other time.

- How the penetrating particles obtain their energy.
- Why the northern and southern lights take the forms they do, splitting up into isolated fingers and streamers as the display progresses.
- The reasons for the color changes, even though the basic cause of the colors is known to be due to oxygen and nitrogen in earth's far-out atmosphere.

Auroras do odd things to radio waves. They disturb long-distance shortwave communications, but boost the distance that television and other very high frequency waves can be received by acting as reflectors.

LEPROSY

Latin Campaign

Leprosy probably exists in each of the 24 Latin American countries, although only 16 report it. While 171,000 cases are known, a much larger number of persons suffer from some stage of the disease.

Now health authorities are closing in on leprosy with drug treatments and a search for a usable vaccine.

Venezuela, with 11,000 reported cases, is attacking leprosy with injections of the drug DDS (diphenyl sulfone). Its campaign is aimed at the 44,000 contacts who share the homes of known victims. A preliminary study of 300 patients showed that the drug is effective in most cases, preventing the disease from ever reaching its infectious and dangerous stages. Now a broadened effort seeks out 6,000 prospective victims.

Drugs, not vaccines, however, are still the chief weapon. BCG, the vaccine against tuberculosis, has been given to some 8,000 children in Uganda, with apparent immunization not only for TB but for leprosy. It also is being used experimentally in Mexico and other places. (SN: 6/3).

Leprosy contacts in Brazil.

But many more years of testing will be required before a universal vaccine can be assured. In the meantime, early diagnosis in children or adults, many of whom have no symptoms at first, can insure its arrest.

There are three principal types of leprosy, also called Hansen's disease for Gerhard Hansen, a Norwegian doctor who died in 1912. He isolated the bacillus Micobacterium leprae, characterized by lesions of the skin or of the nerves. First is the indeterminate form; the second is the tuberculoid form, which is less dangerous that the third form, which is called lepromatous.

IMMUNE REACTIONS

Minuscule Molecules Sidestep Antibodies

Three years ago a British scientist showed that under some circumstances, the body's normal immune reaction to foreign invaders can be sidestepped. Dr. N. A. Mitchison of the Medical Research Council, London, repeatedly injected very small doses of cow albumin into mice and discovered that the mice, instead of building up antibodies to the foreign serum, became quite accustomed to it.

But albumin is not a particularly toxic substance in any animal, and it was not startling that the mice tolerated the cow protein.

Nevertheless, Dr. Mitchison's work attracted the attention of a group of scientists on the other side of the world; they took his findings a step further. Late last month at a symposium on biological research at Cold Spring Harbor, N.Y., and at the American Medical Association's annual meeting in Atlantic City, some of the recent results of the work of Australian scientists were discussed by Dr. Gustav J. V. Nossal, director of the Walter and Eliza Hall Institute of Medical Research, Melbourne.

The Australians found that the ability of an individual to attack a foreign invader depends on the molecular size of the invader. If the invading molecule is small, the body tolerates instead of fighting it. Large molecules, however, trigger the normal mechanisms of the immune system which swing into action and attack the foreigner, be it virus or bacteria, skin or kidney graft.

Kidney transplants, for example, frequently fail to work because the patient builds up antibodies to fight off the highly antigentic substances in the donor kidney. The donated kidney is recognized by the immune system as something foreign and is rejected. The present procedure for avoiding rejection is to use drugs to paralyze a patient's entire immune system—a procedure which enables him to accept the new kidney, but which leaves him vulnerable to attack by innumerable infectious diseases.

The Australian experiments on mice and rats involved a much more powerful antigenic material than Dr. Mitchison's albumin. Dr. Nossal and his team used salmonella bacteria, highly toxic organisms often associated with food poisoning.

First they injected whole bacteria, about two microns in diameter. Next, a salmonella flagellum, a piece of the bacteria about the size of a virus, was injected. Third, the flagellin material was broken down into even smaller pieces, equivalent in size to about 300 amino acid molecules.

With the first two injections, the rats and mice showed a normal immune reaction. But there was no immune response to the third and smallest salmonella particles, injected into young mice with immature immune systems.

Recently the Australian scientists broke the salmonella down into still smaller particles. Adult animals tolerated these completely after a series of injections.

Using a new combination of biological research tools, the electron microscope with the radioautograph, the doctors traced the path of antigens injected into animals and discovered why the large molecules set off immune responses while the smaller ones escape detection.

Tiny pieces of antigenic materials diffuse through all body tissues, they discovered. Large ones, on the other hand, collect in the reticuloendothelial system—the body's field headquarters for fighting disease. The system is a factory for lymph cells that catch disease causing bacteria, isolate and destroy them.

If an antigenic molecule is large enough to be caught by the reticuloendothelial system, it sets off immune responses. If small molecules get through the defense network, the body tolerates the invaders which, in the case of salmonella, infect it.

Dr. Nossal is calling for a worldwide effort to purify the antigens involved in graft rejection and for further studies to see if this work can be repeated. "If one can purify these antigens then we might get a molecule sufficiently small and of the right structure to evade the reticuloendothelial system and so allow tolerance to develop" before an organ is transplanted he says.

Organ transplantation might then be perfected in the 1970s, he says; allergies and autoimmune diseases conquered in the 1980s; while the control of cancers caused by some antigen such as a virus might be expected in the 1990s.