begin, then riding the monsoon winds north to the fringe of the Sahara where they lay eggs. Toward the end of the rainy season, when the winds reverse, a new generation of grasshoppers moves south.

The grasshoppers favor grasses as food, but when these are depleted they shift their attack to crops, and are particularly partial to millet, the major grain crop for Senegal's subsistence farmers. The control strategy with grasshoppers is to conduct spraying operations before they begin their move southward. If the grasshopper hordes in Senegal elude the big spray planes, the effect on this year's harvest could be devastating. U.S. Agency for International Development officials report that spraying operations in the north killed 90 to 100% of the hoppers and that both farmers and government officials are calling the project an unprecedented success. The final verdict will depend on the impact on crops of the grasshoppers' progress south.

In Sudan, signs of a potentially serious locust threat have been present this summer. George Schaefers, an entomologist at the New York State Agricultural Experiment Station at Geneva, says that there is a great increase in grasshoppers and more locusts in evidence than for a number of years, but you can't say there's a locust plague." Schaefers traveled to Sudan to make a locust reconaissance for USAID, returning in mid-September. He says that "the conditions are right" for an escalation and in the absence of adequate control operations "could get out of hand."

Schaefers notes that a serious problem in the area is that Eritrea, which borders on Sudan, is the site of a bitter separatist uprising against Ethiopia and Sudan itself is fighting insurgents in its southern provinces. Both areas are reported to have serious locust infestations, which, if untreated, could become major threats to the region. Access by antilocust forces appears prohibitively hazardous.

With locusts, as with grasshoppers, the key to control is catching the insects after hatching, ideally in the wingless, nymphal stage. Surveys to identify activity in breeding areas and prompt treatment with pesticides is regarded as essential.

For the United States, the question of pesticide choice for pest control operations is a central one. USAID operates under regulations stemming from environmental concerns that, in effect extend domestic restrictions on pesticide use to U.S. activities in Third World countries.

Concern about pesticides in Africa is well founded. Although most countries in the locust zone have regulations governing pesticide use comparable to those in industrial countries, the frequency with which these regulations are violated is notorious. For example, instructions on application and use of protective garb are often ignored. Even more serious is the reportedly widespread use of stocks of pesticides banned in other countries for their toxicity to humans and persistence in the environment.

The use of modern pesticides in the postwar antilocust campaign is widely credited with making human intervention a factor for the first time in controlling a locust plague. By the 1960's, however, concern was mounting about the heavy use of persistent organochlorine pesticides, particularly about the effects on nontarget organisms of the pesticide most widely used for locust and grasshopper control—dieldrin. Studies conducted from the 1960's on found substantial traces of the pesticide in the tissues of humans living in areas where it was regularly used.

While international agencies expressed interest in identifying replacements for dieldrin, no comprehensive research program to find alternatives was conducted in the 1970's. When the current locust emergency began, the search for alternative pesticides was pressed. USAID, for example, backed the field test conducted in Mali by a three-man team headed by Cavin of three U.S. pesticides. One of them was malathion, used in California's Medfly outbreak and chosen for the Senegal spraying operations.

The pesticide issue exemplifies the problems of discontinuity in antilocust operations in the region. FAO's Lukas Bader has recently been quoted in press reports as saying that African governments had "reacted very slowly to our warning cry," and were responsible for the seriousness of the situation.

A common view among development professionals with knowledge of the region is that the pest control agencies of these countries have adequate technical capacity but lack the resources—vehicles, fuel, chemicals, spraying equipment—to do the surveys and carry out the treatment program required. The breakdown of the regional control organizations is seen as an example of the chronic failure of these very poor countries to pay their dues in regional undertakings.

The current outbreak of locusts and grasshoppers is being treated by international agencies as another disaster in a region where such phenomena are frequent. U.S. participation is anchored by USAID's office of disaster assistance which has the capacity for quick response and the flexibility in use of resources that the occasion requires. At the same time, USAID and other donor organizations recognize that the locusts and grasshoppers are likely to return in force next year, perhaps for several years, and that plagues will threaten again in the future. Discussions are, therefore, under way in USAID, the World Bank, and other donor agencies about action in the longer term.

A major question is whether to help rebuild and maintain an effective antilocust control and research capability in the region. (By all accounts, the Desert Locust Control Organization serving East Africa is the regional organization in best fighting trim. Some observers attribute its resilience to the more recent desert locust visitations and to the organization having expanded its mission to become a multipest control agency.)

The issue is a much harder one to decide than what to do when a disaster occurs, and it poses a typical dilemma in development. Does the cost of maintaining an effective control organization outweigh the risks of being unprepared for the next serious outbreak? ■ JOHN WALSH

Briefing:

ICSU Gives Green Light To Global Change Study

Berne

A new international program of research into the changing relationships between the geosphere and the biosphere, paying particular attention to the impact on these relationships of man's activities, was formally launched last week by the International Council for Scientific Unions (ICSU).

Several delegates to ICSU's general assembly, held at the University of Berne in Switzerland, pointed out the need for further discussion of precise priorities and of the relative emphasis to be given to different scientific disciplines and monitoring techniques. However, broad proposals for what is officially known as the International Geopshere/Biosphere Program—but more frequently either by its initials IGBP, or simply as "Global Change"—were accepted "with enthusiasm" by the meeting.

The total cost of research programs carried out under the framework of the IGBP is likely to be more than $1 billion. Most of this money will have to be raised through national research funding agencies, and—in contrast to its predecessor, the highly successful International Geophysical Year—the IGBP is currently expected to extend over a decade or more.

A steering committee will be established to decide on initial research priorities. This will be serviced by a small secretariat based

in the Swedish Royal Academy of Sciences, financed by the Swedish government. The ICSU executive committee has appointed Thomas Rosswell of the University of Linkoping, currently the secretary-general of ICSU's Scientific Committee on Problems of the Environment (SCOPE), to be the full-time executive secretary of IGBP.

Following discussion of the results of a meeting held in Ringberg Castle, West Germany, last year on the future of ICSU, the general assembly gave its approval to the creation by its executive committee of a working party on relationships with the scientific community and the mass media as a way of raising the organization's visibility, both with the public and the scientific community.

The general assembly also approved the idea that ICSU should seek support for a series of special lectures, to be given particularly in Third World countries. A separate proposal for awarding either prizes or honorary membership to selected individuals met with little enthusiasm and was subsequently dropped. So, too, was a proposal that emerged from the Ringberg discussions to launch a new policy journal, *Science International*; ICSU's current newsletter will be expanded to improve the dissemination of information about its activities.

The general assembly, which is made up of representatives from each of ICSU's 21 member scientific unions, as well as 71 national academies and research councils, gave its provisional approval to the creation of a new inter-union Committee on Biotechnology. This decision will be reviewed at the next general assembly, which will take place in Japan in 1988.

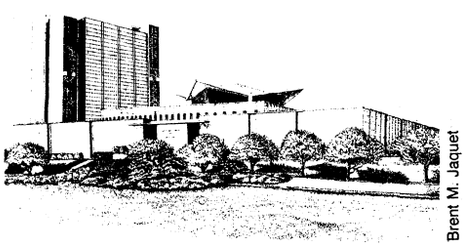
In the election of new officers, physicist M. G. K. Menon, scientific adviser to Indian Prime Minister Rajiv Gandhi, was chosen as president-elect over chemical engineer Heinrich Zollinger, a former chairman of the Swiss National Science Foundation. Menon received 77 votes out of the 106 cast, and will take over as President at the Japan assembly.

A resolution proposed by the International Union of Crystallographers, which would have required all ICSU-affiliated bodies to refuse to sponsor conferences in countries that require visa applicants to formally register their opposition to apartheid, was not put to a vote after discussions with the executive committee and ICSU president John Kendrew. However, the general assembly passed a resolution emphasizing its commitment to "nondiscrimination" as a principle for ensuring the free circulation of scientists, and said that such a commitment was a condition of membership for all scientific and national bodies. ■ **DAVID DICKSON**

Regulating Software for Medical Devices

Computer software used in the operation of medical devices poses new regulatory challenges to the Food and Drug Administration. At present, though, according to FDA commissioner Frank E. Young, the agency hopes to pursue a path of "least possible regulatory action."

Young outlined a tentative policy at a banquet celebrating the 150th anniversary of the National Library of Medicine. Calling medical devices "probably the most complicated area that the FDA has to deal with," Young listed a variety of new computer-assisted devices, such as heart pacemakers which are reprogrammable from the outside. In many of these cases, use of the device is inseparable from the software, in which case the software has to be regarded as part of the device.



Brent M. Jaquet

National Library of Medicine.

Young made it clear that an expert system used as an aid to diagnosis would be no more subject to regulation than a textbook. But it is another story "when computer products move to direct patient care," he said. "When AI [artificial intelligence] is intended to be a total substitute for the judgment of the professional and directs the action in diagnosis and therapy, then software quality control is important."

Young cited a case where two patients were overexposed to an electron beam linear accelerator because of faulty programming. The infusion rate of a substance such as insulin could also be wrong because of errors in the software package. Quality control is an issue in any device in which decisions are based on computer monitoring or are made by the computer. When the floppy disc is sold separately from the apparatus, such as Magnetic Resonance Imaging, the FDA would "look at it as attached to the device" for regulatory purposes.

Young said some software occupies "gray zones"—such as devices monitoring cardiac output or calibrating chemotherapy. But "in principle, any time the physician's judgment can override the judgment of the computer or override the procedures, then FDA has little or no responsibility." He also said the agency had no responsibility over the use of computer-assisted devices in teaching or nonclinical research, or over devices manufactured in particular institutions for their own purposes. ■ **CONSTANCE HOLDEN**

Congress Critical of Foot-Dragging on Critical Materials

Secretary of the Interior Donald Hodel has been named by President Reagan to be the chairman of the National Critical Materials Council. The appointment, made last week, came more than 2 years after the congressional act that provided for the formation of the council was signed into law. It also came one day before a House subcommittee called hearings to check on progress toward implementing the act. The understaffed council has long since missed an April 1985 deadline for the preparation of an advanced materials R&D plan.

Once limited to those strategic metals, such as chromium, whose main sources were overseas and unreliable, the term critical materials now spans the range from the basic metals, such as aluminum, to the advanced, high-technology alloys, ceramics, and composites on which the economic health and national security of the United States reside. The Critical Materials Act of 1984 addressed every aspect of these materials from technical to public policy questions. In particular, it established the critical materials council to help the government form coherent plans for dealing with materials-related issues ranging from the environmental consequences of mining operations to the optimum deployment of federal R&D funds.

In the hearings on 17 September, chairman of the House subcommittee on transportation, aviation, and materials George Brown (D–CA) argued that hundreds of thousands of jobs and tens of billions of dollars were at stake in the competition between the United States, Europe, and Japan to capture the markets for products using these materials. Brown was plainly distressed over what he characterized as "business as usual" in the United States when other countries were moving ahead.

The three-person critical materials council was filled only last November, just after an earlier round of hearings, and two of the members left within a short time. This left only Thomas Moore, who is also a member of the President's Council of Economic Advisors, as acting chairman and one staff person.

In his testimony before the subcommittee last week, Moore reported that Hodel was