become the leading language of the world as a result of the contribution of American science and technology?

The best answer to the question regarding the adaptability of African languages to modern change is to remind ourselves how easily modern techniques are being assimilated into African languages. It is a truism that people do not accept all foreign words indiscriminately. Train, ship, television, mathematics, drugs—in a word all the elements of the new environment are spontaneously translated, especially by the women who often find graphic, picturesque equivalents for them.

In Wolof, for example, the word for train is *saxar,* for mathematics *wann,* for drugs *garab,* all terms drawn from the language itself. For words like television, radar or atom, commonsense operates in Africa as it has in Japan, Germany or India, and the same words are incorporated into the language with minor modifications or none at all.

Today the great problem in Africa is that of translation. School books from the primary to the university level must be translated to make them available to students. This will facilitate the broad diffusion of science and technology in Africa. It is easier, cheaper and will reach more people.

A nation's linguistic policy is not decided by the individual. The individual can make known his suggestions, his desires and his needs; but the final word rests with the State. Specialists agree that the use of the vernacular for literacy campaigns and schooling is certainly the best way to show one's regard for the culture and traditions of a people, and the most effective for making the language the vehicle of modern change; but the politician does not always see things the same way as the specialist.

However, an increasing number of countries are exhibiting a refreshing degree of understanding in this matter, and this is encouraging. In addition to those countries of Africa that have traditionally practiced bilingualism based on the use of both an African language and a European one—such as Nigeria, Ghana, the Democratic Republic of the Congo, Tanzania and Uganda—others like Niger, Guinea and Mali have shown new interest in the question.

Unesco's programme in Africa which gives priority to the question of African languages, shows that Unesco is keenly aware of this problem and its effect on the continent's educational and development policy.

Many details have as yet to be worked out in agreement with Unesco's African member countries; but the proposals elaborated at the Unesco-sponsored Congress of Bamako in 1965 for unification of certain African scripts is a step in the right direction.

— *June 1967*

Photo © Paul Almasy, Paris

With the world's oceans a convenient dumping ground for radioactive waste, scientists are on the alert for signs of contamination which could spread for millions of square miles and ultimately endanger man through the food he harvests from the sea.

THE POLLUTION OF THE OCEAN

by Nicolai Gorsky

THE amount of radioactive substances dissolved in the waters of the oceans and seas is infinitesimal and the highly diversified plant and animal life of the seas and oceans is accustomed to a very low concentration of radioactive substances. It is precisely from this quarter that a grave danger has arisen.

It is known that fishes concentrate phosphorus and zinc in their bodies, while molluscs and crustaceans concentrate calcium, strontium and a number of other elements included in radioactive fission products.

Two days after atomic bomb tests at Bikini atoll, the radioactivity of the upper layer of water increased a million times over the normal. Four months later the radioactivity of the water 1,500 miles away was three times greater than the normal. In thirteen months the contaminated water had

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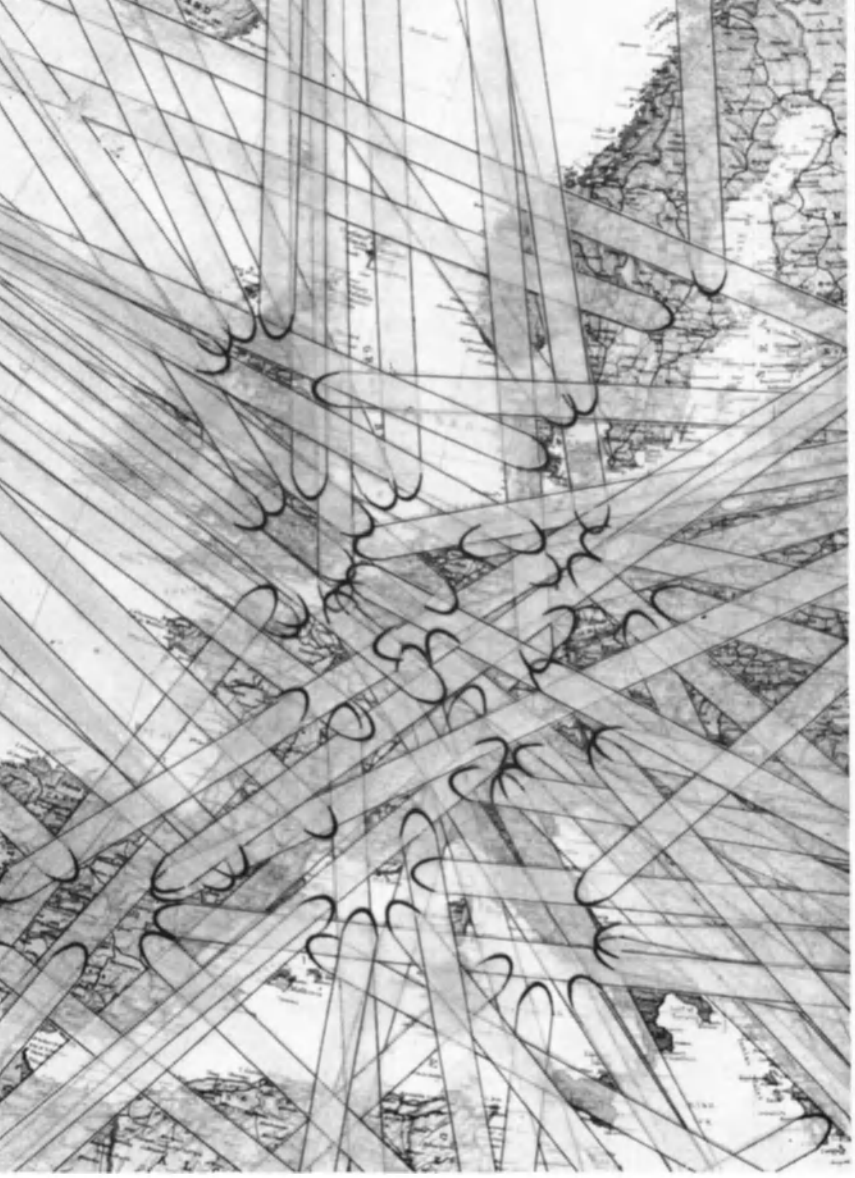

Photo The Aeronautical Reseach Institute of Sweden

OUR POISONED PLANET

In the name of progress, Man has opened a 20th century Pandora's Box of smoke, sewage, smog, detergents and noise which together form one of the great problems of our age—the pollution of our planet. We have been dumping waste into rivers and lakes, fouling the air we breathe, damaging the soil, and assailing each other with noise, that by-product of technological civilization which increases nervous strain, deafness and other mental and physical disorders (photo below). A new noise, the boom of the supersonic jetliner, will soon be added. Map, left, shows "boom carpets" that will be "unrolled" over Western Europe unless restrictions are made or muffling measures found. — *July 1967*

Photo © Walter Studer, Berne

POLLUTION OF THE OCEAN *(Continued)*

spread over an area of over one million square miles.

Due to the rapid development of the atomic industry the problem of safely disposing of radioactive waste-products has become urgent. In Britain, radioactive wastes are in some places drained by pipes into the Irish Sea, while at Oak Ridge in the United States they are drained into the Tennessee River system. Some wastes in the United States are buried in the ground or sunk in the deep sea in special containers.

The sea water, however, will very quickly eat through the walls of these containers and dissolve their dangerous contents. If scores, or hundreds, of containers with their sinister contents are being thrown into the sea today, the number will rise to tens or hundreds of thousands in the future.

There are deep places or trenches in the oceans, particularly the Pacific. The average depth of the ocean is about two and a half miles, but in these depressions it reaches between four and five miles and in places up to seven miles. Proposals are being made to use these depressions as dumping-grounds for radioactive wastes.

How long will i radioactive substances dissolv he water at the ocean bottom to rise to the surface? Will the process of radioactive decay which is always at work render them innocuous before they reach the surface, or will they still be sufficiently radioactive to poison the upper, productive layers?

SCIENTISTS hold widely differing views as to the time required for the water of the ocean bottom to be renewed. Georg Wüst (Fed. Rep. of Germany) has calculated that the cold, heavy Antarctic waters, after descending to the depths, reach the equator in five years four months, while G.E.R. Deacon (Britain) puts the figure at eighteen years. E.B. Worthington (United States) holds that the waters at the bottom of the Atlantic date back to 1810 when the climate became much colder, and have not been renewed in the century and a half that has elapsed since then.

The New Zealand oceanographers, Brodie and Burling, have put the age of the Antarctic waters north of Scott Island at a depth of 8,500 feet at 2,500 years, and of the waters near Campbell Island at a depth of 2,624 feet at 1,900 years. The New Zealanders used the Carbon 14 method to determine the age of the water, but others hold that there are a number of factors besides time affecting Carbon 14, and accordingly that these conclusions must be accepted with caution.

The Danish expedition on the *Galatea* and Soviet expeditions on the *Vityaz* found dissolved oxygen in water from the very deepest Pacific trenches. Water buried at the bottom of the ocean for hundred of years, let alone thousands, could contain no oxygen. It would be consumed in a much shorter time by various processes, both physico-chemical (the oxidation of mineral substances) and biochemical (the respiration of living organisms and the putrefaction of dead ones)—processes that are constantly at work at the bottom of the ocean and in the water above.

The Danish and Soviet expeditions discovered various forms of animal life at the bottom of the ocean trenches, which had till then been thought to be void of life. All these animals consume oxygen continually and they would long since have exhausted the

Photo © Yves Lanceau - Jacana, Paris

Photo © Gene Smith - Magnum

The primitive notion that a river is a sewer has caused many of the world's waterways to stagnate and die, killing off their once-teeming plant and fish life (above). Man's heavy hand is often most obvious in cities and industrial complexes (right) where pollution in all its forms creates a choking, poisoned environment.

supply in the water round them if there were no currents.

The water in the ocean is not homogeneous; its temperature varies both vertically and horizontally. What is more, the water in the ocean is continually in motion, neighbouring layers often moving in different directions. In this way water of different temperatures is being constantly mixed and is sinking as it becomes heavier. An equivalent volume of lighter water is displaced and rises to the surface. This eternal process extends to all the depths of the ocean, apparently penetrating to the bottom of the trenches.

We do not know as yet how long it takes surface water to descend to the ocean bottom, but evidently its movement is relatively rapid since it retains dissolved oxygen.

Among the many depressions studied by this year's Soviet expedition on the *Vityaz* was the Tonga trench, investigated six years ago by the Danish expedition on the *Galatea*. Measurements made this year gave a difference of 0.2° in the temperature of the water.

When one takes into consideration the great accuracy of the deep-water thermometers used by oceanographers, one realizes that this is a significant deviation indicating the existence of what is probably a very slow but continuous exchange of water between the bottom, intermediate, and surface layers of the ocean, even in the regions of the deepest depressions.

THE vertical circulation ventilates the deep layers of the ocean and also raises to the surface a layer rich in nutrient phosphates and nitrates, forming a basis for abundant life. But this process will bring death if pernicious radioactive solutions from the wasteproducts of the atomic industry accumulate in the ocean depths.

There is another phenomenon occuring in the oceans and seas known as upwelling. Due to winds, currents or the relief of the ocean bed, deep, cold layers of water, rich in nutrient salts, rise to the surface in some regions along the continental slope or along submerged banks. This occurs regularly along the Atlantic coast of North America, the California coast and the western coast of South America and Africa. The regions where upwelling occurs are exceptionally rich in plant and animal life, including fish. If the water rising to the surface should be contaminated with substances dissolved from radioactive wastes it will mean the end of the highly productive fisheries in these regions.

The oceans and seas are joined to form an indivisible whole—the World Ocean. No open part can be considered isolated and cannot belong to any one country. Radioactive substances introduced into the ocean at any spot will be dispersed for thousands of miles and will contaminate an area of millions of square miles.

For that reason, all questions concerning the contamination of the ocean by radioactive substances, irrespective of their origin or purpose, acquire international significance and should be solved through friendly, concerted international scientific co-operation.

The rate at which the atomic industry is developing shows that it is necessary to set about the study of this problem immediately. Uncontrolled contamination of the oceans and seas can lead to irreparable catastrophe within ten to twenty years. The Ocean, that great and inexhaustible source of food for man, is in danger.