

NATURAL RESOURCES

Deep Freeze Locker

Permafrost, the Arctic's permanently frozen ground, presents problems in military construction, in farming and mining. The layer goes down 1,000 to 2,000 feet.

By WADSWORTH LIKELY

► MILLIONS OF dollars worth of treasure are in a gigantic deep freeze "locker" built by Mother Nature.

The treasure is in all forms—mineral wealth, the profits on agricultural enterprises, anthropological and archaeological finds—and the permafrost of the Arctic prevents man from getting at it easily.

This permanently frozen ground of the northern part of North America also gets in the way of the free world's defenses. It makes problems for those who have to build air strips, radar stations and other military installations. Building roads over permafrost presents a special problem. Heated houses begin sinking into the ground as the heat slowly melts the permafrost, unless special engineering tactics are used.

The Russians have the same problem. A broad belt of permafrost exists in Siberia, sometimes going surprisingly far to the south. Russian geologists and engineers have studied this Siberian permafrost and Americans can make use of much of the Russian knowledge, published in the 1920's and 1930's before the Communists clamped down so tightly on exporting scientific knowledge.

A Shorthand Word

"Permafrost" is a sort of shorthand word with which the scientists, who like exactness, are not quite comfortable. It has been defined by one scientist as "a thickness of soil or other superficial deposit, or even of bedrock, at a variable depth beneath the surface of the earth in which a temperature below freezing has existed continually for a long time (from two to tens of thousands of years)."

Scientists would prefer the term "permanently frozen ground," or better still "perennially frozen ground." Some geologists have coined the words: "cryopedology, congeliturbation, congelifraction and "cryoplanation," each of which covers the subject with more precision, they think. However, "permafrost" has become popular, and "permafrost" it will probably remain.

Permafrost starts quite close to the surface, the top of it unfreezing in summer and freezing up again in winter. It has been known to go down as far as 2,000 feet—this in northern Siberia. In Alaska the greatest known depth is about 1,000 feet, south of Barrow.

The part which affects man most is what is called the active layer, that part which

thaws in summer and freezes in winter. In it all plants are rooted, and all churning and soil movements take place. The active layer provides the peculiar ground surface characteristics which make permafrost regions easily recognizable.

No one knows exactly how permafrost got started. It is maintained, they know, because not enough heat gets into the ground from the sun during the summertime to keep the annual average temperature of the ground above the freezing point. Thus the ground stays frozen.

Scientists are asking each other whether this cold reserve is the result of the present climate or if it is left over from past, colder climates. Right now permafrost seems to be retreating northward, disappearing on its southward borders and growing thicker on its northern borders.

Constant slight changes in climate can change permafrost conditions in many areas. These changes, whether regional or local, can be brought about either by man or nature. It is the active layer which most concerns man.

When thawing or thawed in the summertime, the active layer is an unstable, water-logged mass resting on the stable perma-

frost. Drainage of the excess water is not possible, no water can seep into the ground to provide stores of ground water. This material rests uneasily on its permafrost base and can creep and flow when a gentle slope is provided.

Man can change this. If he removes the covering of vegetable matter in order to farm, he destroys the insulation nature provided. Thus the sun can pour more heat into the ground. At agricultural experiment stations in Alaska, fields have become unusable after several years of farming because of the melting of large blocks of permafrost beneath the surface. Caverns or gullies form in cultivated fields.

Cultivation May Be Possible

Future studies, agriculturists hope, may develop principles for the farming use of the active layer so that fields are not destroyed or so that areas subject to caving and settling can be avoided.

During World War II, the armed forces encountered many difficulties in obtaining permanent water supplies and in constructing runways, roads and buildings in permafrost areas. The problem becomes even more important as our most likely enemy faces us across the North Pole.

With the emergence of these problems, American scientists realized that permafrost had been the greatest single deterrent to the settling of the northern part of Siberia.



ALASKAN RUNWAY—The caving and irregular settling shown in this picture took place in a gravel fill over thawing ice wedges at Umiat, Alaska. This and many other construction problems are the result of disturbing nature's deep freeze locker.

The Russians have worked long and hard on the problem, and Americans have been able to avail themselves of the Soviet findings.

The Russians found that it is a losing battle to fight the forces of frozen ground simply by using stronger materials in construction or by resorting to more rigid designs. They learned that construction designs should appreciably minimize or neutralize the destructive effect of permafrost. Frost forces are utilized to play the hand of the engineer rather than against him.

Used as Construction Material

Permafrost can itself be used as construction material but, if so, steps must be taken to see that it is kept frozen. If that cannot be done, it must be destroyed, and then steps taken to see that it does not come back.

All construction problems are individual and they depend on the nature of the permafrost. Is it expanding, is it stabilized, or is it being destroyed by nature? What kind of material is in the permafrost, how deep does it go? These are some of the questions the engineer has to answer for himself before he begins planning each individual construction job.

Artificial freezing, during a few hours on summer days, can be used to treat bad slides on roads and railroads, settling under expensive buildings, loosening of the foundations of dams, bridges and towers.

Scientists and engineers emphasize that much future research into the nature of permafrost is needed. The surface, literally and figuratively, has been barely scratched.

"As our civilization presses northward," says Robert F. Black, permafrost expert of the U. S. Geological Survey, "the practical needs of construction, water supply, sewage disposal, trafficability, and other engineering problems must be solved speedily and economically. Our present knowledge is relatively meager, and trial-and-error methods are being used too frequently."

Science News Letter, July 19, 1952

TECHNOLOGY

First Anti-Sub Sub Has Extra Sonar Gear

See Front Cover

► THE USS K-1, the Navy's first anti-submarine submarine, is shown on the cover of this week's SCIENCE NEWS LETTER. The sub recently visited Washington to give Navy officials a chance to see the latest developments in undersea warfare.

The boat is 195 feet long and displaces 750 tons. Her appearance differs from many other submarines because of the added sonar equipment, used to locate submarines by sound wave reflection, housed in the forward bulge.

Science News Letter, July 19, 1952

Chloromycetin Dangers Investigated After Death

► "QUITE A substantial number of deaths" were among the almost 300 cases of blood disorders found by the Food and Drug Administration among people who had been given the wonder drug, Chloromycetin (chloramphenicol).

Some of the cases of blood disorder have already been diagnosed as aplastic anemia. Experts are checking on the rest.




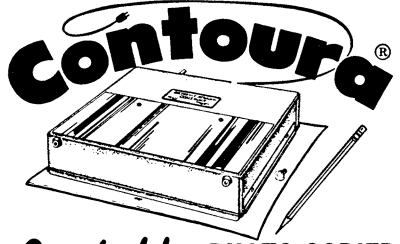

Whether they are actually due to the use of the first practical synthetic antibiotic or merely a coincidence will be determined by a panel of physicians and blood experts to be called by the National Research Council's medical division. It was pointed out that several million people all over the world have been given Chloromycetin and, perhaps, thousands of lives have been saved by the new drug.

Physicians have been warned, in administering the drug, to watch for signs of disorders in the blood-forming functions of the body, particularly if the medicine is given over a period of time, or for a second time after a long interval.

It was pointed out that many of the new wonder drugs have side effects and physicians have learned to watch for them. A study will be made of such cases.

Science News Letter, July 19, 1952

4 SHORT-CUTS FOR SCIENTISTS

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44 Pease Rd.
Woodbridge, Conn.