

rust of *Coffea arabica* are severe below 4,000 feet, but slight between 6,000 and 7,000 feet. This is why in Africa *C. arabica* is restricted to the highlands and the more resistant *C. canephora* is grown in the lowlands.

In the long term the answer to rust disease in America seems likely to be resistant varieties of coffee. A breeding programme to produce resistant *C. arabica* has been in progress at the Agricultural Station of Oeiras near Lisbon since the 1950s, and doubtless all possible haste will be made with trials in Brazil. But resistant varieties cannot be developed, tested and put on the market overnight. In the meantime there will surely be a considerable setback to Brazil's largest industry, which produces thirty-five per cent of the world's coffee.

TECHNOLOGY

Two Cheers for OTA

REPRESENTATIVES of industry came last week to pay tribute to or declare war on the bill to establish an Office of Technology Assessment which would advise Congress on the impact of technological developments. Hearings continued before Mr E. Q. Daddario's subcommittee on Science, Research and Development. A prophet of doom, General J. M. Gavin, chairman of the board of Arthur D. Little, warned that it was almost too late to check technology; the rate at which environmental resources are squandered will leave the world in a perilous state before the end of this century. Industry would be only too happy to cooperate with the OTA, he said.

His main thesis was that the advent of the nuclear age has so changed the nature of society that man must radically readjust his thinking, and that, to this end, Congress must be well informed so that it can in turn educate the public. The unprecedented rate of scientific advance makes it essential that technological assessment should be part of the legislature. General Gavin was also anxious about the diversion of resources to military ends—this is why he resigned from the Pentagon in 1958.

Another witness opened fire by proposing that the OTA should be emasculated. Dr W. E. Hanford, vice-president for research and development of Chemical Group of Olin Corporation, made obeisance to the need for technological assessment but doubted the need to create a new organization; it would be less wasteful, he said, to expand the capabilities of some present organization such as the Library of Congress. And in any case, the putative OTA would be unworkable; it would have too many chiefs and not enough Indians, would be unable to react quickly enough to developments and its functions are not even properly defined. He would deprive the OTA of some of its powers, such as the right to subpoena witnesses. In contrast to his complaint that the OTA would be too ponderous, he entered a plea that the targets at which it might aim should remain stationary for long enough to allow industry to recover its investments. The bill requires that the staff of OTA have no conflicts of interest with industry; Dr Hanford felt that with so few qualified people available, it must remain essential for some time that they wear several hats at once.

Almost every aspect of the proposed OTA has been disputed. There is agreement only that Congress urgently needs to be informed of technological developments. Both the National Science Foundation and industry oppose the creation of a separate organization, while others demand a more far-reaching establishment than the modest proposal of Mr Daddario's bill. The ability of the OTA to conduct technological assessments has been called into question and there is also doubt whether it could act effectively within the present organization. But Mr Daddario's kite may be expected to continue to fly through these storms; his subcommittee appears firmly wedded to the bill as now tabled.

MOLECULAR BIOLOGY

First Synthetic Gene

from our Special Correspondent

Cold Spring Harbor, New York

THE first synthesis *de novo* of a gene from chemical components was announced last week by Professor H. G. Khorana, whose research team at the University of Wisconsin has been working on this project for the past five years. Completion of this task marks another milestone in Khorana's contribution to molecular biology—he was the joint recipient with R. W. Holley and M. W. Nirenberg of the 1968 Nobel Prize for Medicine for working out the genetic code.

The starting point for Khorana's synthesis was the determination by Holley of the nucleotide sequence of a yeast transfer RNA which codes for the amino-acid alanine. Working backwards from this sequence, Khorana used rules of complementary base pairing to predict the sequence of base pairs which must comprise the gene which specifies the tRNA. The gene was pieced together step by step. Fifteen double stranded segments of from five to twenty nucleotide residues long were synthesized by chemical means and linked covalently by enzymes to yield three large fragments between them corresponding to the entire length of the gene. These were then linked together to give a DNA sequence of 77 base pairs one strand of which specifies the transfer RNA. Using this sequence it will be possible for the first time to study the biological functions of a double stranded DNA of chemically defined sequence.

The next gene which Khorana intends to synthesize will code for a tyrosine transfer RNA of *E. coli*. Although it has taken five years to make the first synthetic gene, he expects to complete the second very much more rapidly. And once further genes are available—whether synthesized chemically or prepared biologically—not the least value of the technique which he has pioneered will be to enable them to be joined to give pieces of synthetic DNA which consist of many genes.

ENVIRONMENT

Florida on My Mind

FLORIDA may be considered a representation in miniature of the nation's most acute and intransigent environment problems. Fifty years ago it was still "wilderness"—unexploited and indeed unpenetrated