AIDS often carry other infections as well and may respond to immunization against the AIDS virus differently than people who are not multiply infected. Finally, some argue that it might be unethical to withhold even a candidate vaccine from people at high risk for AIDS.

Outside the United States, Daniel Zagury of the Pierre and Marie Curie University in Paris and his colleagues have already begun to test a candidate vaccine for AIDS by injecting himself and 12 Zairian volunteers with a vaccinia virus that contains a protein from the AIDS virus. But within the United States, clinical trials of any new drug or vaccine, including those for AIDS, will occur in three phases—testing for toxicity (phase I), determining proper doses and timing between doses (phase II), and evaluating efficacy (phase III).

Existing prototype vaccines for AIDS include other components that may by themselves elicit side effects—sometimes another virus, which is genetically engineered to express a protein from the AIDS virus, or an adjuvant, a large molecule that is chemically linked to a protein from the AIDS virus to boost the immune response. Samuel Katz of Duke University Medical Center stresses that careful controls are needed at all stages of clinical testing to determine which components of the vaccine preparation may be responsible for any side effects that might occur.

The initial toxicity tests should last between 3 months and 1 year, according to Fauci, but determining whether or not a vaccine is effective will make phase III trials last much longer. The duration of a phase III trial will also be extended if the end point is prevention of disease rather than prevention of infection.

James Curran of the CDC raises a related issue. "Because of the long lag period between infection and serious disease, we will also need to enlarge the sample size to compensate for the small number of people who will get disease in a short period of time," he says.

June Osborn of the University of Michigan School of Public Health in Ann Arbor emphasizes that all volunteers who receive test vaccines need to be counseled about how to avoid becoming infected with the AIDS virus. All researchers agree that counseling is essential and that volunteers must be followed for very long periods of time. But they also recognize that the net result of encouraging people to reduce their risk of getting AIDS, which may lower the rate of new infections, will be to increase the amount of time needed to determine whether a vaccine is effective and prolong the process. ■ **DEBORAH M. BARNES**

Report Urges Funds for Conservation Biology

A report by the Office of Technology Assessment outlines the accelerating rate of species extinction caused by human activity and suggests options that Congress should consider

DURING the past year the issue of conservation biology—and specifically biological diversity—has been in the news to an unprecedented degree, with major international conferences sponsored by the Smithsonian Institution and the National Academy of Sciences in Washington and the New York Zoological Society in New York. Perhaps the prime reason for this quickened pace of activity is the relatively recent realization of the very high rate of extinction of species caused by human activity, both by megadevelopment projects and by creeping environmental destruction and fragmentation. Completing this sharpened focus on the deteriorating state of the biological world is the recent publication of a report by the Office of Technology Assessment (OTA), entitled "Technologies to maintain biological diversity."*

"The report is more comprehensive than anything that has gone before," says David Ehrenfeld of Rutgers University and a member of OTA's advisory panel. "It represents a unique compilation of information on the threat to biological diversity and the approaches by which species can be protected." Representative James H. Scheuer (D–NY), who is chairman of the House Subcommittee on Natural Resources, Agricultural Research and Environment, says "I am very pleased with the thoroughness of OTA's analysis of this urgent global problem. However, the time for describing the problem is passed. It is necessary that we act immediately to remedy the loss of biological diversity." Scheuer's office is currently considering a number of legislative options that could be introduced via his subcommittee. Hearings are to be held in May or June.

Baboons under threat. *The home range of these baboons in Kenya is being fragmented by development for farming land. Effective conservation in the end demands that large portions of natural ecosystems are kept intact.*

The OTA study, which was initiated a little over 2 years ago, was requested by several congressional committees, including the House Committee on Science, Space, and Technology and the Senate Committee on Foreign Relations. Representative Gus Yatron (D–PA), who is chairman of the

*"Technologies to maintain biological diversity," published by the Office of Technology Assessment, 31 March 1987, U.S. Government Printing Office, Washington, D.C. 20402, $15.

Report's Principal Findings

The Office of Technology Assessment's (OTA) report notes that biological diversity refers to the variety and variability among living organisms and the ecological complexities in which they occur. The report identifies diversity at three levels:

Ecosystem diversity: A landscape interspersed with croplands, grasslands, and woodlands has more diversity than a landscape with most of the woodlands converted to grasslands and croplands.

Species diversity: A rangeland with 100 species of annual and perennial grasses and shrubs has more diversity than the same rangeland after heavy grazing has greatly reduced the frequency of perennial grass species.

Genetic diversity: Economically useful crops are developed from wild plants by selecting valuable inheritable characteristics. Thus, many wild ancestor plants contain genes not found in today's crop plants. An environment that includes both the domestic varieties of a crop (such as corn) and the crop's wild ancestors has more diversity than an environment with wild ancestors eliminated to make way for domestic crops.

In assessing the role of Congress in responding to the current threat to biological diversity the OTA report identifies ten "findings" in five different but related areas:

1. Strengthening the national commitment to maintain biological diversity:

■ A comprehensive approach is needed to arrest the loss of biological diversity. Significant gaps in existing programs could be identified with such an approach, and the resources of organizations concerned with the issues could be better allocated.

■ Because maintenance of biological diversity is a long-term problem, policy changes and management programs must be long-lasting to be effective. But, such policies and programs must be understood and accepted by the public, or they will be replaced or overshadowed by shorter term concerns. Conveying the importance of biological diversity requires formulating the issue in terms that are technically correct yet understandable and convincing to the general public.

2. Increasing the nation's ability to maintain biological diversity:

■ Current technologies are insufficient to prevent further erosion of biological resources. Thus, increasing the nation's ability to maintain biological diversity will require acceleration of basic research as well as research in development and implementation of resource management technologies.

■ Many federal agencies sponsor diversity maintenance programs that are well designed but not fully effective in achieving their objectives because of inadequate funding and personnel, lack of links to other programs, or lack of complementary programs in related fields.

3. Enhancing the knowledge base:

■ Congress and other policy-makers need improved information on biological diversity. Such information cannot be supplied without improvements in data collection, maintenance, and synthesis.

4. Supporting international initiatives to maintain biological diversity:

■ The United States has begun to abdicate leadership in international conservation efforts, with the result that international initiatives are weakened or stalled in the tropical regions where diversity losses are most severe. Renewed U.S. commitment could accelerate the pace of international achievements in conservation.

■ Constraints on international exchange of genetic resources could jeopardize future agricultural production and progress in biotechnologies. Such constraints are becoming more likely because developing countries with sovereignty over most such resources believe that the industrial nations have benefited at their expense.

5. Addressing loss of biological diversity in developing countries:

■ Existing legislation may be inadequate and inappropriate to address U.S. interests in maintaining biological diversity in developing countries.

■ The Agency for International Development (AID) could benefit from additional strategic planning and conservation expertise in promoting biological diversity projects.

■ A major constraint to developing and implementing diversity-conserving projects in developing countries is the shortage of funds. Present funding levels are insufficient to address the scope of the problem adequately. ■ **R.L.**

House Committee on Foreign Affairs, which endorsed the study request, says "I believe the OTA's study will increase Congressional, public, and world attention and awareness on one of the earth's most urgent problems." Yatron has already pushed through legislation designed to protect natural resources, including tropical forests, and plans to use the OTA report to develop more. Meanwhile, the $2.5 million that is earmarked annually for environmental protection through the Agency for International Development is likely to be increased to $10 million a year.

One of the most interesting of the report's proposals is the establishment of a National Endowment for Biological Diversity, which, says Ehrenfeld, could have a significant impact without requiring enormous expenditure. "We were surprised to discover how very widespread and how very effective existing private, grass roots endeavors were in conservation biology in this country. A national body that could give out, say, 40 small grants of up to $25,000 a time every year to support and expand these grass roots efforts could make a major difference."

Michael Soule, who is president of the Society for Conservation Biology, which is based in Washington, D.C., agrees. "A National Endowment for Biological Diversity would have a flagship value," he says, "even if the government didn't put very much money into it." As the OTA report acknowledges, and as conservation biologists have long known, the problem of protecting and maintaining biological diversity is as much one of education and perception as it is of developing the appropriate technologies. Hence the value that is placed by Soule and his colleagues on establishing a national symbol of some kind.

The report ranges widely over the issue of biological diversity and identifies a series of problem areas—both national and international—that Congress might address (see box). In addition to the proposal for establishing a National Endowment for Biological Diversity, the report argues that Congress should pass a National Biological Diversity Act that would "set priorities for diversity conservation," and a National Conservation Education Act that would "promote the importance of biological diversity to human welfare."

Legislation that specifically addresses the threat to biological diversity in the United States is "largely piecemeal," observes the report. As a result, "existing Federal programs focus on sustaining specific ecosystems, species, or gene pools" and do not form a coherent objective. By contrast, a National Biological Diversity Act could "explicitly state maintenance of diversity as a

national goal." With an explicit national goal in place it might then be possible to coordinate the currently disparate federal, state and private activities. However, without adequate resources and powers, an act of this sort, no matter how nobly worded, "would simply provide a false reassurance that something was being done."

"Too much emphasis on the success of technology—in a very limited area—may be kidding the world that this problem is easy to solve."

Although the report recognizes the great importance of changing people's attitudes toward conservation biology through education, which is why it explicitly suggests the establishment of a National Conservation Act, it also sees potential problems "because of the trend to reduce the Federal Government's role in education and to rely more on State and private sector initiatives."

Biologists who are aware of the magnitude of the threat to biological diversity and who are concerned by its implications are nevertheless frustrated by the degree of scientific ignorance that still prevails about the scale and complexity of the biological world. As Edward Wilson of Harvard University frequently points out, annual spending on ecology in the United States is about $50 million, which is two orders of magnitude less than the amount spent on molecular biology and biomedicine. And only a tiny fraction—perhaps as little as $1 million—goes specifically to conservation biology. For this reason the OTA report suggests that the National Science Foundation (NSF) should be directed to set up a program for conservation biology.

"Current funding for research and technology development in conservation biology is negligible," notes the report, "in part because the NSF considers it to be too applied, while other government agencies consider it to be too theoretical." According to Ehrenfeld, most researchers who do work in conservation biology piggyback it on other projects. "All conservation genetics, for instance, is in effect supported by grants that were not specifically given with that goal," he says. "Conservation genetics is intellectually high-powered work but it is forced to be a parasitic endeavor on more conventional research."

Soule says that "there is a prejudice against anything that smacks of applied research, so there is always a high probability that conservation biology proposals will get a poor review when they go through the biology panels at NSF." Because of this barrier, Soule and several conservation-minded biologists are due to meet informally with NSF officials at the end of this month to discuss the OTA report's suggestion of a separate conservation biology panel within the Directorate for Biological, Behavioral, and Social Sciences.

Although conservation biologists are generally pleased with the attention that the OTA report brings to the issue of biological diversity, there is some concern about the implied philosophy of the overall approach. As the name of the report implies, there is considerable—but by no means exclusive—emphasis on technological intervention for protecting diversity, including artificial insemination in small captive populations and cryostorage of embryos, sperm, and ova.

As William Conway of the New York Zoological Society has pointed out, "These kinds of techniques can be effective, but only in crisis situations and for a tiny fraction of the world's endangered species." Thomas Lovejoy of the World Wildlife Fund says "If you know only 1 in 10 or 1 in 20 of the species that exist, technological intervention isn't going to make a big impact on the overall problem." The 1.7 million species so far recorded by biologists is estimated to be only one-twentieth of the total number that now exist. At current rates of destruction, most species seem destined to become extinct without ever being recorded by science. As a result, says Lovejoy, "Too much emphasis on the success of technology—in a very limited area—may be kidding the world that this problem is easy to solve." The only effective path to a solution, stresses Lovejoy, is a major commitment by governments to provide land and financial resources in order to maintain species and ecosystems in their natural contexts. ■ **ROGER LEWIN**

Panel Urges Newborn Sickle Cell Screening

If babies with sickle cell disease are identified at birth, they can be treated early to prevent what are otherwise deadly infections

A National Institutes of Health panel recommended on 8 April that newborn screening for sickle cell disease be made available for all babies. Only ten states offer screening now, but the panel concluded that the benefits of screening are "compelling." The early identification of babies with sickle cell disease could reduce their mortality rate by 15%.

The materials for a sickle cell screening test cost $0.22 and the panel expects that the test could be included among other routine procedures, such as blood counts and blood typing.

It is especially important that babies who are found to have sickle cell disease receive follow-up care, the panel stressed. During a consensus meeting, which took place on 6 to 8 April at the National Institutes of Health in Bethesda, Maryland, two mothers of children with sickle cell disease told of the difficulties they had when appropriate care was lacking.

Because sickle cell disease is inherited and incurable, health policy planners thought until recently that there was no advantage to identifying babies with the disease early. The disease causes abnormal, sickle-shaped red blood cells that can become stuck in small blood vessels, causing strokes or, more often, painful and swollen joints. It also results in anemia.

Sickle cell disease is a recessive genetic disorder that is particularly prevalent among blacks and among persons from Central and South America, India, Asia, and the Mediterranean. One in 400 blacks has sickle cell disease and about 1500 black babies are born with it each year.

All 50 states routinely screen newborns for the genetic diseases phenylketonuria and hypothyroidism, which are much less com-