icals designed to interfere specifically with the biochemical systems of target pests while having little if any effect on vertebrates and other nontarget organisms.

4) Employing ecologically-based, integrated control strategies which, besides perhaps taking advantage of some or all of the above, will involve adoption of various "cultural practices" (such as adjusting planting and harvesting schedules) designed to prevent outbreaks of particular pests.

In connection with these recommendations, the report calls for better application of contemporary theory in population biology and ecosystem analysis to pest control problems.

The report recommends that the U.S. Department of Agriculture (USDA) and the state agricultural experiment stations support and encourage greater use and development of such theory. It then points to the "heavily concentrated structure of the agricultural research enterprise," and calls for the National Science Foundation and other agencies responsible for the support of basic sciences to encourage "the increased use in basic research of organisms and ecosystems that may yield benefits to the science of pest control." It also recommends that the USDA and other agencies with a pest control mission be given the resources to make "competitive extramural grants for basic research to qualified investigators wherever they are located."

One conclusion reached by the NAS committee which is sure to displease part of the agricultural research and pest control communities has to do with efforts at the total eradication of certain pests, such as that old and formidable enemy of cotton growers, the boll weevil. In the committee's opinion, eradication programs are well advised only under the most favorable circumstances, as when the target pest is confined to a relatively small region.

The boll weevil is found throughout the original "cotton belt" stretching from Virginia to Texas, and it occurs also in Mexico, the place from which it first invaded the United States in the 1890's. A proposed belt-wide project to eradicate the boll weevil (*Science*, 8 February 1974) could easily cost $1 billion or more, yet offer no assurance of success. A particular concern of the NAS committee was that, in the event that such a campaign failed, the public might lose confidence in the alternative control strategies employed rather than place the blame where it belonged—on the eradication concept itself.

The report invites the inference that the NAS panel agreed with many criticisms that have been made in the past as to the quality and direction of the work of the federal-state agricultural research establishment. But, by and large, it maintains a positive thrust by pointing to new opportunities rather than to past inadequacies. At this writing, few research administrators at USDA have had an opportunity to review the report.

Jacqueline Warren, a Washington attorney with the Environmental Defense Fund who has taken part in the series of law suits and administrative proceedings to ban several of the chlorinated hydrocarbon pesticides, is pleased with the report. She notes its emphasis on the need for new integrated pest control strategies as an alternative to conventional strategies relying heavily on chemical compounds. She also notes with satisfaction the report's endorsement of the Environmental Protection Agency (EPA) practice of using animal test data to determine whether a pesticide is a potential carcinogen in humans which must be banned or restricted in use.

Pesticide manufacturers and the USDA have disputed the validity of some actual or proposed pesticide registration actions based on such data. But the NAS committee says that "despite the problems involved in translating the results from [animal] experiments to human risk, the present techniques are sufficiently reliable to justify registration actions based upon such data alone, on an interim basis, until evidence convincingly demonstrates that there is no human risk." It says, too, that more money should go into the gathering and analysis of epidemiological data bearing on human exposure to pesticides and the incidence of cancer and other diseases.

The report also observes that, while a billion pounds of toxic pest control compounds are placed in the environment each year, "it is 'normal' for us to have only the vaguest idea of how much of each compound was used and where, and then only after a half a decade's lag." It calls for this situation to be remedied through an improved system of reporting by USDA and EPA. In addition, it recommends better reporting of the occupational injuries suffered by farm workers as the result of pest control activities.

The NAS study leading to the report began in August of 1972 under the auspices of the Academy's Environmental Studies Board. Besides the executive committee headed by Kennedy, four other study panels were created, one for pest control and public health and others for pest control in forestry and in the cultivation of cotton and of corn and soybeans. Each panel produced a separate report. Altogether, the study involved the work of about 60 scientists and other specialists and the expenditure of about $300,000, of which the Ford Foundation provided half, with USDA and EPA providing the remainder.

With one or two exceptions, the main thrust of previous NAS reports on pest control and pesticides has been in support of the status quo. Quite clearly, the present report cannot be so characterized, and its influence may be the greater because, while its authors were mindful of human health and environmental problems, their study focused on the effectiveness of present and future pest control strategies and technologies.—LUTHER J. CARTER

† In January, the Environmental Protection Agency registered, for the first time ever, a pesticide made from a naturally occurring insect virus; this product, bearing the trade name Elcar, has been approved for use against two highly destructive cotton pests, the cotton bollworm and the tobacco budworm. Other viruses are now being tested for the control of two timber defoliating insects, the gypsy moth and the tussock moth. Also, a fungus that is the natural enemy of a weed common to rice fields is being tested in Arkansas, and a protozoan known as *Nosema locustae* is being tested in Montana and Wyoming for control of grasshoppers.

RECENT DEATHS

Oscar L. Alm, 88; professor emeritus of psychology, Kansas State University; 18 November.

Joseph W. Barker, 84; former dean of engineering, Columbia University; 10 December.

Nathan Birnbaum, 68; professor emeritus of chemistry, City College of New York; 9 December.

Walker E. Bryan, 90; former professor of agriculture, University of Arizona; 26 November.

Victor L. Butterfield, 71; president emeritus, Wesleyan University; 19 November.

Richard H. Chamberlain, 60; former chairman of radiology, University of Pennsylvania; 5 December.

Philip Cox, 92; professor emeritus of education, New York University; 5 December.

Theodosius Dobzhansky, 75; adjunct professor of genetics, University of California; 18 December.

Gustav Hertz, 88; nuclear physicist and Nobel Prize winner; 30 October.

Frank P. Jones, 70; professor emeritus of classics, Tufts University; 15 October.

William T. Mac Creadie, 87; former associate professor of mathematics, Bucknell University; 13 November.

James M. McDonnell, 56; associate professor of biology, West Chester State College; 8 December.

W. Byers Unger, 77; former professor of zoology, Dartmouth College; 2 November.

Aleksandr A. Vishnevsky, 69; head, Institute of Surgery, Soviet Academy of Medical Sciences; 19 November.

E. Grace White, 85; former chairman of biology, Wilson College; 1 December.