have been heavily emphasized. In a pamphlet that the university prepares to serve up its budget to the legislature in appetizing form, a section titled "Impact of higher education on industrial growth" makes these four points:

1) "University graduates are highly productive contributors to the state's economy."

2) "University employment increases income, spending, tax revenue" (the university employs 43,000 people at an annual payroll of about $327 million).

3) "The university attracts new and growing industry to California."

4) "The university brings Federal research funds into the California economy."

Of the total operating budget of $581 million requested for the university for the coming fiscal year, $173.7 million would come from the state, $92 million from the university funds (including fees, gifts, and private grants), and $314.6 million from the federal government.

By far the largest portion of these federal funds is the $236 million in Atomic Energy Commission contracts and grants concentrated in U.C.-administered projects at Berkeley and the Livermore and Los Alamos sites.

Not to be ignored in any analysis of the university's good relations with the public and state power structure is the University Regents. Originally established to govern a single university, the Regents have evolved into supervisors of a statewide system. The board of Regents is made up of eight ex-officio members, who are state officials, and 16 appointive members. A 16-year term of appointment, unusually long for trustees of a state university, is viewed as the basis of their power, which is extraordinary among state-university governing boards. The long term is felt to give Regents time to lose whatever partisan coloration they may have been tinged with at the time of appointment, and to gain genuine expertise in university affairs. The Regents, over a long period, have proved themselves sympathetic to the view that research is an important element in higher education. In recent years they have naturally been closely concerned with expansion. They meet for 2 days each month, and their interest and influence are reflected in every detail of university operations. To cite a minor example, the predominance of tile roofs on university buildings is attributed to Regents' preferences.

Things have not always gone smoothly in Regents-university relations, and the loyalty-oath controversy of the early 1950's was probably the most notable instance of discord. The height of the dispute found faculty activists, the university administration, and the governor on one side and a dominant group of Regents on the other. An end to hostilities on the issue seems to have come not so much through the victory of one side or the other as through the passage of time and the departure of many of the major antagonists from the immediate scene.

Over the long run, however, there is no question that the Regents' combination of experience, ability, and influence in the state has counted significantly in advancing U.C.'s fortunes.

The long era of good feeling between the university and the legislature has also been attributed in part to a former peculiarity of California's political system. Until the 1950's, candidates were permitted to "cross-file" for nomination by more than one party in primary elections, and to this was attributed a blurring of party lines and partisan issues in the legislature.

Bipartisanship Beset

California has changed its election laws to follow more conventional procedures and, as a result, party consciousness has been growing in the legislature. Bipartisanship is always under special pressure in a national election year, and education seems to have become, at least indirectly, a matter of party conflict. The legal limit of annual session was reached last Friday without the legislature's having passed an education budget. As this was written, the legislature was in overtime, and education was caught in a snarl of controversy over the timing of balloting on referendums.

Many observers feel that the immunity to partisanship which education has enjoyed in state politics may now have been significantly compromised.

However, up to now at least, California has profited from a favorable political climate, solid public support, strong internal leadership, fruitful faculty initiative, and the benefits of statewide planning. It is these advantages which the makers of the Master Plan have tried to perpetuate in the expanding higher-education system as a whole. The prospects for successs will be discussed in another article in this space.

—JOHN WALSH

Pesticides: Minute Quantities Linked with Massive Fish Kills; Federal Policy Still Uncertain

The case for government attention to the pesticides problem was dramatized last week with the Public Health Service's announcement that the massive fish kills of the past 4 years on the lower Mississippi River have been traced to incredibly minute concentrations of these useful, but highly toxic, chemical agents.

The Public Health Service, which has spent several years trying to detect the cause of the Mississippi slaughters among the more conventional scourges of fish life—accidental poison spillage, changes in water temperature, excess sewage, unusual bacterial diseases—appears rather surprised by its own discovery. PHS officials have asserted that the concentrations of the pesticides are so minute that 3 years ago the techniques for isolating them did not even exist. And the PHS appears to be further stunned by the realization that the deadly amounts accumulated not from any excessive or unusual use of pesticides, or from any monstrous accident, but, as Senator Abraham Ribicoff (D-Conn.) pointed out in a speech last week, simply from "business as usual" along the Mississippi.

Actually the surprise is a bit puzzling: the toxic potential of extremely small quantities of pesticides, and their wide use on crop lands abutting the Mississippi, is no news; the extreme vulnerability of fish was stressed in a well-publicized report by the President's Science Advisory Committee (PSAC) last spring; and one of the substances found in the dead fish—endrin—had been reported by the PHS as the cause of at least one major fish kill as long ago as 1961, albeit in somewhat more obvious circumstances. Much of what passes for surprise, however, is probably really alarm: now that damage to the fish has been proved, the PHS knows that it may have a serious problem on its hands, for the pesticides involved are in very common use.

The evidence that pesticides had been responsible for the killings of tens of millions of fish since 1960 was reported last week, but no one is sure what the mechanism of the poisoning is or what can be done to stop it. According to a letter from a Louisiana state health officer, James R. Strain, to Robert J. Anderson, a PHS assistant surgeon general in charge of en-

vironmental health programs, endrin was found in the fish in concentrations up to 7 parts per million, and in the water in concentrations ranging from 0.054 to 0.134 parts per billion. Another chemical, dieldrin, was also found in minute quantities, and both turned up in even smaller quantities in the treated drinking water of the city of New Orleans. In addition, endrin, dieldrin, heptachlor, DDE, and DDT have all been found in shrimp from the Gulf of Mexico. The affected fish were in an area centering around Baton Rouge but extending as far up the Mississippi as St. Louis and Memphis.

(The use in England of two of the pesticides involved in the Mississippi problem, dieldrin and heptachlor, and of a third, aldrin, was severely restricted last week by the British Ministry of Agriculture, Fisheries, and Food, acting on the recommendation of an advisory committee. Minister of Agriculture Christopher Soames stated that the committee found no evidence of serious, immediate hazards but was concerned that traces of the chemicals appeared in so many situations, and believed that "accumulative contamination of the environment by the more persistent organo-chlorine pesticides should be curtailed." As a result, fertilizers, seed dressings, sheep dips, and garden products containing these chemicals will go off the market shortly. A separate government report on endrin and four other pesticides is expected later this year.)

In this country, also, the Public Health Service has stressed that "no immediate health problem exists." This is probably true, but it does not dispose of other potential difficulties. On the health side, the fact is that the pesticides are being ingested by humans—not only through the river fish but through the apparently irreducible quantities remaining in drinking water—and the level of human tolerance to them is not known. On the economic side, the fact that the pesticides are now thought to have affected shrimp in the Gulf threatens that area with commercial devastation, for its dependence on its fishing industries is extremely heavy. Most worrisome, however, is the probability that the Mississippi case is only an omen of more to come.

The Mississippi disclosures, in fact, constitute a sort of thalidomide of the pesticide world—a panic notice that pesticides threaten the public welfare in a variety of ways that require remedial action. There will be action in the immediate case, but mainly because the federal government traditionally responds to the immediate needs of states in crises, not because it has developed any plan for dealing with pesticides. The Public Health Service will move in to help Louisiana—the state most severely affected—in a variety of ways. PHS personnel will try to determine the specific source of the pesticides and establish their toxic level in human beings, and they will begin analyzing the river water itself, and evaluating the provisions for treating it, in order to provide maximum removal of pesticides from city water supplies.

These researches will undoubtedly develop a body of knowledge essential for taking corrective action in the Mississippi and future cases, but even after the knowledge is attained the authority for taking such action may still be lacking. From the overall point of view it appears that nearly a year after PSAC issued its comprehensive study on the use of pesticides (*Science*, 24 May 1963) and more than 2 years after Rachel Carson stirred public concern with her prophecies of a silent spring, the role of the government in regulating these dangerous substances is still a weak and confused one.

Government Accomplishments

After the appearance of the PSAC report, federal agencies, particularly the departments of Interior, Agriculture (USDA), and Health, Education, and Welfare (HEW), began paying more attention to the pesticide problem. Their efforts have taken the form of better interagency coordination, on the one hand, and stronger emphasis on research, on the other. There has been some progress, but much remains to be done.

Each of the agencies involved has requested a bigger budget for research than formerly—HEW to study pesticide tolerances in people, the Interior Department to study the effect of pesticides on fish and wildlife, and the Agriculture Department to study ways of circumventing the use of pesticides altogether, through the development of new means of pest control. In addition, it is thought that present pesticides, of the type responsible for the Mississippi damage, are used in unnecessarily dangerous ways, and that methods of applying them might be refined through further study. In the first place, large-scale spraying has been very common, little effort having been made to discover the amounts necessary for a particular job; and the pesticides themselves are of a "broad-spectrum" variety, indiscriminately killing other things along with their intended victims—rather as if cops were equipped with atomic bazookas instead of pistols. The Agriculture Department has asked for $20 million for pesticide research this year, and the Interior Department for a little over $2.5 million. Although these studies are bound to be useful, it is a fair bet that when research has discovered whatever there is to discover, the agencies and their respective clients will find themselves with more to argue about than formerly, not less.

Coordination, perhaps largely a matter of spirit, appears to have benefited from increased attention. The Federal Pest Control Review Board, established in 1961 to review all proposals for the often extensive use of pesticides by federal agencies, is reported to have shifted its emphasis. Instead of greeting a proposal with "Why not?" the high-level officers from HEW, Interior, Agriculture, and the Pentagon who compose the board are reported now to ask "Why?" and the burden of convincing the board now lies with the proponent of a big spraying project, not the critic. At the same time, the agencies are apparently developing more administrative liaison in connection with the registration of pesticides for sale than formerly existed.

On the other hand, there is a considerable range of disagreement between the agencies, focused particularly on a proposal by Congressman John Dingell (D–Mich.), which would require the Secretary of Agriculture to consult with the Interior Department and state wildlife authorities before registering a pesticide for sale, and would otherwise strengthen Interior's role. The Agriculture Department, under a 1947 law, must register all pesticides sold in interstate commerce, and it is the only federal agency with substantial authority over pesticides. In 1954, amendments to the law provided that in the case of pesticides that would leave a residue on fresh fruit, vegetables, or other raw food products the manufacturer had to submit it to

the Food and Drug Administration, along with proof that the residue would not be dangerous in the amounts expected to be used. Only after FDA had established a tolerance indicating safe levels for the residue, and had notified the Agriculture Department, could the pesticide be registered or sold—and then it was registered for use in accord with the specific tolerance set. Congressman Dingell's bill would establish a roughly similar consultative role for the Department of the Interior, only with the emphasis on establishment of guidelines for preservation of fish and wildlife, not people.

The Agriculture Department, which last week published new administrative regulations strengthening its control over pesticide labeling, does not want to see the Interior Department move into the role of co-evaluator of pesticide registration. Bureaucratic jealousy plays a role in USDA opposition, as does a feeling that the administration of the registration program would be hopelessly muddled by the presence of too many chiefs. Underlying these differences, however, is a built-in conflict: the USDA's job is to prevent bugs from hurting crops, while the job of Interior's Fish and Wildlife Service, and of its Bureau of Commercial Fisheries, is to prevent pesticides and other intrusions from hurting animals and fish. Although the outcome of his efforts are unpredictable, Representative Dingell plans to take advantage of the renewed concern over pesticides to get action on his bill from the House Merchant Marine and Fisheries Committee, in which it is lodged.

A loophole in the pesticide laws, the requirement that USDA register for sale even those pesticides for which the manufacturer's evidence of safety and effectiveness is not deemed sufficient, is the subject of another bill, this one introduced by former Secretray of HEW, Senator Ribicoff. Ribicoff's bill, following through on a suggestion of the PSAC report, would eliminate these so-called "protest registrations" and clear up the purchaser's confusion over whether the chemical he is buying is or is not approved. At present, the pesticides registered under protest, like the approved ones, remain on the market for 5 years, unless the USDA itself develops evidence to prove them unsafe. Although there is no opposition to closing this loophole, Agriculture officials are quick to point out that it has been used very rarely—only 27 times, they say, out of over 54,000 registrations—and that it has probably had little adverse effect on public safety. The bill has been approved by both House and Senate, but minor differences remain to be resolved before final passage. Ribicoff has also announced that a subcommittee of the Senate Government Operations Committee, of which he is a member, will resume hearings in 2 weeks on questions highlighted by the Mississippi situation.

So far, at least, the federal reaction to the pesticide controversy can be summed up only as piecemeal and inadequate. Individuals are making progress on a variety of small fronts, but the cause and its leadership are diffuse, and their results are often dissipated in political and bureaucratic bickering of Congress and the departments. On what is probably the central question in the controversy—regulation of the use of pesticides after sale—there has been no activity at all, and not even the most optimistic supporter of federal action expects any. In its report last spring, the President's Science Advisory Committee said, modestly, that while it could state the case—"the benefits, the hazards, and the methods of controlling the hazards . . . and suggest ways of avoiding or lessening the hazards . . . in the end society must decide." Unfortunately, society has no way of dealing with these issues, except through its elected and appointed leaders. If they don't do the job, who will?—ELINOR LANGER

Mary I. Bunting Named to AEC

Mary I. Bunting, president of Radcliffe College, has been named to fill a vacancy on the five-member Atomic Energy Commission left by the resignation on 1 February of Robert E. Wilson, a former oil company executive.

Mrs. Bunting, a microbiologist, went to the Radcliffe presidency in 1959 from Rutgers University, where she was a professor of bacteriology and dean of Douglass College. She joins two other members with scientific backgrounds on the commission, chairman Glenn T. Seaborg, a chemist, and Gerald F. Tape, a physicist. The other two commissioners, John G. Palfrey and James T. Ramey, are lawyers.

Announcements

S. Fred Singer has resigned as head of the U.S. Weather Bureau's national weather satellite center to become dean of the recently announced school of **environmental and planetary sciences** at the University of Miami. The school, which will begin operation in September, will consist of four institutes: marine science, which is already in existence at the university under the direction of F. G. Walton Smith; planetary bioscience, led by Sidney W. Fox, now director of space biosciences at Florida State University; atmospheric science, and space physics, for which the heads will be named.

The school will offer programs leading to the master's and Ph.D. degrees, arranged to fit the needs of the individual students; courses and research work may be undertaken in one or more of the institutes simultaneously.

Scientists in the News

The new president of the American Society of Ichthyologists and Herpetologists is **Arnold Grobman**, director of the Biological Sciences Curriculum Study at the University of Colorado, Boulder.

Charles V. Kidd, associate director for training at the National Institutes of Health, has been appointed to the new NIH position of Associate Director for International Activities.

Bertram S. Kraus, formerly professor of physical anthropology at the University of Washington, has been appointed director and research coordinator of the Cleft Palate Research Center, of the University of Pittsburgh, and professor of anatomy at the university's dentistry school.

J. James Smith, formerly chief of the medical service at Manhattan Veterans Administration Hospital, has been appointed director of medicine at the Methodist Hospital of Brooklyn, and clinical professor of medicine at the Downstate Medical Center, State University of New York.

Erratum: In the report: "Conglutination: Specific inhibition by carbohydrates" by Myron A. Leon and Ryuichi Yokohari [*Science* **143**, 1327 (20 Mar. 1964)] there is an error in Table 1. The molarity required for inhibition in the third group of inhibitors is 0.006, not 0.060.