EXPANDING FIELD

Biome approach in ecology

Ecologists and economists, politicians and industralists increasingly realize that any efforts to bring man more into tune with his natural environment will require immensely detailed research into the complex interrelationships of the variables involved. Thus the interdisciplinary approach has evolved, and all over the world scientific teams are working to identify the biological, chemical and physical relationships within the environment—and the impacts man can have on these relationships. But the surface has been barely scratched.

Perhaps foremost among these efforts are the biome projects of the International Biological Program (IBP) coordinated in this country by the National Academy of Sciences and funded by the National Science Foundation.

The method is to subject ecosystems typical of a number of areas to intense scrutiny by teams of scientists from a variety of disciplines. As more and more data are accumulated, they are fed into a mathematical model, and every scientist's data are available to every other scientist. Thus the model evolves as more knowledge becomes available; at the same time, new directions for research are quickly identified. And although the research is confined to a fairly circumscribed area, the model can help indicate the relationships in a similar area, perhaps on the other side of the world.

Farthest along in the United States is the grasslands biome project in Colorado (SN: 9/5/70, p. 204). Some 4,623 pages of data have now flowed into the project offices in Fort Collins, Colo., and NSF plans to fund the study at a level of about $2 million in fiscal 1972, up from $1.8 million this year. Although managers say this is less than they might want, the biome projects, along with other NSF-funded research, are faring far better than research generally. The total IBP budget for NSF in 1972 is expected to be in the neighborhood of $10 million in fiscal 1972, up $2 million from 1971.

Other biome projects getting under way (and the level of funding in 1971) are a coniferous forest study, centered at the University of Washington, $300,000; a deciduous forest study at Oak Ridge National Laboratory, about $1 million; a desert study, at Utah State University, about $1 million, and a tundra study, at various locations, around $1 million.

Although this is not big money by some standards, it is steadily increasing. A prime reason, according to Dr. Donald Jameson, a project director with the grasslands project, is that the biome approach eliminates the old distinctions between pure and applied research and synthesizes them into a vehicle that can have immediate practical application.

For instance, although the grasslands project involves an acreage essentially free of human impact, the mathematical model being formulated will easily lend itself to the measurement of man's effect. Economic values, can be equated with energy and nutrient flows within the system. One such flow is from forage to various insects feeding on the forage. "With the model," says Dr. Jameson, "we can shift from grasshoppers to cows," and thus assess

Nader to sponsor study of Academy

The National Academy of Sciences, which conducts dozens of advisory studies for Federal agencies each year, will itself become the object of a study this year sponsored by Ralph Nader's Center for the Study of Responsive Law. It will be the first time Nader's investigatory apparatus has focused squarely on the ways by which the Government gets advice from the scientific community.

Philip M. Boffey, a journalist who has resigned from the news and comment section of SCIENCE effective April 12, will conduct the study. During his three and a half years with SCIENCE Boffey has established a reputation among science newsmen as a diligent and responsible reporter on public policy aspects of science, although the subjects of his investigative articles have not always been pleased by them. Boffey says former Interior Secretary Stewart L. Udall's speech in December calling for a Nader study of the Academy stimulated him to formally propose such a study to Nader.

According to Boffey, the study will try to determine what impact the Academy, including its operating arm, the National Research Council, has on public policy. "How, if at all, do they affect the life of you and me and everybody else?" Then, using yardsticks still undetermined he will try to assess whether the impact "is good, bad or indifferent" and whether the Academy's advisory activities are in the interests of "John Q. Public, or the scientific community or just of the sponsoring agencies." Beyond this Boffey hasn't decided upon a detailed plan of operation. "In the next six months, I'll probably read everything I can get my hands on and interview everybody I can get a hold of," he says. One or two assistants may be used during the summer, but that hasn't been decided. The nine-month study is supposed to result, sometime after next Jan. 15, in one of the series of book-length reports published by Nader's group.

All this is leaving the Academy decidedly uncomfortable. A planned meeting early this week between Nader, Boffey and NAS President Philip Handler fell through because of difficulties with Nader's schedule, but Boffey met with other Academy officials to describe the plans in general. Afterward an Academy spokesman said the NAS "intends to cooperate as much as it can in the study" but that it was not yet clear what would be required.

The general nervousness at the Academy is in part because, unlike institutions more accustomed to the rough and tumble of political life, the Academy has seldom in its 108-year history been subjected to outside scrutiny. (The last occasion of any import was a series of three articles in SCIENCE in 1967 by Daniel S. Greenberg; they were not charitably received by Academy higher-ups.) There is also concern at the Academy about the Nader organization's objectivity (Dr. Handler was critical of the Nader report on air pollution). Some at the Academy consider Nader to have a vested interest in revealing institutional wrong-doing to the public constituencies that support him.

"God knows the Academy needs to be looked at from the outside," says one Academy staff member, " . . . but it is as much in Nader's interest to produce scandal as it is in a contemporary movie to show bosom."

But Boffey says he sought, and received, assurance from the Nader organization that a negative-toned report was not required. "I expect it will be relatively straightforward," he says. Nevertheless the Academy would prefer the study were being done by a scholarly group.

the impact of grazing by a certain number of these economically productive animals upon the total energy and nutrient budget of the biome.

The IBP biome studies are going on all over the world. Each country funds its own. There are, for instance, grasslands studies in Canada, Poland, Australia, Czechoslovakia, Mexico, South Africa and Norway. The biomes being studied range from tropical savannahs to near tundra. Dr. George Van Dyne, director of the Colorado study, has proposed an "international grasslands synthesis center," which would correlate the data from all the projects and provide training in biological modeling for scientists.

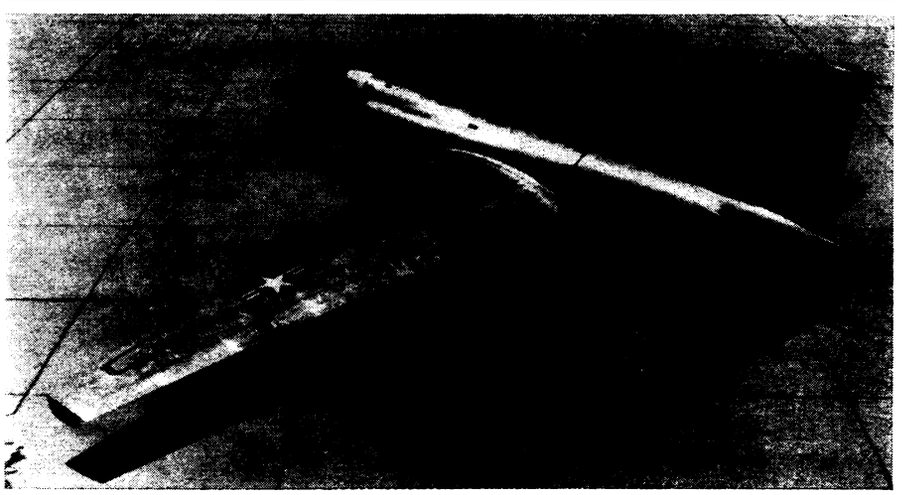
In addition to biome studies, IBP is also studying human populations in several areas, to learn about cultural adaptations to environment. One study by United States scientists of a South American Indian tribe has focused on, among other things, how cultural patterns have influenced the genetic evolution of tribe members.

The IBP programs are by no means the only interdisciplinary, systems-oriented environmental projects in progress. Another NSF program, Interdisciplinary Research Relevant to the Problems of Our Society (IRRPOS), has studies under way to monitor the genetic effects on humans of pollutants, to correlate the technical, economic, social and political aspects of environmental quality, to devise systems of solid waste disposal, and to examine lead pollution.

And this week, scientists of the National Aeronautics and Space Administration and other agencies got together to try to take a total look at how Chesapeake Bay might be studied, with special reference to the use of remote sensing from aircraft and satellites. □

TWO U-2'S

Scientific spy eyes for NASA



USAF

U-2: Two of the high-flying spy planes will keep watch on the environment.

One of the more salable programs of the National Aeronautics and Space Administration in this era of ecological concern is earth observations. Although the program is not new, recent demands for more accurate information about the earth's environment and natural resources have focused attention on the capabilities of remote sensing from both aircraft and satellites. Instruments such as infrared scanners and radiometers, for example, can sense water temperatures, pollutants, diseased crops and mineral resources.

This week NASA acquired on loan from the Air Force two U-2's which will bring to five the total aircraft used in NASA's remote sensing program. (Others include a modified Electra, a C-130 B Hercules and an RB-57F.) The U-2's are unique. Capable of sustained flight at altitudes of 68,000 feet, they will provide a platform to photograph areas up to 500 square miles.

The aircrafts' primary job is to lay a foundation for two earth resources projects to be launched in 1972: the Earth Resources Technology Satellites and the manned orbiting workshop, Skylab. Four sites have been selected for a comprehensive study at varying altitudes and during different seasons: Arizona, for analysis of arid land; the Feather River and San Francisco-Los Angeles areas, for hydrology and agriculture, and 20,000 square miles of the Chesapeake Bay area, for ecology and oceanography. In this way, analysts can establish, for example, at what altitude diseased corn can be detected, and what it looks like.

The U-2's will be used to photograph sites simultaneously with the passes of both ERTS and Skylab. □

PRINCETON-PENN ACCELERATOR

Heavy ions for cancer

The late Dr. E. O. Lawrence, who constructed the first cyclotron, occasionally got funds for developing particle accelerators by pointing out their usefulness for cancer therapy. Since then particle accelerators have continually been used for radiation therapy, mainly as sources of more intense and powerful X-rays than ordinary X-ray tubes could produce.

Lately scientists have become interested in the possibility of using more exotic forms of radiation—mesons, neutrons and heavy ions—in tumor therapy. These particles promise to be better at killing deep-seated tumors than X-rays because they lose very little energy as they pass through tissue until they are slowed to a stop. Then they give up almost all their energy. X-rays give up large amounts of energy all the way through the body, and thus cannot be used in doses strong enough to kill deep-seated tumors for fear of seriously damaging skin and other outer tissues.

The promise of heavy ions for cancer therapy is extending the life of the Princeton-Pennsylvania Accelerator. The PPA was built as a proton accelerator of 3 billion electron-volts (GeV) energy and served about a decade in that capacity. Last year, in an economy measure the Atomic Energy Commission decided to stop the PPA's operating funds and the accelerator was scheduled to be closed down this year.

This week Dr. Milton G. White, director of the PPA, announced that the accelerator had received a grant of $230,000 from the Fannie E. Ripple Foundation of Newark, N.J., which gives money for equipment to treat cancer and heart disease. The money will be used to equip the accelerator to accelerate heavy ions and to do basic studies in the effects of heavy ions on tumors. It will keep the accelerator running until Aug. 31. Dr. White continues to seek more money elsewhere.

Of particular interest are nitrogen ions and possibly neon ions. At energies of three to five GeV, these ions ought to be even better than neutrons or mesons at penetrating and killing deep-seated tumors and thus be far superior to X-rays. The heavy ions should also do the job in smaller numbers, says Dr. White. It would take 100 billion pi mesons to kill a 100-cubic-centimeter tumor, but it should take only one billion neon ions. All these suggestions are based on theoretical calculations, says Dr. White, and "you can't guess what will happen in the real world." The experiments should tell. □