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Sectors of a tobacco leaf infiltrated with the plant pathogenic bacterium *Erwinia amylovora* or harpin, a protein isolated from it, show collapsed tissue (dark spots); sectors infiltrated with *E. amylovora* mutants that lack harpin have not collapsed. *Erwinia amylovora* causes fire blight, a severe disease of apple and pear trees; harpin appears to be responsible for the collapse of infiltrated tissue and is required for the development of the disease. See page 85. [Photograph: K. Loeffler]

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The pigtail macaque: a new model for HIV infection
"Here's why GELase™ may replace Nal/glass bead kits for purifying DNA from LMP-agarose gels."

7 reasons that you can easily check for yourself...

1. Recovery of DNA is about 100% using GELase.
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7. Protocols for using GELase are the same for RNA as for DNA.
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Agriculture and Climate Change

How will increases in levels of CO2 and changes in temperature affect food production? A recently issued report analyzes prospects for U.S. agriculture 1990 to 2030.* The report, prepared by a distinguished Task Force, first projects the evolution of agriculture assuming increased levels of CO2 but no climate change. Then it deals with effects of climate change, followed by a discussion of how greenhouse emissions might be diminished by agriculture. Economic and policy matters are also covered.

Most forecasts of the future miss reality by a large margin because of the unforeseen. However, trends of increases in agricultural productivity have been robust. If climate does not change drastically, U.S. agriculture is likely to continue to expand production per hectare by about 1.5% per year. The report points out that from 1930 to 1987, while population nearly doubled, the land area required for crops in the United States shrank by one-seventh. Were climate to remain steady, the crop land area needed to meet domestic demand and projected increased exports would decrease from 134 million hectares in 1987 to about 88 million hectares in 2030. Those estimates did not factor in beneficial effects of increased CO2 in enhancing yields and lessening need for water by plants. The increased efficiency in production would be based largely on genetic improvements. Traditional plant breeding continues to produce better varieties. In addition, the potentials of biotechnology are only beginning to be exploited.

How the climate would respond to more greenhouse gases is uncertain. If temperatures were higher, there would be more evaporation and more precipitation. Where would the rain fall? That is a good question. Weather in a particular locality is not determined by global averages. The Dust Bowl of the 1930s could be repeated at its former site or located in another region such as the present Corn Belt. But depending on the realities at a given place, farmers have demonstrated great flexibility in choosing what they may grow. Their flexibility has been increased by the numerous varieties of seeds of major crops that are now available, each having different characteristics such as drought resistance and temperature tolerance. For example, in future, varieties of winter wheat are likely to have an even larger role than now. Seeds are planted in the autumn, and the crop is harvested ahead of the drought and heat of midsummer. The area suitable for this crop has already been doubled as a result of success of plant breeders.

In past, agriculture has contributed about 5% of U.S. greenhouse gases (CO2, CH4, and N2O). Two large components have involved emissions of CO2 from farm machinery and from oxidation of organic matter in soil. Use of diesel fuel and more efficient machinery has reduced emissions from that source by 40%. In some areas changed tillage practices (no till) are now responsible for returning carbon to the soil.

The report identifies an important potential for diminishing net U.S. emissions of CO2 by growth and utilization of biomass. Large areas are already available that could be devoted to energy crops. Estimates of potential impact included one from the Office of Technology Assessment. It hypothesized that 30 million hectares might be employed, ultimately resulting in production of 6 to 8% of current U.S. energy consumption. Another estimate suggested that the United States could offset half of its current emissions of CO2 related to fossil fuels by planting 140 million hectares with trees. Other projections (not cited) indicate a potential that all U.S. liquid fuels eventually could be obtained from biomass. To achieve such a goal would require selection and development of fast-growing, high-yielding trees or herbaceous plants, plus improved methods of processing their cellulose to ethanol alcohol. A substantial potential for diesel fuel lies in the seeds of some plants such as sunflower and rape. In addition to providing local benefits, technology developed in the United States could widely find applications in other countries, resulting in diminished global emissions of CO2.

To achieve long-term goals of using biomass energy and maintaining reliable food production under changing conditions will require a vital agricultural research and production system. But the goals can be reached. As the report states, "Unlike the earth's endowment of land and water, which are fixed and growing relatively smaller compared to demands on them, the capacity for acquiring knowledge has no known limit."

Philip H. Abelson

Tree-Ring Research

Regarding a photograph by one of us (B.M.B.) that appeared with the article "There’s a new offering on campus: Global change 101" by Ann Gibbons (Research News, 22 May, p. 1146), I would like to clarify a few points. First, the photograph shows Mike Peterson of the Tasmania Forestry Commission and Mike Barbetti of the University of Sydney working near the summit of Mount Read, in a group of trees killed by fire in 1961. Neither Peterson nor Barbetti is a Lamont-Doherty researcher, as stated in the caption; both were assisting on an ongoing project directed by Ed Cook, a research scientist at Lamont-Doherty. We cut and sectioned this standing, dead tree for our study; but the rest of our samples were taken with the use of increment cores, which remove only a 4-millimeter dowel of wood from the tree and cause no discernible harm to living trees. We do not usually cut trees, and when we do only dead trees are cut. Additional samples taken at this site included buried and partially buried, nonliving stems and eroded stumps from within the fire-killed site only, and not from the adjacent, living site. We make every effort to have minimal impact in the areas in which we work, while at the same time getting the best samples for our research interests.

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Evolution of HIV in Africa

Steve Sternberg’s Research News article of 15 May (p. 966) describes a phylogenetic analysis which concludes that West Central Africa may contain a lineage of HIV-1 (human immunodeficiency virus–1) that is ancestral to the other HIV-1 isolates analyzed to date. This conclusion has been criticized on the basis of the relatively low prevalence of HIV-1 in that region of Africa, but this low prevalence is entirely consistent with the patterns expected from current evolutionary considerations of HIV virulence (I). These evolutionary considerations suggest that the pandemic HIV evolved to a high level of virulence in mid-Central and East Africa in response to an increase in multiple-partner sexual contact brought about by the socioeconomic crisis that occurred there during the 1970s. The lower rates of sexual contact along the west coast of Africa should have favored the evolution of lower virulence. Accordingly, current evidence indicates that the HIV-2 in West Africa has a lower virulence and lower prevalences than the pandemic HIV-1 (1–3). The limited comparisons to date also suggest that these low prevalences of HIV-2 are remaining fairly stable in areas of West Africa where HIV-2 predominates (4). According to this evolutionary argument, the same should be true of HIV-1 strains that have evolved endemically in areas with relatively low rates of multiple-partner sexual contact. That is, we can expect such strains of HIV-1 in western regions to have a lower, more stable prevalence than the HIV-1 strains in mid-Central and East Africa.

This evolutionary argument can be tested by assessing the virulence of the root West African HIV-1 lineages in humans by quantifying, for example, the time between the onset of infection and the onset of AIDS. The evolutionary theory predicts that the virulence and replication rates of these lineages should be lower than those of the lineages in mid-Central and East Africa. Seropositivity should also increase more gradually with age, more like the age structure of HIV-2 infections than pandemic HIV-1 infections (2, 3).

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Bevalac Funding

More is at stake in the imminent closure of Berkeley’s Bevalac than David P. Hamilton suggests in his article “NASA researchers
antidote for MH; (ii) MH patient-physician organizations that educated medical personnel to recognize and treat this rarely occurring disease; and (iii) biomedical engineers who created new monitoring devices to permit the early detection of the hypermetabolic state that characterizes acute MH.

Much additional work remains to be done before the understanding of the molecular biology of MH is sufficient to permit development of improved diagnostic tests. No doubt, such tests will help reduce MH morbidity and mortality rates even further in the future.

Marilyn Green Larach, Director, North American Malignant Hyperthermia Registry, and Department of Anesthesia, College of Medicine, Pennsylvania State University, Hershey, PA 17033

REFERENCES


Chemical Weapons Disposal

The article “Piecemeal rescue for Soviet science” by David P. Hamilton (News & Comment, 27 Mar., p. 1632) mentions a suggestion by scientists from a former Soviet weapons lab to use nuclear explosives to destroy chemical weapon stockpiles. The article states that the suggestion met with a “very mixed response” from the Americans.

One could note that the U.S. government has also considered this method. The Defense Nuclear Agency completed a study in 1982 (1) which suggested that there were a number of advantages to be gained by using a nuclear blast to destroy chemical weapons in an underground cavity. For example, the weapons would require no preparation or disassembly, and there would be no residue requiring disposal. This idea, along with other novel concepts for the disposal of the chemical stockpile, was rejected by the Army in favor of reverse assembly-incineration.

David N. Clark, Battelle, 11650 Stark Road, Tooele, UT 84074

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Pharmaceutical/ Biotechnology:
Careers In Industry

This special section, reprinted from the May 8 issue of SCIENCE takes an in-depth look at careers in the pharmaceutical and biotechnology industries.

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How far will Science's editorial team go to get to the bottom of a news story? To the ends of the Earth... as Senior Writer Joseph Palca did when he accompanied a National Science Foundation team to the South Pole last November. Palca was after hot science, and the weather played its part when temperatures hit a balmy 40° below. This allowed the NSF team to brief Palca—and, by extension, Science's readers—on astronomers' latest plans for astrophysical observations, climatologists' most recent probings of the polar cap to get at the Earth's historical talent for blowing hot and cold, and ozone hole aficionados' newest numbers.

Just what you expect from Science; the journal that finds news that's hot even when it's 40° below.
"Siona and Secoya hunters [in northeastern Ecuador] sharpening spears. Bamboo-tipped spears are a traditional weapon for hunting terrestrial game such as peccaries and tapirs. Since the 1950s, the shotgun has replaced both the spear and blowgun in most hunting. Most of these shotguns are single shot 16 gauge. Factory manufactured shells are expensive, so all hunters reload the plastic shell casings with primers, shot, and gunpowder purchased from river traders." [From W. T. Vickers's paper in Neotropical Wildlife Use and Conservation]

outlook for wildlife in the United States was not much better than what is currently being predicted for Latin America. For example, in 1913, the imminent extinction of the pronghorn "antelope," the bighorn sheep, and the elk was predicted, yet today these species are harvested through sport hunting. Can the wildlife management strategy that has made this possible be adapted to Latin America? Shaw reviews the enormous cultural, political, economic, demographic, and ecological differences between the Americas that make wildlife management in Latin America especially challenging. Existing philosophies, techniques, and theories may not be readily transplantable to Latin America without modification for tropical systems, developing economies, different sociopolitical profiles, and different social views of nature.

Several papers discuss theoretical models for determining potential harvest levels. Unfortunately, as with many models, assumptions are unverified or will be found to be species-specific and thus have limited applicability. The most detailed data are those of Franklin and Fritz for guanacos. Franklin and Fritz conclude, on the basis of two decades of research, that sustainable harvest is feasible. The time it took to reach this conclusion underscores the need for intensive research on other wildlife species. On a more hopeful note, several species of economic importance (caiman, white-winged doves, whistling ducks, capybaras, pacas, iguanas) are amenable to ranching or farming. Unfortunately, these are only a small proportion of the wildlife species utilized, both legally and illegally, from Mexico to Argentina.

Wildlife biology in North America is looked down upon by many ecologists and other biologists, and this is largely the fault of the wildlife biologists themselves, who, with their strongly regional orientation and the close linkage of their work to local game departments, have been long on politics and mundane census studies and short on global theories of management strategy and policy. Undoubtedly, the bright future for wildlife in North America is due to their efforts, but now it is time for them to turn their attention to the question of wildlife management elsewhere in the Americas, where the greatest wildlife diversity resides.

The future of Latin American game and non-game wildlife lies in an international melding of ecology, wildlife biology, conservation, economics, and politics. Can Neotropical wildlife be preserved and used sustainably? Yes, but only if governments and scientists work together to produce solid data and new theories of management. We know that by protecting economically important game and non-game species, we ensure concomitant management of many associated species of vertebrates, invertebrates, and plants. Major attention must be given to habitat protection. Law enforcement efforts based on reasonable (rather than draconian) wildlife laws need to be instituted throughout Latin America. Educational materials are needed for school children and the general public that illustrate the total value of wildlife and the need for wildlife protection.

There may be more species of wildlife to preserve in the Neotropics than in North America and they may be harder to study, but there is no reason to think that the task is beyond our abilities. This volume is a very positive first step in describing its magnitude and complexity.

Michael A. Mares
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Books Received


