

foolish not to have developed all defensive and offensive angles of this potential weapon. Our enemies were or could have been at work in their medical laboratories.

On the eve of the United Nations Organization's first general assembly, even the facts about biological warfare so far developed may seem to add to the diffi-

culties of building the peaceful world. Like the atomic bomb, however, biological warfare makes a united peaceful world all the more urgent.

The only hope is to bring germs and atoms alike into the open so that they may be controlled in the interest of all peoples.

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BIOLOGY-MEDICINE

Harmful Effects Persist

Biological warfare doesn't stop with surrender or armistice; once it is let loose it cannot be brought under control again like other forms of war's destructiveness.

By FRANK THONE

► BIOLOGICAL warfare, loosing the germs of pestilence against whole peoples, will undoubtedly strike humaneminded persons as the ultimate in atrocities. It isn't, necessarily; people suffer just as agonizingly from flame-hurt and bomb-blast as they would from plague or cholera—or whatever diseases might be sown among them by an enemy.

No, the worst horror about biological warfare is that once loosed it cannot be brought under control again. Other forms of war's destructiveness are more or less self-limiting: they run their course and stop. The most awesome of them all, the atomic bomb, strikes with the suddenness of a thunderbolt. Most of the thousands who died in Hiroshima and Nagasaki did not even have a hundredth of a second in which to realize that they were dying. Other explosives, though more limited in scope, can be almost as instantaneous in effect.

Incendiary fires, though self-propagating, are also self-limiting. A town or a factory may burn for days, but when everything combustible has been consumed the fire goes out. When the victor moves in, he finds the ruins charred, but cold.

Even the worst of the poison gases, like lewisite and the nitrogen mustards, are limited in their effects. They may contaminate an area so severely as to interfere with the advance of the user's own troops, but after a couple of good rains their curse is washed from the countryside.

Not so, however, with the germs of disease that man may launch against his fellow man, or his ox and his ass, or his wheatfield and vineyard. These are self-propagating but not self-limiting, except

in the mysterious fashion that some epidemics have, of "running their course". But even then, there always remain some reservoirs of the disease, in which it remains latent for a time and then breaks forth again.

The same would be true of artificially propagated diseases of crop plants or of forest or orchard trees. Once an infestation is let loose among them it is almost never eradicated. One or two such plagues have been stopped, but only by most drastic methods and in limited areas, like the outbreaks of citrus canker and the Mediterranean fruit fly in Florida some years ago. For the most part, however, the story is one of heroic effort and final failure: black stem rust of grains, late blight of potatoes, codling moth in fruits, are only three out of a thousand possible examples. And their mischief was wrought blindly and spontaneously; they had no aid from a malicious enemy in getting started.

We must face the fact that if one nation launches such uncontrollable agencies of harm against its neighbor, the war will never stop. Plagues and pests recognize no surrender, know no armistice. A germ-conquered people will make occupation unsafe for the conqueror's troops unless they are thoroughly immunized; and although the weakened survivors may offer no resistance to the victor's will they will be too inert to give obedience to his decrees. Their wasted fields, with blights still sweeping on unchecked, will have little capacity to pay reparations.

Such pestilence-ridden lands could easily forbid entry to victorious armies, even though the exhausted losers could not fire a shot against them, simply through fear of the black tributes of defeat that homegoing troops might carry



PROTECTION NEEDED—Resembling a "Man from Mars," a man wearing a rubberized protective suit prepares to go about his duties at the Naval Medical Research Unit.

back with them. If intercontinental war is ever waged with biological weapons, it may become necessary to maintain intercontinental quarantines for years afterwards, with communications (if any) maintained only by cable and radio, and even the magnanimous victor's charity gifts of food and medicine dropped hastily from speeding planes or impersonally hurled across the oceans in rocketcraft.

Biological warfare can be terribly devastating. But it is a two-edged weapon, not to be lightly unsheathed.

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SEISMOLOGY

Last Earthquake Of 1945 "Got Lost"

► THE LAST big earthquake of 1945 "got lost" and has only now been turned up by seismologists of the U. S. Coast and Geodetic Survey, after a study of data transmitted by wire and radio through Science Service. It was a very heavy shock, but probably produced no harm, for it shook the ocean bottom off the northern coast of New Guinea.

Epicenter location was in approximately 5 degrees south latitude, 147 de-

grees east longitude. Time of origin was 12:48.4 p.m., EST, on Friday, Dec. 28.

Observatories in England and Australia announced on incomplete data that the earthquake took place in the Antarctic regions. This was an entirely natural mistake, for when earthquake locations are given on the basis of observations by only one station they may be fully 180 degrees off the compass bearing estimated by the observer. Only when reports from three or more stations are available is it possible to strike

intersecting arcs and pin the epicenter down to a definite locality.

Seven stations reported to Science Service. They were the observatories of the Jesuit Seismological Association at St. Louis University, Weston College in Massachusetts and Spring Hill College in Alabama; the observatories of the U. S. Coast and Geodetic Survey at Honolulu, Tucson, Ariz., and College, Alaska; and the observatory of the California Institute of Technology at Pasadena.

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PLANT PATHOLOGY

Could Attack Food Crops

Fungus-spore blasting of Japanese rice and other food crops could have followed atomic bomb if Japs had put up a fanatical resistancé.

By FRANK THONE

► IF THE Japanese had put up the fanatical, last-man resistance on their home islands that many expected of them and used the biological warfare they were preparing, atom-bomb blasting of their cities might have been followed by fungus-spore blasting of their rice and other food crops, to starve out the scattered resistance forces hiding in the hills.

By the same token, that kind of starvation strategy might be used against any people in a future war, if cities are broken up and populations dispersed to make the concentrated attack of atomic missiles difficult and unprofitable.

Although no specific kind of disease-producing organism is mentioned by name in the just-released report by George W. Merck, special consultant to the War Department, his definition of biological warfare explicitly includes the use of bacteria, fungi and other disease germs against plants as well as against men and animals. The scope of biological warfare might properly be extended to include larger organisms, such as insects and parasitic worms, whether they cause disease directly, serve as carriers of diseases like malaria and typhus, or produce crop failures by ravaging the fields.

One of the advantages that lies with the attacker, in this kind of warfare, is the enemy's inability to determine what is harming him until the mischief has actually commenced. For any given crop, several distinct kinds of plant-disease germs are at the choice of the attacker, no two of which can be met

with exactly the same means of defense.

As a specific example, rice is attacked by half-a-dozen fungus diseases bearing such depressing names as blast, black smut and mildew. Sweet potatoes, another highly important food crop in Japan, has to contend with black rot, dry rot, ring rot, soft rot and white rust, which are all fungus-caused; also with burrowing nematodes, which are small, soil-infesting worms; with several virus-caused diseases, and with one or two bacterial rots. Soybeans, a third great standby in the Orient, are attacked by at least five different kinds of fungi, four or five kinds of bacteria causing blights and leaf spots, a virus causing mosaic disease, and finally by a nematode that causes root-knot.

This array of farmers' woes affects only three crops, and does not include the insect enemies of even those. Probably not all of these fungi, bacteria and viruses could be pressed into service for the purposes of biological warfare, but certainly enough of them could be to make the lot of the Japanese farmer even more unhappy than it normally is.

In Europe, different crops have major importance, and different diseases would be used against them. The attack would probably center on the grains, potatoes and sugar beets. All the grains, including American corn which is extensively grown in the Danube and Po valleys, are susceptible to smuts, rusts and root rots, all of which are fungus-caused. There are plenty of other grain diseases, but these alone would cause plenty of trouble. Potatoes are liable to the blight that caused



THIS IS NEPTUNIUM — Dark brown neptunium dioxide is shown at the bottom of a capillary tube. About 10 micrograms is shown and it is the first compound of this element to be isolated. This neptunium is the long-lived isotope 237 and it was isolated June 21, 1944, from uranium bombarded with neutrons from a cyclotron. Magnification is about 15 diameters. The scale shows millimeters and part of a dime appears in the photograph. Photograph from Dr. Glenn T. Seaborg, discoverer of elements 94, 95 and 96, who did chemical work on the atomic bomb elements. One isotope of neptunium is a stepping stone to the formation of plutonium, one of the atomic bomb elements.

the great Irish famine of the 1840's, as well as to several serious virus diseases; it might be possible also to sow striped American potato beetles across the fields from low-flying airplanes. Beets are susceptible to several virus diseases, to a number of rots that attack their big, juicy roots, and to such fungus-caused ills as root tumor, dry rot and leaf spot. Obviously, biological warfare might play hob with Europe's ability to feed its own population.

Still another kind of biological warfare might consist in sowing seeds of foreign weeds. America has had plenty of bitter experience with alien plants even though