide means of dissipating heat from plant effluents. But cooling towers and lakes have their drawbacks. A tower may cost $10 million or more. A cooling lake costs less but may be controversial if the utility must condemn farmland for the site. And, under certain atmospheric conditions, either a cooling lake or tower may cause fogging or icing.

Thus, if it should prove possible to develop a closed system in which heated plant effluents are cooled through useful farm applications and then recycled, the power industry's problem of heat disposal would have been turned to good account. Development of a "once-through" system, in which plant effluents were cooled through farm use and then discharged back into a stream, would be less of a breakthrough but would still represent a major gain. Even if heated water were no better for crops than unheated water, either the closed-loop or once-through systems would allow utilities to dissipate their effluent heat without large cooling lakes or towers.

Thus far, findings from the EWEB and Boersma projects are limited and inconclusive, but they are regarded by the project leaders as encouraging. The Vitro Corporation of America is managing the EWEB project, and Herman Miller, of Vitro's Portland office, has been one of the project's prime movers and principal spokesmen. According to Miller, fruit trees on the demonstration area were protected from killing frosts on seven occasions this spring by the sprinkling of warm water.

Researchers at agricultural colleges in the United States and Europe have shown that frost damage can be prevented by sprinkling water at ambient temperatures, for as the water freezes on the buds and tree limbs there is a release of latent heat. Miller acknowledges this, but says that when unheated water is used, heavy icing on the fruit trees can occur, with the result that losses from limb breakage may exceed losses that would have occurred from the frost. When, on the other hand, warm water was used this spring, no icing occurred on the upper three-fourths of the trees, and there was only light icing on the lower parts, where limbs were sturdiest and least susceptible to breakage.

In June, strawberries grown as part of the project and irrigated with warm-water sprinklers ripened 11 days earlier than other strawberries in the Willamette Valley, according to Miller. During one period when the ambient temperature was about 28°F, water was released from the sprinkler at 105°, 34 inches above the strawberry plants. The droplets hit the ground at 67°F. "It was like forming a hothouse around the plants," Miller says. A full report on the first year's experience with warm-water sprinkling will not be available until November, following summer and fall harvests. Apples, cherries, pears, peaches, filberts, and walnuts are being grown in the project area, as are a variety of row crops, such as beans, corns, tomatoes, and cauliflower. It will not be known before the end of the 3-year project, if then, whether warm-water irrigation will extend the growing season enough to allow some "double cropping."

Corn Grows Taller

A few weeks ago, when a reporter visited Boersma's 2-acre experimental plot, where electric cables have been buried to simulate warm-water pipes, corn that had been planted in the heated soil was about a foot higher than corn grown in unheated soil. String beans grown in heated soil had germinated faster, and the plants were fuller than other beans. However, no difference could be observed between the alfalfa, soybeans, and lima beans grown in heated soil and those grown as controls. Boersma's project is to continue for two more years.

Though the Boersma and EWEB projects are not being coordinated, next year EWEB will actually do what Boersma is now simulating. Warm water running through buried pipes will raise the soil temperature in a 3-acre plot, and, if the results are as expected, a bumper crop of sweet corn and beans will be produced. Thrusting upward at intervals from the buried pipe will be "risers" to which sprinklers can be attached. Warming of the soil and irrigation can go on simultaneously if desired. It was discovered recently that corn plants growing above one of the EWEB project's warm-water trunk lines is taller and has tasseled out earlier than other corn in the same field.

The EWEB project is now being criticized and derided by some people in the Eugene area. Chiefly, this seems to be because the project is linked with the utility's plans to build a 1000-megawatt nuclear plant somewhere in the upper Willamette Valley. The Oregon Environmental Council, a body on which a number of conservation groups are represented, believes that EWEB and other Oregon utilities, encouraged by state and federal authorities, are moving into the field of nuclear power generation precipitously. The council is concerned about possible hazards, such as it fears will arise from persistent low-level emission of radioactive substances or from a catastrophic reactor accident.

Opposition to the proposed plant also has developed among some farmers who are afraid they will lose land to the plant and its 2500-acre cooling lake. The lake is an essential part of the project, for, with the plant scheduled to go on the line in 1976, EWEB cannot gamble on using still hazily formulated and unproved concepts for a closed-loop system to cool plant effluents and serve agriculture simultaneously. Warm water from the lake would be made available for irrigation, but the water used by the farmers would be in addition to the amount the power plant would require for its closed-cycle cooling system.

Opponents of the nuclear plant tend to regard EWEB's warm-water irrigation project as a public relations gimmick. The project, they note, was well publicized during EWEB's highly successful campaign last fall to win the approval of Eugene voters for a $225-million bond issue. Yet the idea for the warm-water irrigation project clearly did not originate within EWEB as a public relations ploy. Miller, of the Vitro Corporation, believes in warm-water irrigation with evangelistic fervor, and he came to the utility with the idea. Promoting it, too, was William Puustinen, a commercial salmon fisherman and a long-time crusader against water pollution. Puustinen is a farmer as well as a fisherman and is one of the seven orchardists taking part in the EWEB project.

The project is encountering some criticism on its own merits as well as on the grounds that EWEB is using it as a public relations device. Some of its critics are University of Oregon professors who believe that the project promises much more than it is likely to deliver—and, further, that it could lead ultimately to health hazards. For example, Howard T. Bonnett, a botanist and associate professor of biology, indicates that the project's claims for providing frost protection are inflated. "This spring was an excellent spring for flower and fruit development," he says. "All orchardists in the Eugene vicinity had excellent crops, whether they were parties to the warm-water experiment or not." Bonnett also questions whether the enormous quantities of warm water—up to 500,000 gallons a minute or more—that a 1000-megawatt plant would be continuously discharging could be used by farmers in the area surrounding it. In the Willamette Valley, he observes, "irrigation is only needed a few months during the year. Frost control [is needed] only a few days a year."

Bonnett's major concern, however, is that an irrigation system using effluents from a nuclear plant would lead to the contamination of plants and livestock. "Numerous radioactive isotopes, such as tritium, are released in the cooling water during normal function of nuclear plants," he says. "The possible dangers of directly providing for the accumulation and concentration of radioisotopes during plant and animal growth, followed by human consumption of such crops, should be carefully studied. This issue is exceedingly complex and may be of overriding importance."

Furthermore, Bonnett, as well as some scientists in the School of Agriculture at Oregon State University, feel that a utility has no business conducting what is essentially an agricultural experiment. While EWEB speaks of its project as a "demonstration," not much is known scientifically about how crops respond to warm water under actual field conditions, nor can one predict yet how warm water will affect insects and plant disease organisms. In the critics' view, research problems of the complexity of those presented by the EWEB project could best be dealt with by a university, which could bring a greater wealth of scientific resources to bear than any utility could, and which might be less likely to have axes to grind.

In sum, by searching for a beneficial use for the heat that is a troublesome by-product of electric power generation, EWEB has taken a forward-looking step; but, if the fears expressed by Bonnett and others have merit, the utility has ventured upon a course beset with more problems and uncertainties than it has imagined.

—LUTHER J. CARTER

Harvard Graduate School: The Elite Response to Enrollment Pressures

Rapid enrollment increases and severe morale problems have led Harvard University to plan substantial reductions in the size of its graduate school of arts and sciences. The faculty, on 6 May, approved a proposal to reduce the overall size of Harvard's graduate school in the next 5 years by at least 20 percent—from its present enrollment of more than 3000 to 2400 students. This plan will begin to go into effect for applicants to the graduate school in the 1970–71 academic year.

The action has potentially wide significance, for Harvard has long been recognized as a pacesetter in American academic circles. Most universities—particularly the publicly supported institutions which must respond to the demands of the taxpayers—will probably continue to expand to accommodate increasing numbers of qualified applicants. But for the elite private institutions, Harvard has suggested that there is another response to the growing hordes of applicants. Instead of opening the gates wider, Harvard has chosen to nudge them closer together.

In a report explaining the reasoning behind this decision, a special Harvard faculty committee said:

> It is sometimes argued that bigness *is* a necessity: that Harvard has a moral and social obligation to the nation to train as many graduate students as possible. To this we reply that there are already many and soon will be more graduate schools far larger in numbers than Harvard could possibly become. We are conscious of Harvard's national obligation, but we believe we must continue to put our em-