of the network. Projected operating costs for the principal node are $6 million yearly, including lease of the supercomputer. Capital costs for the central site would be about $5 million.

The regional nodes would house medium-scale computers of the type also known as super-minis. There might be 20 of these at an average cost of $0.5 million, although the range of capabilities from node to node (memory size, for example) could be broad. In addition, certain of the regional sites might also incorporate extra features, such as interactive graphics. Others might serve as test vehicles for advanced facilities not yet reliable enough for the central site.

Press emphasized to *Science* that proposals to use these facilities would be judged by a broadly based panel of physicists to ensure that theoretical problems of importance to the entire community, not just to computational physicists, were addressed.

Press frankly admitted to the committee that the inspiration for the proposed network is the 7-year-old Magnetic Fusion Energy Computer Center at the Lawrence Livermore National Laboratory. Livermore, with a Cray-1 supercomputer and several other machines, is the principal node, and there are 13 service centers with minicomputers for fusion researchers across the United States that communicate with Livermore by way of leased telephone lines or microwave links. People who have used this network, the Defense Advanced Research Projects Agency's ARPANET, or other networks proclaim that communication between researchers at distant sites is so good that, in some ways, a network serves as well as a centralized institute for collaborations. Similarly, all the facilities on the network would be accessible to researchers at any node.

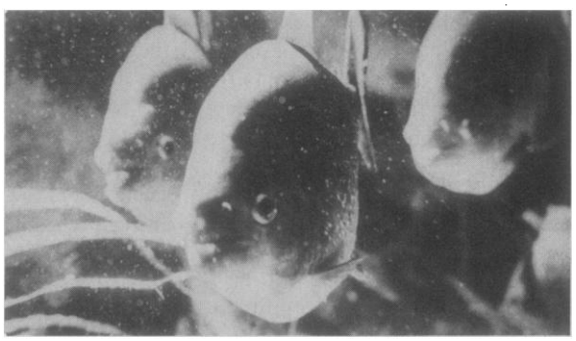
The physicists are certainly thinking big, but are they thinking big enough? NSF's Deslattes said at least three times that the network is expensive enough to be visible to Congress. It therefore behooves the physicists to have their act together before entering the fray for funding. One thing worth considering, he suggested, is banding with other research groups, including computational astronomers and quantum chemists (who are at loose ends with the loss of the NRCC). In this way, a plan for computer facilities that satisfied everyone's foreseeable needs could be presented to Congress, which would then have to wrestle with the issue only once. In this day and age, if each group pestered the legislators on its own, nobody would get anything.—ARTHUR L. ROBINSON

A Fish in the Bush Is Worth . . .

In the middle of the Brazilian jungle, some 30 miles from the nearest river, a school of piranha wait patiently under a rubber tree. When one of the tree's pods explodes in the hot, equatorial sunlight, there is a mad rush among the fish to catch the seeds that are ejected. Few of the seeds ever reach the ground—at least until after they have passed through the fishes' digestive systems and have been carried far from their source.

No, these fish have not evolved legs. They are, however, part of an unusual ecosystem that, according to the International Union for Conservation of Nature and Natural Resources (IUCN), is in danger of destruction because of extensive deforestation in the Amazon basin. If the deforestation continues, IUCN says, the commercial fishing industry on Brazilian rivers will collapse and many species of both plants and fish could disappear. The government of Brazil argues that the total amount of deforestation is small and that new trees and other crops are being planted to replace the felled trees.

The Amazonian basin represents a type of delicate ecosystem that has virtually disappeared elsewhere in the world. Every year, between June and November, the waters of the Amazon and its tributaries flood some 40,000



New England Aquarium

square miles of forest. When this happens, fish from the rivers follow the water and become part of the fauna of the forest, feeding on the seeds and fruit falling into the water. Many fish of the region are evolutionarily adapted to these conditions, having molars to crunch nuts and bloated stomachs so that they can build up a store of fat for the period when the waters recede. Several types of piranhas have even been found, says Michael Goulding of the Instituto de Pesquisas da Amazonia, that have forsaken the pleasures of flesh for a vegetarian diet. The trees and other plants benefit also, since the fish disperse their seeds widely throughout the region. In 2 years of work, scientists participating in a survey of the region sponsored by IUCN and the World Wildlife Fund have already identified more than 200 species of fish and trees that rely on this symbiotic interaction.

Man also depends on the symbiosis. Fish are a major source of protein for residents of the Amazon basin, says Goulding, with three-quarters of the catch coming from the floodplain forest. The most important commercial species, the tambaqui, is a seed eater. But in heavily deforested areas, the IUCN scientists have already noted a drastic decline in the fish population. Some fishermen in those areas have already been put out of business by lack of fish, and this trend is expected to accelerate if deforestation continues.

And continue it does, according to IUCN. Thousands of acres of palm trees have been destroyed in harvesting palm hearts, which are much valued as an ingredient for salads. Elsewhere, IUCN says, large areas of forest have been cleared for agriculture, chiefly rice cultivation and cattle ranching. An extensive forested area along the Rio Tefé is now being zoned for a large agricultural experiment. The question that has not been addressed in many of these projects, IUCN argues, is whether the protein from rice, beef, and other crops will be an adequate replacement for that formerly supplied by fish. And even if the protein is adequate, the wisdom of destroying this natural ecosystem and, perhaps, innumerable species of fish and plants, is still highly questionable.—THOMAS H. MAUGH II

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