ions—molecules of common atmospheric gases that have taken on a positive or negative electrical charge.

The effects of air ions on living matter (including bacteria, plants, and human beings) are readily apparent but not thoroughly understood, write Krueger, a biometeorologist, and Sigel, a psychologist, both of the University of California at Berkeley. It is known, for example, that depletion of ions in the air may increase susceptibility to respiratory infection. Conversely, enhancing the negatively-ionized atmosphere of a Swiss bank for a 30-week test period produced a 94 percent reduction in the incidence of respiratory illness among bank employees.

Furthermore, recent experiments have shown that a net increase in negative ions reduces the concentration in the blood stream of serotonin, a potent neurohormone. Krueger and Sigel assert that, like the serotonin-reducing drug Reserpin, this change in blood chemistry has a calming effect on humans; negative-ion therapy has also been found to relieve pain in severe burn victims.

Ion concentrations in the air fluctuate naturally, but there is a trend toward continuous depletion because pollutants combine with ions and render them biologically inert. Modern ventilating equipment also tends to reduce ion levels. Chronic ion deprivation, the authors warn, may cause "discomfort, lassitude, and loss of mental and physical efficiency." However, future research may make it possible to establish optimum air-ion standards, to replenish ion-depleted air, and to find increasing uses for ions in the treatment of pain and respiratory illness.

## *Problem-Solving for Mutual Profit*

"The Dynamics of International Technology Flow" by Denis Goulet, in *Technology Review* (May 1978), Massachusetts Institute of Technology, Cambridge, Mass. 02139.

Modern technology flows to Third World countries through many channels. By far the most significant channels today are the Western companies that export products or manufacture them overseas and the Western consultant firms that specialize in solving problems for a fee.

Developing countries, writes Goulet, Senior Fellow at the Overseas Development Council in Washington, D.C., are beginning to realize that there is a vast difference between technology "transfer" in the traditional sense (e.g., through exports of machinery or licensing contracts) and the "genuine assimilation of technology," which gives the recipient both a measure of control and the promise of future technological independence.

While the international companies see technology transfers as "strategies for successful marketing," the poorer countries view the acquisition of technology as an end in itself. The companies will give up only as much technology as they must to achieve access to new Third World markets. Western consultants, meanwhile, act as "technical gatekeep-

ers" who advise clients about new technologies that might be useful to them.

Yet, the technologies in which Western consulting firms specialize (e.g., design and problem-solving services) are not easily transferred, Goulet observes. It is easier to train engineers to build dams than to train feasibility experts of consultant-firm caliber who can evaluate dam siting, cost, and design problems. It is the absence of these skills that makes developing countries technologically dependent on outsiders. The difficulty with consulting firm contracts for technology transfer is that a lot of problem-solving takes place but not much transfer of technology.

"The 'transfer' of technology is no neutral, value-free technical activity," Goulet concludes. It occurs in a competitive arena. It is up to the developing countries to devise more sophisticated policies to make this process serve their long-term social goals and national objectives.

## *Exploiting the Gulf Stream*

"Benjamin Franklin and the Gulph Stream" by Frederick P. Schmitt, in *Oceans* (May–June 1978), Oceanic Society, Fort Mason, San Francisco, Calif. 94123.

Ben Franklin, America's Renaissance man, was the first person to map the waters of the Gulf Stream, gleaning data on the great "ocean river" from his own scientific observations and the whaling experience of a Nantucket sea captain.

Franklin's interest in the "Gulph Stream," writes Schmitt, curator of the Whaling Museum at Cold Spring Harbor, N.Y., was stirred in 1769 by complaints that the supposedly fast mail packets plying the Atlantic between Falmouth, England, and New York were taking two weeks longer than ordinary merchant ships bound from London to Rhode Island.

Although Franklin had noticed the great stream, with its carpet of floating gulfweed, as early as 1726 during a sea voyage to London, he did not appreciate its significance until his cousin, Captain Timothy Folger, explained that the fast westbound merchant ships were skippered by Rhode Island men who understood that it was wiser to cross the Gulf Stream quickly than try to buck its northerly three-mile-per-hour current. Franklin persuaded his Nantucket cousin to prepare a sketch of the "ocean river" with instructions on how to benefit from or avoid its brisk flow.

As Deputy Postmaster General of the British Colonies in North America, Franklin had copies of Folger's sketch sent to Falmouth where, Schmitt writes, "the packet skippers paid no attention."

Franklin, the scientist, continued his studies of the Gulf Stream, measuring its temperature during subsequent transatlantic voyages with a thermometer suspended from a line. He knew the waters were warmer in the current, and he hoped to devise a method for navigators