merchantable timber.)

The dispute arises largely over the method used to assess the damage. Because much of the inland forests are still under Vietcong control, assessment rested almost entirely upon interpretation of aerial photographs. The criticism is that the photographs alone are inadequate for measurement of damage, especially beneath the dense canopy of tropical forests.

If the Alaska pipeline leaks?

Environmentalists fighting to stop the trans-Alaska oil pipeline have expressed two main worries: Will increased activity of men and machines permanently damage the permafrost that underlies the peat topsoil and will inevitable oil spills spell instant disaster for the fragile tundra biome? The tentative answer, according to a review article in March 1 NATURE, is a qualified "no."

When trucks drive over the "active layer" of topsoil that freezes and melts to a depth of 35 to 60 centimeters each year, they leave deep ruts that some early observers feared would turn long, thin stretches of the tundra into a bog. Research has now shown that regeneration of vegetation and disappearance of the ruts depends on the region involved. In wet areas, regeneration is completed in five years; in dry areas, the process may take 20 years. Nevertheless, repeated traffic could erode the peat too much.

To identify the possible effects of oil spills, carefully controlled experimental spills have been made in the Mackenzie Delta area of northwest Canada, in amounts equivalent to 1,950 barrels per acre. Evaporation of the oil—as much as 15 percent within the first 16 hours after application—apparently removes some of the most lethal constituents of the petroleum and helps counteract the heating effect of a blackened surface, by absorbing heat during vaporization. All lichens and mosses, with one exception, were killed; but higher plant species, including sedge and willow, recovered pretty well. Total plant recovery was as high as 55 percent after one growing season following a spill and temperature rises were not enough to melt permafrost.

"It seems," the article concludes, "that the tundra can probably cope with occasional, acute pollution from oil spills," and that local ecology is resilient enough to recover naturally, suggesting the desirability of no "further interference." But the question of how low-intensity, chronic pollution may affect the Alaskan environment remains unanswered. □

On helping the less developed nations

The world of 1994, envisions Roy Amara, president of the Institute for the Future in California, will embody rejuvenated cities, increased ecological concern and socially rather than economically motivated development. Yet, he predicts, there will still be a conspicuous absence of much-needed ways to share the wealth—to equitably allocate income and other kinds of wealth among the nations and peoples of the world.

As thousands of scientists at the annual meeting of the American Association for the Advancement of Science discussed the questions and answers of their fields, several groups confronted the problems of applying science and technology where there essentially is none: in the underdeveloped regions of the globe. There have certainly been successes—a favorite example at the meeting was rural China—but many of the participants agreed that for some of the neediest regions the difficulties are huge, and that much of the current effort is at best being misdirected.

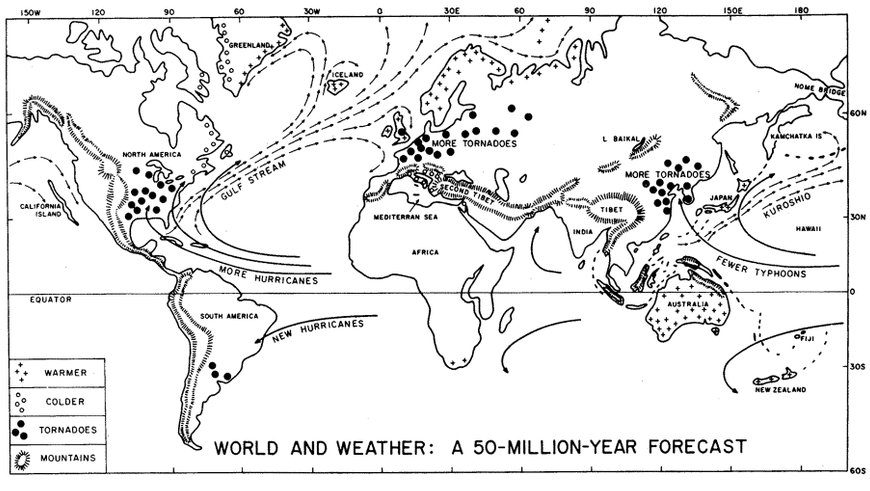
A major problem with rural development, says Uma J. Lele, who has been analyzing some 3,000 programs in Africa for the International Bank for Reconstruction and Development, is that the emphasis is often on the simple, direct import of technology, rather than on development of ways to help technology become involved with the population, particularly through social understanding. A plan to breed more compact cattle in Kenya to conserve grazing land, for example, hit a snag when planners failed to deal with the herdsmen's desire for larger herds of bigger cattle, even though undernourished.

In fact, says University of Maryland economist Irma Adelman, some of the most highly-touted goals of outside developers—increased political participation and a larger share of the national wealth for the poor—often backfire completely. A study of 12 years of development efforts in 43 countries, she says, suggests that the initial impact of such plans on these two areas is to decrease both. Many of the common elements of economic redevelopment schemes, such as tax changes and even land redistribution, make little difference by themselves, and need to be part of an overall plan that will support them.

In the least developed areas, Adelman says, economic development efforts may work in reverse, with the income of the poorest 60 percent of the people actually decreasing significantly, and only the top five percent going up. "In these countries," she says, "the path toward sustained economic growth is eventually blocked, unless either the country is sufficiently large or redistributive policies are sufficiently important to generate an internal market for growth."

Corporations, points out international business consultant Charles S. Dennison, are often more maneuverable than governments in implementing such programs, but as one development planner pointed out at the meeting, "the number of corporate people in any country who are interested in development is distressingly small." □

A look ahead: 50,001,974 A.D.



U. of Chicago

Radical changes on the earth due to 50 million years of continental drift are predicted by three University of Chicago paleoclimatologists *(see p. 176).*