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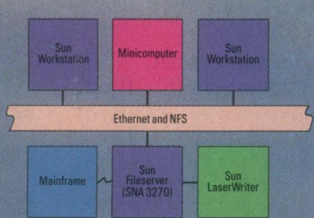

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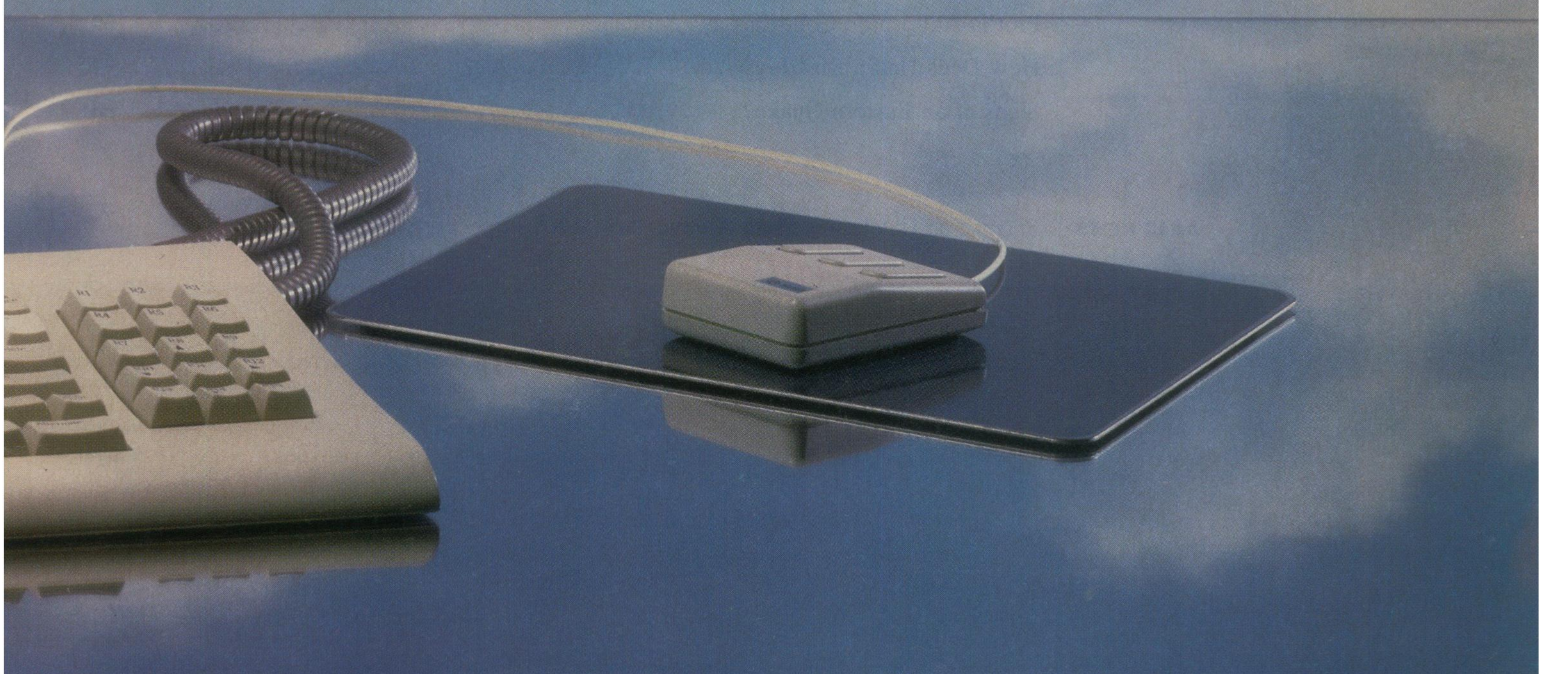

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COVER

Barn owl (*Tyto alba*) moments before it strikes a mouse located beside the lens of the camera. This nocturnal hunter depends on its keen sense of hearing to locate prey in the dark. Young barn owls use vision to adjust their auditory localization accuracy. See page 545. [Eric I. Knudsen, Stanford University School of Medicine, Stanford, California 94305]

AAAS–Philip Hauge Abelson Prize

To Be Awarded to a Public Servant or Scientist

The AAAS Board of Directors has created the AAAS–Philip Hauge Abelson Prize of $2500 to be awarded annually either to:

(a) a public servant, in recognition of sustained exceptional contributions to advancing science, or
(b) a scientist whose career has been distinguished both for scientific achievement and for other notable services to the scientific community.

AAAS members are invited to submit nominations now for the initial prize, to be awarded at the 1986 Annual Meeting in Philadelphia. Each nomination must be seconded by at least two other AAAS members.

Nominations should be typed and should include the following information: nominee's name, institutional affiliation and title, address, and brief biographical résumé; statement of justification for nomination; and names, identification, and signatures of the three or more sponsors. **Nominations should be submitted, for receipt on or before 31 December 1985, to the AAAS Executive Office, 1333 H Street, NW, Washington, D.C. 20005.**

The winner will be selected by a seven-member panel appointed by the Board.

First and last appearances

Evolution of oceanic plankton may require up to several million years; their extinctions may be quite abrupt (page 538). The first and last appearances of groups of Radiolaria (single-celled Protozoa) that lived 1 to 15 million years ago were determined in cores from five deep-sea drilling sites in the Indian and Pacific oceans. The majority of last appearances were synchronous, whereas most first appearances were not, being, instead, time-transgressive. Some radiolarian species in the Indian Ocean apparently preceded their counterparts in the Pacific by several million years, an unexpected finding both because the oceanic circulation pattern is in the opposite direction and because the assumed global ocean mixing time is on the order of only thousands of years. Johnson and Nigrini suggest that because extinction data are more likely to be synchronous over a wide geographic area, they may be more precise than data on first appearances for stratigraphic correlations.

Treatment for jaundice

Bilirubin-rich blood—a sign and cause of jaundice in newborns—can be depleted of bilirubin and returned to the jaundiced donor (page 543). The detoxification procedure designed by Lavin *et al.* consists of filtering blood through beads to which the enzyme bilirubin oxidase has been coupled: the bilirubin is enzymatically converted to less toxic products. Mild jaundice causes yellowing of skin in 20 percent of newborns, but severe disease causes mental retardation, cerebral palsy, deafness, seizures, or death. Therapy includes use of "bililights" to photochemically convert bilirubin to a metabolizable form and transfusions, which carry numerous risks. Therefore, a low-risk procedure for treating jaundice would have major clinical value. In addition, the depletion technology may be applicable to other diseases in which toxic substances circulate in the blood.

Sound localization by owls

Barn owls learn to locate the sources of sounds accurately with two senses, hearing and seeing (page 545). When young owls (cover) were fitted with one earplug for several weeks they learned how to locate sounds using altered cues. Later when their ears were unblocked, they failed to orient correctly toward sound sources. Knudsen and Knudsen found that normal vision was essential for correcting the errors. Owls whose vision was blocked did not correct errors; those whose vision was altered by prisms fitted to their eyes made corrections in accordance with the type of visual error imposed. If the owls were subjected to distortions to either sense until they were 7 months old, they could not make proper adjustments: either vision could no longer fine-tune or hearing could no longer respond as the two sensory systems interacted to locate the source of a sound.

Biting genetic engineers

When an animal tail or a human hand sweeps away a blood-sucking mosquito, bunyaviral evolution may be promoted (page 548). The LaCrosse bunyavirus, a major cause of encephalitis in children, is transmitted to a vertebrate host by a mosquito bite. Its genetic material is contained on three RNA segments, and reassortment of these segments from two viruses can take place inside a mosquito to produce a new virus. Beaty *et al.* found that double infections occurred if feeding, interrupted on a first viremic host, was resumed within a short time on a second host; once meals were spaced more than 48 hours apart, the insects became refractory to a second infection. Parent and recombinant viruses could subsequently be isolated from both dually infected mosquitoes and from mice that the mosquitoes had bitten.

Pigment variations in algae

The amount of the blue pigment phycocyanin in blue-green algae depends on prevailing light conditions (page 550). Phycocyanin molecules are part of the cell's light-harvesting machinery through which light energy is absorbed and transferred to the photosynthetic center. Conley *et al.* show that phycocyanin levels change with variations in light quality and that this adaptation can be accounted for by quantitative changes in cellular levels of messenger RNA molecules for phycocyanin. The messengers have an intermediate role in pigment synthesis, carrying from the gene information for producing the phycocyanin protein. Messenger levels for phycocyanin (which absorbs red light) were high in organisms kept in red light and low in those grown in green. Since other components of the light-harvesting machinery vary coordinately with phycocyanin, the information for their synthesis may be carried on contiguous portions of the same messenger molecules.

Rickettsial roots

The rickettsiae—small bacteria that cause diseases such as Rocky Mountain spotted fever and typhus—are closely related to two groups of plant-associated bacteria and to a cellular organelle, the mitochondrion (page 556). Rickettsiae generally grow inside cells of their hosts and have proved difficult to culture, study, and classify. Weisburg *et al.* determined the relation of the rickettsia *Rochalimaea quintana* to other bacteria by comparing sequences of their genes for 16*S* ribosomal RNA. Evolutionary relations of rickettsiae to agrobacteria (plant pathogens) and rhizobacteria (plant symbionts) were established by this test—making explicable puzzling reports of agrobacteria in human clinical specimens; suspected relations to organisms such as *Legionella* were ruled out. The divergence of plant organisms and vertebrate pathogens from a common ancestor may have been facilitated by insect vectors that are responsible for transmission of these bacteria.

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Agricultural Research and U.S. Trade

Farm exports have long been a major source of foreign exchange for this country and a primary factor in offsetting our adverse balance of payments, but during the past 2 years, our agricultural exports have leveled off and even declined. This has triggered a depressed U.S. agricultural economy that is of national concern.

Recently well-meaning agriculturalists are placing the blame for this decline on U.S. support for agricultural research and education in developing countries. Although a simplistic assessment might lead to such a conclusion, a study of the facts strongly supports the contrary view—that collaborative agricultural research with developing countries has been and is a decided benefit to U.S. agriculture.

Countries that have and are receiving assistance from the Agency for International Development are not the primary sources of current food surpluses. Improved varieties and new technologies that U.S. support has helped create have prevented the massive starvation and hunger that the pessimists of the 1960's predicted. But unprecedented population growth has permitted only marginal increases in per capita food production in the countries that we support—some 2 percent over the past 8 years. This insignificant increase can hardly be the source of serious competition with U.S. agriculture. In contrast, during the same period of time, per capita food production in Western Europe has risen 16 percent and in China 39 percent. None of these countries has received technical assistance from the United States, but their food production increases, stimulated by costly subsidies, are resulting in significant competition.

The primary objective of U.S. technical assistance for Third World agriculture is to enhance the economic development of these countries. But U.S. agriculture is also a direct beneficiary of these efforts. Experience in Asia and Latin America during the past two decades shows that American farm exports have generally benefited from increased agricultural productivity in the Third World. Countries such as Taiwan, Korea, Brazil, and Nigeria, which once were recipients of U.S. technical assistance, are now among the major purchasers of U.S. food exports. Developing countries have become the fastest growing markets for U.S. agricultural exports in the past decade, accounting for 52 million metric tons of cereals and feed grains in 1983 or 50 percent of all such exports.

Collaborative research with Third World countries has benefited U.S. agriculture in another important way—through the infusion of yield-producing genetic materials into the seeds of our cultivated crops. The center of origin of essentially every major crop that we grow is in the Third World. Consequently, genetic diversity is highest there. Through collaboration with developing countries, we help them use the reservoir of wild species to improve their own crop-producing potential. But we also have access to that same genetic diversity to improve our own cultivars. For example, semidwarf wheat varieties, the genes for which came from Asia, occupy almost 60 percent of our wheat acreage. The genetic sources of resistance for pests, such as the golden nematode for potatoes, came from Peru. Strains resistant to southern corn leaf blight, corn rust, and maize dwarf mosaic virus resulted from collaboration with scientists in developing countries, as did the resistance to the soybean mosaic virus. Comparable benefits can be cited for essentially every crop we grow.

There are other valid reasons for a decline in U.S. agricultural exports. Competition from other countries is enhanced by the high value of the dollar and by lingering U.S. policies that encourage high food prices. Also, the worldwide slowdown in economic growth limits the foreign exchange to purchase U.S. goods. But continued scientific and technical assistance to the developing countries is essential and in the long run will provide expanded trade opportunities for U.S. agriculture and industry.—NYLE C. BRADY, *Senior Assistant Administrator for Science and Technology, Agency for International Development, Washington, D.C. 20523*