

keep the signals up to strength, compared to vacuum tube amplifiers spaced at 20-mile intervals in the last, 138-channel version. A special research program led to improved insulation that prevents the signals' energy from leaking away.

The first of the new cables, which went into operation last month, is a short hop from Jacksonville, Fla., to St. Thomas in the Virgin Islands. The next is now being laid from Puerto Rico to the Dominican Republic. The trans-Atlantic version will be placed next year for operation beginning in 1970.

Building bigger communications satellites, however, has not been a technological strain on the state of the art. Ground stations are already big enough to handle the upcoming Intelsat IIIs, and the satellites themselves will simply be given more power to handle a wider communications band.

In years to come, business developments are likely to be every bit as important to the growth of overseas communications as technological ones. Engineers are working with lasers (which pack thousands of channels into a single beam of energy), waveguides (already used to direct microwave beams but which could offer greater efficiency for other wavelengths), new switching systems (which can often double the capacity of an existing system with few other changes) and other techniques.

A major obstacle is the incredible tangle of interests vying for control of what they know will be an increasingly booming market. Comsat, AT&T, the Federal Communications Commission, RCA, Western Union International and the International Telecommunications Union are a few of the protagonists.

The ITU, in fact, already anticipates enough growth that it has adopted a plan for worldwide direct distance dialing. Under the system, to call a friend overseas, a caller would first dial an access code for the international network, then the country code, an area code, the exchange and the number itself, perhaps carrying a headful of numbers such as 900-686-807-542-0855.

LEPROSY

Step toward a vaccine

The culturing of *Mycobacterium leprae*, the bacillus of Hansen's disease, a major advance toward a vaccine for the disease, has been announced by Dr. Toyoho Murohashi, head of the tuberculosis department of the Japanese National Institute of Health.

Dr. Murohashi reported his success to a recent meeting of the panel on tuberculosis and leprosy of the Japan-U.S. Cooperative Medical Science Committee in Tokyo.

ONLY FIVE YEARS

Transplanted hearts will be shortlived

The first beat of one man's heart in another man's body was so revolutionary that the recipient's survival for a matter of days was a matter for wonder and thanks.

In the few months since this event, however, the science and technique of heart and other organ transplantation has come a long way. Strides made in countering the recipient's immune reaction to and rejection of the foreign organ have brought this demon under some control, and no one is much surprised any more to hear of patients making routine recoveries from transplants.

Now that heart recipients can realis-



Barnard: a sobering view.

tically look forward to leaving the hospital and taking up a semblance of normal life, the question arises, what kind of semblance, and for how long? South Africa's Dr. Christiaan Barnard, performer of the first heart transplant, has a sobering view.

These operations, he told the recent meeting of the Australian Medical Congress in Sydney, can only be considered palliative, not curative. A transplanted heart can not be expected to survive for more than a few years at best, regardless of the skill used in immunosuppression.

A palliative measure basically is one which postpones the consequences of a disease, for a greater or a lesser period of time. To be curative a procedure must result in the patient's being free of the disease itself.

"A transplanted heart will last only five years—if we're lucky," Dr. Barnard told the congress. However, he added, "a thing is a success when it

does what it was planned to do. The operation was planned to palliate heart disease. Dr. Philip Blaiberg would not have lived six days without a heart transplant." He said Dr. Blaiberg, who received his new heart seven months ago, now is able to lead a "practically normal life."

So the transplanted heart, because of the operation itself and the inevitable degree of physiological mismatch with the new body, must still be considered an abnormal heart. Thus the patient still suffers from heart disease, though less troublesome than before.

In line with this is a further point: In most cases heart disease is basically a symptom of a general upset of the body's biochemistry, for instance hardening of the arteries. This leads to clogging of the coronary artery which supplies the heart muscle itself with blood; the heart starves for oxygen and may eventually die from the lack (the familiar coronary attack).

Or heart disease may be the symptom or result of a mechanical failure elsewhere in the body, such as congested lungs. This puts a greater pumping load on the heart, which may then lose its elasticity, and become enlarged until it can no longer pump.

In either event replacing one heart made useless by its environment with another will only expose the new heart to the same damaging environment. Sooner or later it too will become a victim—sooner in the case of most transplants of this generation of surgery, which have to be a compromise between suitability and availability of donors.

Actually Dr. Barnard's statement should strike most organ transplant surgeons as something they already know or might expect, for the same thing holds true for nearly all tissue transplants.

Kidney transplants, for instance, though major surgery, are by now almost routine. Yet even these have a poor record of long-term survival. There appears to be a gradual deterioration which cannot be explained simply as a rejection process.

Dr. Donald E. Kayhoe, chief of the transplantation immunology branch of the National Institute of Allergy and Infectious Diseases, Bethesda, Md., says several factors may come to bear on the transplanted organ. Rejection, the tendency of the body to destroy foreign tissue, may be the most obvious factor at first. But of equal importance are the state of the patient's health generally and the specific nature of the original disease.

The relationship between the rela-

tively normal tissue of the transplant and the sick environment of the patient, says Dr. Kayhoe, is a "very sophisticated research problem." So far, he says, physicians have not had long enough experience with enough transplant patients to draw reliable conclusions.

An immediately practical consequence of what Dr. Barnard says is that surgeons may not need to be so rigorous in selecting young donors if other factors, such as tissue type, are favorable.

"It was thought at the beginning," Dr. Barnard says, "that we needed young donors. But there is no real need for this, as a transplanted heart will last only five years. So we can use donors of 50, as long as their hearts are functioning normally."

(Meanwhile, in both Houston, Texas, and Sao Paulo, Brazil, surgeons performed unprecedented quadruple transplants of organs from single donors. In Texas, a 60-member team under Dr. Michael E. DeBakey used the heart, kidneys and one lung from a woman suicide.

In Sao Paulo, another gunshot victim provided a heart, kidneys and a pancreas for four patients in Das Clinicas Hospital.)

DISEASE DYING OUT

Cannibalism may spread kuru

Kuru, the fatal nervous system disease found in the Fore tribe of New Guinea is now dying out—as cannibalism declines.

Dr. R. W. Hornabrook, director of the Institute of Human Biology of New Guinea, says he is convinced the disease arises from ritual cannibalism, which has been disappearing from the highlands of eastern New Guinea since missionaries came.

When kuru first was found among the Fore tribe it was thought to be a genetic disorder because of the limited area in which it spread. But later research showed that it occurred occasionally among neighboring tribes and also among women who married into the Fore tribe. Doctors also were puzzled by the fact that after about 1960 virtually no children appeared to contract the disease, although earlier it had been common among them.

Anthropologists traced the course of the epidemic and established that it spread at a constant rate through the tribe. Although there has been no airtight evidence to prove it, a number of doctors have concluded that kuru was transmitted through the process of ritual cannibalism that required a family to eat any member who died.

Dr. D. Carleton Gajdusek, chief of collaborative and field research of the

National Institute of Neurological Diseases and Blindness, Bethesda, Md., who has spent considerable time in New Guinea doing research on kuru, agrees with Dr. Hornabrook that ritual cannibalism could have played a role in the transmission of kuru.

Dr. Gajdusek, with Dr. Clarence J. Gibbs Jr., and Dr. Michael Alpers last



NIH

Human brain tissue gave chimp kuru.

year reported transmission of a syndrome closely resembling kuru in man, from chimpanzee to chimpanzee.

The affected chimpanzees belong to a large colony that had been inoculated with brain suspensions from human patients with multiple sclerosis, Parkinson's disease and other neurological ailments.

Dr. Hornabrook emphasized that kuru was the first neurological disease believed to be transmitted by an infec-

METEOROLOGY

Hail-fighting plan

There are few meteorological phenomena in which the interplay of the macroscopic and the microscopic is more perfectly coordinated than the storms that produce hailstones. The range is from the miniscule scale of nucleation and crystal growth up to the sweeping drafts within the cloud.

Hailstorms cause between \$200 million and \$300 million in crop losses every year in the United States alone. The costs world wide cannot be estimated, but the economics are sufficiently severe to have caused at least five other countries to engage in large-scale projects to decrease hail.

They are the Soviet Union, France, Kenya, Canada and Italy.

Until now, U.S. projects on hail suppression have been fragmented; in response to a recent request from the

agent. The linkage with ritualistic cannibalism opens the way to further research on more common brain disorders, he declares.

Sir Macfarlane Burnet, Australian immunologist who won the 1960 Nobel Prize, believes, after touring the New Guinea highlands, that kuru "holds in unprecedentedly concentrated form, a manifestation of some of the most important problems in general medicine." Understanding the disease would be a major medical advance.

Kuru appears to destroy the brain in stages. First, patients lose coordination. Their legs tremble and the victim cannot stand or sit correctly. Finally there is difficulty swallowing and the patient eventually chokes to death or succumbs to starvation or pneumonia. Death occurs within a year.

Kuru is a Fore word that means trembling associated with fear or cold. Its common name is laughing sickness or laughing death, so-called because of the slack facial muscles of its victims, who seem, at one stage of the illness, to be laughing.

Investigators in England, Scotland and the United States have noted striking similarities between kuru and the incurable brain disease of sheep called scrapie (SN: 2/18/67, p. 167). Intense itching drives the sheep to scrape off their wool by rubbing against any firm object they can find. Brains of normal sheep have been injected with materials from the brains of patients who have died of multiple sclerosis, and some of them have developed a disease similar to scrapie.

The transmissible agent of scrapie is believed by some scientists to be a subviral basic protein. Others insist that the cause is a genetic abnormality.

Federal Council for Science and Technology, the National Science Foundation has come up with a national plan for attacking the problem.

The program, developed by the National Center for Atmospheric Research, is now under review by the FCST. It calls for spending \$3 million to \$4 million a year during the next five to ten years, in an effort to modify hail formation.

In the pilot project next summer, Colorado State University scientists will rocket explosive nose cones into the center cell—the hail-producing core—of thunderstorm clouds. Detonation of the cones, containing lead iodide as a seeding agent, will be timed by command from ground radar.

The idea is to cause the formation of many more hailstones than would other-