Arms Control and Disarmament Agency has only a token budget in the field.

One modest pilot project which could provide a possible pattern for retraining is in progress at Stanford. Sponsored by the National Science Foundation (NSF), 15 unemployed Bay area scientists and engineers are in the midst of a 1-year program in computer engineering. The NSF grant is being administered by a local Technological and Social Committee (TASC). TASC began as a loosely organized group of socially concerned scientists and engineers. The group was setting up an action arm to make it possible for professionals who wished to do so to use their talents outside defense work. The employment squeeze struck before the project got under way, and the NSF program became a chief TASC activity. The NSF grant pays tuition and some fees and a $541 a month stipend during the academic year of the program.

The major hope for more ample federal help currently seems to rest in a Department of Housing and Urban Affairs (HUD) idea for retraining unemployed scientists and engineers to work on urban problems. Details are not yet available, but the idea is being developed in HUD's Model Cities division headed by assistant secretary Floyd Hyde.

A working paper detailing the plan is expected to go forward to the White House within a few weeks. It is obvious, however, that the project could not have progressed so far without blessings from up the line.

Estimates put the number of unemployed scientists and engineers in the nation at about 45,000. A budget of under $5 million for the project is mentioned, and the chances of action seem to be enhanced by the prospect that funds already voted could be transferred to the program.

HUD last spring launched a small pilot program under which some 20 professionals under the age of 35 were retrained and then placed in various housing and urban affairs jobs for which they had no previous experience. All of the original group are reportedly still employed.

Aerospace scientists and engineers who have lost their jobs could become a new kind of hard-core, high-technology unemployed. Their plight and the social cost of their idleness are now at least gaining greater visibility. But this is not much consolation to those who have experienced the shock of discovering they were living on a kind of economic San Andreas fault.—JOHN WALSH

Timber Management: Improvement Implies New Land-Use Policies

Last summer, when testimony was being taken in Congress on a proposed National Land Use Policy Act, the need for such legislation was endorsed by two groups generally regarded as natural enemies—the Sierra Club and the National Forest Products Association (NFPA), the first of which views a tree as an esthetic and spiritual resource while the other sizes it up by the board foot. Each of these groups knew that it had much at stake in the development of a land-use policy. For the Sierra Club, there was the goal of preventing needless exploitation of natural areas and of having all development planning respect ecological principles. For the NFPA, there was the objective of protecting the industry's resource base.

The land-use policy bill recently approved by the Senate Interior Committee is not specifically directed at regulating forestry practices or protecting forests for commercial timber management or wilderness use. Rather, it is concerned with land-use practices generally and would require the states, as a condition for receiving funds under federal programs having a substantial environmental impact, to establish enforceable land-use plans. Its aim is to end the haphazard process by which development activities have proceeded in the past, with forest lands and open space around cities often having been lost to urban sprawl, with major natural areas such as the Florida Everglades threatened by water projects and proposed jetports, and with power plants built with little regard for protecting air and water quality or scenic amenities.

Recent controversies over the use of timberlands offer striking illustrations of some of the problems that would confront state and federal officials developing and administering land-use policies. Consider the following:

● *The fight over the National Timber Supply Bill.* This measure, which the House last February voted to refuse to consider, called for intensifying timber management in the National Forests and increasing the annual "allowable cut." Conservation groups viewed the bill as a proposal to put the ax quickly to nearly all the virgin or "old growth" timber not already classified for protection as wilderness. Moreover, some conservationists argued—and this is the relevant point here—that a truly "national" timber supply measure would include provisions for government supervision of cutting on private lands. For instance, a Sierra Club spokesman called for "stringent regulation" to prevent the overcutting which had denuded many large private forests of their stands of commercial timber and which had led to the voracious demands on the public timberlands.

● *Protests over logging practices that abuse land and water resources.* Last February, the Northwest regional office of the Federal Water Quality Administration (FWQA), responding to what it felt was an "urgent need," published an "Industrial Waste Guide on Logging Practices." The FWQA said there was "far too much evidence" of improper, low-cost logging operations resulting in streams becoming turbid and debris-clogged, with their gravel beds smothered with silt and made useless for spawning fish and their banks stripped of the shade trees that keep stream temperatures from rising to fish-killing levels. The FWQA guide recommended such things as the designing of "clear-cuts"—timber blocks from which all trees are removed—to provide buffer strips along streams and the building of haul roads without excessive cuts and fills.

Investigations this year of logging in

Clear-cutting, as in this scene from Flathead National Forest in Montana, is widely used in timber management. The clear-cuts shown are small and look like natural openings; but, if badly done, clear-cuts leave a visual blight and cause soil erosion.

the Bitterroot National Forest in Montana and the Monongahela National Forest in West Virginia have pointed up the prevalence of abusive practices even on some federal timberlands. Arnold Bolle, dean of the School of Forestry at the University of Montana, was asked by Senator Lee Metcalf (D–Mont.) to head an interdisciplinary study of timber management in the Bitterroot. The Bolle study concluded in part that clear-cutting, a technique which is helpful in the regeneration of shade-intolerant species but which can leave a mountainside stripped of forest cover for years, had been practiced in situations where it was unnecessary and uneconomic. Residents of the Bitterroot Valley have complained loudly about the clear-cutting, which in some places has left the appearance of a wasteland.

A special Forest Management Practices Commission of the West Virginia Legislature condemned past harvesting practices in the Monongahela. Findings made by the Forest Service itself agree with some of the major conclusions of the Bolle and West Virginia commission reports. Henceforth, clear-cuts in the Monongahela ordinarily will be no larger than 25 acres, whereas one of those made in the past covered more than 500 acres.

Logging practices of the kind complained of in the Bitterroot and Monongahela studies are common on private timberlands. For instance, even the most progressive forest products companies, such as Weyerhauser, sometimes clear-cut an entire section, of 640 acres or 1 square mile. The "multipurpose" philosophy that applies by law to the national forests has not yet been extended by state or federal statute to private lands, whose owners are still largely free to do as their consciences and profit opportunities may dictate. Yet the forest industries own 65 million acres of timberlands; some individual tree farms are huge, embracing several hundreds of thousands of acres. More than half of the state of Maine, to take a particularly striking case, is owned by the pulp and paper companies and is used for tree farming. Altogether, there are 510 million acres of commercial timberland in the United States, of which 368 million acres are in private ownership, mostly in farm woodlots. These lands represent about a fourth of the country's total area and their management obviously will require careful attention in any serious public strategy for environmental quality.

● *Conflicts in suburban areas between loggers and new residents and homeowners.* Marin and San Mateo counties, to the north and south of San Francisco, provide a case in point. County officials have been beset by citizens' complaints about the ill effects of logging—soil erosion and water pollution, spoiled scenery and recreation areas, and even fire hazards attributable to logging slash. Yet, until this past year, California's forestry practice law, a generally weak statute affording little environmental protection, seemed to preempt the field of logging regulation. The 1970 legislature, however, amended the law to allow the Bay area counties to adopt comprehensive logging-control ordinances. Except for the potency of the environmental protection movement in California and the political strength of the Bay area, this change in the state forestry practice law—a law designed chiefly to protect the interests of the timber industry—might have been impossible. The kind of legal problem that faced the Bay area may not often arise, however, for many states have no forestry practice law of any kind, weak or strong.

● *Zoning and tax policies affecting the timber industry.* When timberlands in suburban counties can be easily rezoned for housing development, the subdividing of the land becomes nearly inevitable and real estate tax assessments tend to be fixed accordingly. Faced with rising taxes and tempted by the possibility of receiving a high price for his property, the timberland owner is likely to cut his trees and sell his land to a developer. A Stanford Uni-

versity faculty-student research team this year recommended that Marin and San Mateo counties establish permanent forest zones in which tax assessments would be based on the actual income from logging and recreational uses.

According to a 1969 Forest Service review of state property tax laws, about a half dozen states assess timberlands on the basis of their present use, rather than their potential use. In cases where a property owner stands to benefit financially from a change in land use, some states impose a "rollback" tax covering several past years, whereby the landowner loses the tax savings he has gained under the "present-use" assessments.

But, while some states and local governments have been trying to adjust their tax policies in such a way as to discourage speculation on farm and timberland, these efforts are producing mixed results. California has a Land Conservation Act intended to maintain "agricultural preserves" by contract between county governments and landowners. Commenting on this law, the Stanford study team observes: ". . . in the absence of permanent zoning, it functions mainly as a delaying tactic. Once a few landowners have started housing developments within an agricultural preserve, it may be anticipated that many other owners will fail to renew their contracts . . ."

Progress on a broad front in overcoming the kind of forestry problems discussed here may not be achieved without a national land-use policy. The Senate Interior Committee bill, sponsored chiefly by Senator Henry M. Jackson (D–Wash.), would require each state to establish a land-use planning and control agency. Such an agency could be expected to become, early on, one of the most powerful, most controversial, and—if wisely administered—most useful state agencies. As now drafted, the Jackson bill would require states to consult with federal agencies in preparing their land-use plans, but federal approval of the plans would not be required. Ultimately, as the national land-use policy evolved, some mandatory federal standards might very well be imposed on the state planners and some of those standards could reach to forestry practices and the tax treatment of forest lands.

The idea of national forestry practices legislation is by no means new. The "cut-and-get-out" philosophy that

NEWS IN BRIEF

● **HUNGARIAN-AMERICAN EXCHANGE**: The National Academy of Sciences and the Hungarian Academy of Sciences have reached agreement on a scientific exchange program after 4 years of negotiations. The program calls for exchange visits by scientists, including mathematicians, engineers, and behavioral scientists. On an annual basis, the visitors will spend collectively a total of 40 working months in each country. They will give lectures and undertake surveys and research during visits which will range from 1 month to a year. Similar understandings already exist between NAS and Poland, Czechoslovakia, Rumania, Yugoslavia, Bulgaria, Greece, and the U.S.S.R.

● **HARVARD SETS RESEARCH GUIDELINES**: The Faculty of Arts and Sciences at Harvard University has adopted six criteria governing the support by outside agencies of research within the university. The rules represent a codification of policy followed since the end of World War II. They state that the source of sponsorship and the nature of research must be such that they can be publicly disclosed; that the ethics and techniques of such research must have prior sanction from the university; and that Harvard provides no institutional endorsement of the results.

● **AEC TIGHTENS LICENSING**: The Atomic Energy Commission (AEC) has revised its policy on licensing of nuclear power plants to provide for fuller consideration of environmental issues. In accordance with the Water Quality Improvement Act of 1970, the AEC has added the following requirements: (i) certification that an applicant conforms with federally approved state water pollution control standards; (ii) consideration of environmental objections raised by any party to the issuance of a construction permit or operating license; and (iii) preparation of environmental statements on all proposed construction sites. The new license requirements apply retroactively to plants which have been previously licensed.

● **JPL OPENING UP FACILITIES**: The Jet Propulsion Laboratory at the California Institute of Technology has formally announced that certain of its facilities are available to qualified investigators from the academic community. The equipment includes microscopes, spectrometers, and the facilities of wind tunnels, vacuum chamber, hypervelocity laboratory, and image-processing laboratory. Investigators are expected to help defray expenses, but limited funding will be furnished in some cases by the Laboratory.

● **PILOT POLLUTION CURRICULUM**: Charles County Community College in La Plata, Maryland, has received a grant of $76,550 from the National Science Foundation (NSF) for development of a new interdisciplinary curriculum in estuarine resource technology. The grant is the first of its kind NSF has awarded to a junior college. The college, which is located near the Potomac River and has an on-campus sewage treatment plant, claims it is the only junior college in the country now offering an associate of arts degree in pollution abatement technology. About 25 students are expected to enter the 2-year program next fall.

● **BUDGET ADVISERS CRITICIZED**: The House Committee on Government Operations has issued a report accusing industrial advisers to the Bureau of the Budget (now the Office of Management and Budget) of stalling for nearly 7 years a major program to curb industrial pollution. The report says the Advisory Council on Federal Reports, an industry-dominated council set up in 1942 to advise on the Bureau's information-gathering activities, has opposed and delayed procedures for conducting an inventory of water pollution caused by industrial wastes. In an article in *Science* (3 July, p. 36), a Senate aide criticized the Bureau's advisory committees for failing to represent consumer interests and for conducting their affairs in undue secrecy—charges rejected as out of date and invalid by budget director Robert P. Mayo.

● **NEW PUBLICATION**: *Prospects of Engineering and Technology Graduates —1970* presents results of a survey which shows that salaries are going up despite the national economic slowdown. Copies of the survey are available for $2 from Engineers Joint Council, Department "PT," 345 East 47 Street, New York 10017.

once prevailed throughout the timber industry had so offended conservationists that during the 1930's there was an effort, with the National Forest Service leading the way, to have Congress pass a law for the regulation of private forestry practices. However, the forest industries managed to forestall such legislation, partly by arguing that wherever public regulation was needed the states could do the job. State forestry practice acts, where they exist, generally date back to that era.

These state laws were concerned mostly with providing for either the natural or artificial regeneration of logged-over lands, and sometimes with reducing fire hazards. The requirement for leaving seed trees or replanting lay lightly upon the loggers, however. Commenting on Washington State's law pertaining to restocking, Glenn Jorgenson, the Forest Service's assistant regional forester in the Northwest, has observed: "You have to make the effort [at regeneration], you don't have to succeed."

Nevertheless, as part of its campaign to defeat proposed national forestry practice legislation, the forest industries successfully promoted the idea of "tree farms." By now, two generations of school boys have grown up with the mistaken belief that every time a logger cuts a tree he plants another one. The "high-yield forest" that the major forest products companies now talk about is a relatively recent innovation. Generally, tree farming has been a passive, low-intensity operation, seldom going much beyond trying to protect the area from fire.

But Weyerhauser and other major forest products companies are no longer waiting passively on nature to restock their timberlands. They are pushing her for all they are worth, and this may lead to some new problems. Cutover land is being carefully prepared for replanting, and seedlings of superior stock from company nurseries are planted, either by hand or by machine. The hope is that through research in genetics fast-growing varieties of Douglas fir and other species will be developed. As a Weyerhauser geneticist explained to me, "Trees have evolved in such a way as to enhance their chances for survival in the wild. But the mortality hazards can be eliminated or reduced by intensive management. We hope to make the plant concentrate more on cellulose production rather than on survival."

The Forest Service, which has carried on a productive research program for many years, accepts much of the industry's high-yield forest doctrine, but not all of it. Some of the doctrine in dispute has significant implications from the standpoint of environmental values. In growing Douglas fir, the principal commercial species in the Northwest, the timber companies hope to shorten the "rotation"—the period during which the tree is allowed to grow—from the customary 95 to 100 years to no more than 70 years. But, in a study published in 1969, the Forest Service said that, while the 70-year rotation would produce more saw timber in the short run, production would decline in volume and quality after old-growth stands had been harvested and converted to young stands. Moreover, according to the Forest Service, the increased road building and logging—going from a 100-year to a 70-year rotation means a 30-percent increase in clear-cutting—associated with the short rotation would make timberlands less valuable for recreation and would increase stream siltation.

The spraying of nitrogen fertilizer on growing timber is another feature of high-yield forestry which the Forest Service has not yet embraced. "It looks as if use of fertilizer is promising, but how to do this efficiently and safely [from an environmental standpoint] is just being worked out," Philip A. Briegleb, director of the Forest Service's Pacific Northwest experiment station, has remarked.

Whatever the fate of Senator Jackson's proposal for national land-use policy, and however such a policy might be applied to forestry practices, at least a few states may be moving on their own toward comprehensive forestry practice regulation. For example, the Board of Forestry of the State of Oregon, which includes some nonindustry members, is developing a forestry management bill that could be far-reaching. This measure is expected to require applicants for logging permits to have effective plans for reforestation and for the protection of all the important environmental values except esthetics. Inasmuch as the timber industry itself is playing a major part in preparing the bill, its chances of approval next year by the Oregon legislature are excellent, although the conservation groups will no doubt try to make the measure stronger.

It's a sign of the times when a state such as Oregon moves toward comprehensive regulation of its dominant industry. The industry itself is well aware that it must manage its vast timberlands in a way acceptable to a public to whom ecology is now a household word. The industry is, moreover, motivated by a genuine desire to avoid abusing those lands and to make them fully productive. But, whereas in the past the forest products industry was able to keep a jump ahead of the public by creating the appearance of self-regulation, it could no longer do this even if it tried. In the future, state and federal agencies, possibly acting under the aegis of a national land-use policy, are likely to be the industry's conscience.—LUTHER J. CARTER

RECENT DEATHS

Abram I. Alikhanov, 66; director, Institute of Theoretical and Experimental Physics, Moscow; 9 December.

Konrad J. K. Buettner, 67; professor of atmospheric sciences, University of Washington; 14 November.

John P. Colmore, 49; interim executive vice president for Medical Center affairs, University of Oklahoma; 26 November.

Fred S. Griffin, 84; former chairman, mechanical engineering department, University of Akron; 14 November.

Willard R. Line, 82; professor emeritus of chemistry, University of Rochester; 19 November.

Clarence W. Mendell, 87; former dean, Yale College; 14 December.

Thomas J. Murray, 80; former president, Loyola College; 16 November.

Abraham E. Neumann, 81; former president, Dropsie College, Philadelphia; 20 November.

Lee H. Person, 66; former professor of plant pathology, North Carolina State University; 17 November.

Elbert L. Persons, 66; former professor of medicine, Duke University; 24 November.

Henry Slonimsky, 86; dean emeritus, Hebrew Union College; 12 November.

Grace A. Stewart, 78; professor emeritus of geology, Ohio State University; 15 October.

George W. Stratton, 84; professor emeritus of chemistry, University of Kansas; 21 November.

Theos J. Thompson, 52; former professor of nuclear engineering, M.I.T.; 25 November.

Paul S. Williams, 75; professor emeritus of dairy science, Pennsylvania State University; 14 November.