A Mass Extinction Without Asteroids

Although the data are still swathed in uncertainty, biologists have an increasing sense of urgency about the accumulating extinction of species through tropical deforestation; the loss could equal some of the largest of the mass extinctions of the geological record

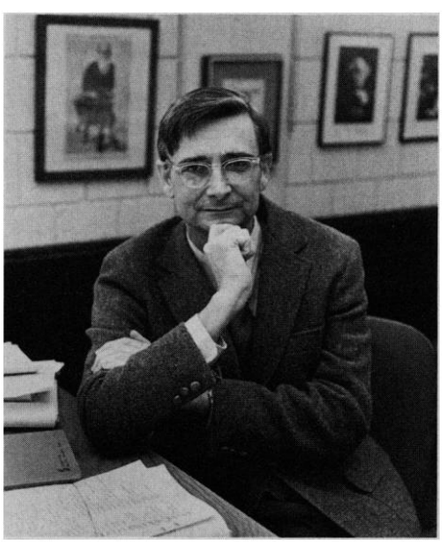
THE National Academy of Sciences (NAS) and the Smithsonian Institution last week jointly sponsored a national forum on what most biologists perceive as a global crisis: namely, the potential imminent extinction of perhaps half the world's species, mainly through deforestation. The gathering, which was aimed at educating the public and lawmakers alike, kicked off a fall season in which it appears as if biodiversity has become a hot topic.

For instance, shortly after the NAS/Smithsonian forum, a coalition of American and international environmental groups, calling itself the Tropical Forest Action Group, held seminars and street protests in Washington to coincide with the annual meeting of the World Bank. The group contends that many of the bank's larger projects are promoting global deforestation, which accelerates species extinction. During October the New York Zoological Society and the Missouri Botanical Garden are independently sponsoring scientific symposia on biodiversity, as is the newly established Woods Hole Research Center.

Meanwhile, Congress is in the final stages of deliberation over two bills sponsored by Representative Gus Yatron (D–PA), which address in a small way some of the issues raised at the recent and upcoming gatherings. One of them would earmark up to $10 million annually of Agency for International Development (AID) funds for protection of biological diversity in developing countries. The second would deny international economic aid "unless a proposed project would improve the livelihood of the rural poor in an environmentally sound manner."

Although many biologists in the September and October meetings are encouraged by this congressional action, they see it more as symbolic than substantial. "The estimated cost to make an impact on tropical deforestation over the next 5 years would be $8 billion," noted Harvard biologist Edward O. Wilson in addressing the forum.

Biologists' concern over the perceived threat to biodiversity is not new of course, but this fall's events signal a distinctly sharpening urgency about the problem. "There is no controversy among mainstream biologists that there is a crisis in biodiversity," said Paul Ehrlich of Stanford University. He pointed out that humans currently consume directly and indirectly some 40% of the terrestrial net primary production (NPP), which roughly speaking is the energy trapped by photosynthetic organisms throughout the globe. Referring to estimates of a doubling of the human population during the next century he said, "This implies a belief that our species can safely commandeer some 80% of the terrestrial NPP, a preposterous notion to ecologists who already see the deadly impacts of today's level of human activities."



Edward O. Wilson: *An $8-billion rescue effort for tropical forests?*

In addition to his role as a session chairman in the NAS/Smithsonian forum, Ehrlich is also a member of a newly formed "Club of Earth," which released a forthright statement to coincide with the beginning of the Washington gathering. "The species extinction crisis is a threat to civilization second only to the threat of thermonuclear war," said the group, which consists of nine National Academy members. "While a majority of the species threatened with extinction are still completely unknown, the results of their loss could be an unprecedented human tragedy."

Members of the Club of Earth, who speak as individuals and not for the NAS, include G. Evelyn Hutchinson of Yale University and Ernst Mayr of Harvard University.

At its core, the concern over biodiversity centers on two numbers, each of which has a substantial degree of uncertainty about it. The first is the number of extant species in the world; and the second is the rate at which they are being lost. In addition to offering some new data on these points, the NAS/Smithsonian forum also added some historical perspective for their evaluation, by making comparisons with previous diversity crises in the history of life.

As often happens in discussions of biodiversity, the forum concentrated on tropical moist forests, because, said Wilson, "they are both the richest in species of organisms of all major habitats and in greatest danger." The forests cover 7% of the land surface of the globe but contain half the species.

Wilson noted that although about 1.7 million species have been described so far, including in the major groups some 750,000 insects, 47,000 vertebrates, and 250,000 plants, "the absolute number is likely to exceed 5 million." In fact, that number might be as high as 30 million, according to a recent estimate by Terry Erwin of the National Museum of Natural History, Washington. Erwin and his colleagues made collections in the Peruvian Amazon rain forest and found so many previously unknown insects that, on extrapolation, the higher figure seems reasonable.

The rate at which species might be going extinct depends directly on the scale of tropical deforestation, a subject on which there has always been a good deal of uncertainty and dispute. Norman Myers, an environmental consultant from Oxford, England, presented a figure of 92,000 square kilometers for the annual, irrevocable loss of tropical forest, with a similar area being grossly disrupted through shifting farming and some logging. "These figures are pretty robust," he said, "because they are based on remote sensing data of 78% of the relevant land surface."

Estimates by the Food and Agriculture Organization and the United Nations Environment Program are somewhat lower, but

nevertheless lead by extrapolation to a virtually complete destruction by the year 2135, which more or less coincides with the time at which the World Bank estimates that global population will plateau at 11 billion. With the forests vanished or largely disrupted, up to half the world's species of animals, plants, and insects would disappear too.

Ariel Lugo of the USDA Forest Service in Puerto Rico dissented from this generally supported view. He suggested that many species would survive in the secondary forests that sometimes replace the rain forests, and that extrapolation of current trends might be misleading. "By changing the rate of deforestation only slightly you can get a species loss that is only 9% rather than 50% over the next few decades," said Lugo. Wilson argued that, on the contrary, simple extrapolation might be too conservative. "Population pressures in the Third World will certainly continue to accelerate deforestation during the coming decades."

According to David Raup, of the University of Chicago, a figure of 50% extinction would be closely comparable with the mass extinction of 65 million years ago, during which the dinosaurs finally disappeared together with 60 to 80% of the rest of the world's species. The difference between natural mass extinctions and the current extinction spasm, if indeed that is what it is, is twofold. First, unlike previous events, current losses involve large numbers of plant species. Second, the agent that is causing extinction—namely, human intervention—will persist, therefore potentially preventing the diversity rebound that typically occurs after natural events.

The degree of ignorance about fundamental processes underlying diversity and its response to disturbance is profound. For instance, Wilson notes that "the study of extinction remains one of the most neglected subjects in ecology." He added that "the magnitude and control of biological diversity is not just a central problem of evolutionary biology; it is one of the key problems of science as a whole."

One reason for the ignorance, and a measure of the value placed on this branch of biology, is the relatively modest funding that tropical biology currently receives: the figure stands at some $30 million a year in the United States, compared with at least $5 billion spent on molecular and cellular biology, including biomedicine. "It is a pity congressmen don't die of species extinction," quipped one participant.

Ehrlich blames an understandable insensitivity rather than indifference. "Human beings have great difficulty in reacting to changes that occur on a scale of decades," he concluded. ■ ROGER LEWIN

Promising Results Halt Trial of Anti-AIDS Drug

Although not a cure for AIDS and in spite of some toxic side effects, AZT appears to increase the survival of a subset of AIDS patients who participated in clinical trials

OFFICIALS from the Public Health Service (PHS) and the Burroughs Wellcome Company have announced that AZT, an AIDS drug tested in clinical trials, prolongs the survival of some AIDS patients. The company has terminated its clinical trials prematurely and will make AZT available to additional AIDS patients who meet certain clinical criteria.

"AZT (3′-azido-3′-deoxythymidine) is not a cure for AIDS," said Robert Windom, assistant secretary for health, who spoke at a news conference announcing the recent decision. "Although the study results we are announcing today hold great promise for prolonging life for certain patients with AIDS, uncertainties remain: uncertainties about possible toxic effects, uncertainties about long-term benefits, or ill effects."

David Barry. *Overseeing development and testing of AZT for Burroughs Wellcome.*

Windom also indicated that he will help facilitate the process by which AZT is approved for commercial distribution.* First, Burroughs Wellcome must file an application for a new drug. Then, Harry Meyer of the Food and Drug Administration will oversee the approval process, which may be completed by January 1987. After the drug is commercially available, physicians will be able to dispense it by prescription. As a result, future clinical trials will probably include AZT alone or in combination with other drugs.

The impetus for the recent decision came from an independent data safety monitoring board (DSMB), which reviewed preliminary data from clinical trials that were designed to test the effectiveness of AZT in a carefully defined group of patients. Burroughs Wellcome enrolled "only AIDS patients who were within 4 months of their first episode of *Pneumocystis carinii* pneumonia," according to Dannie King of Burroughs Wellcome. "Patients with AIDS-related complex (ARC) and significant disease progression such as weight loss, thrush, fever, and herpes zoster, were also eligible for treatment on this protocol." Because of significantly lower death rates in patients receiving AZT, the DSMB concluded that it would be unethical to continue to withhold the drug from patients participating in the trial who were receiving an inactive placebo compound instead of the drug.

A total of 282 patients participated in the AZT clinical trials at 12 different testing centers in the United States. Only one patient died out of the 145 receiving AZT, but 16 of the 137 patients in the placebo group died—11 with AIDS, and five with ARC. The first patient entered the trial in February 1986 and the last patient was enrolled at the end of June. The trial was originally designed to last until December and premature termination admittedly compromises its full research value.

In addition to decreasing the mortality rate of AIDS patients with pneumocystis pneumonia, at least over the short term, AZT also seems to improve their quality of life. To varying degrees, AZT recipients had fewer serious medical complications, showed an increase in the number of circulating T4 lymphocytes, could respond to a

*Burroughs Wellcome will supply AZT free of charge to qualifying patients until the drug is available for sale. The patient's physician must be licensed to practice medicine in the United States and apply for the drug on behalf of an AIDS patient. The PHS and Burroughs Wellcome have established a toll-free information line (1-800-843-9388), open every day from 8 a.m. to midnight, for AIDS patients and their physicians.