SCIENCE NEWS

Science Service, Washington, D. C.

A SURVEY OF OIL IN ALASKA

OIL in the Arctic is the objective of Dr. Philip S. Smith, of the U. S. Geological Survey, who has just left for Alaska to continue his survey of the government's great oil reserve on the shores of the Arctic Ocean. According to present plans, the party will make a 700-mile trip overland with dog sledges from Nenana, the northern terminal of the Alaska Railroad, to Kotzebue, on an arm of Bering Strait, and thence northeastward across the unexplored Arctic coastal plain and adjacent regions. From April until September they will be wholly out of touch with civilization, and will have to subsist entirely on supplies which they will carry, plus what game the country affords.

"Of course there is oil there," Dr. Smith told a representative of Science Service. "There is a great deal of it, if our explorations during the past two years mean anything. But we must not immediately jump to the conclusion that the Navy is sure of fuel in unlimited supplies. If you will look at the map you will see that there are some very difficult problems to be solved before we can get the oil out.

"Even though the best indications we have found so far are near the sea, it is unlikely that tankers can be used to carry the oil. That part of the Arctic is free of ice for only about one month in the year, and not certainly free even then. Moreover, there are no harbors, and large ships have to lie at least a mile off shore. That would mean an almost impossible job of storage and loading, and would require a whole navy of tank ships.

"I am not intending to throw cold water, however. If we discover oil in large enough quantities to justify it—and that would require very large quantities—the railroad could be pushed through, or a pipe line built. But a pipe-line would present problems of its own. The mean annual temperature of that region is only ten above zero, and the line would probably have to be kept heated at frequent intervals, or the oil would become too thick to flow. Fortunately, there is a good deal of bituminous coal up there, so we probably would not have to burn some of the oil to heat the rest. However, all this is speculation as to the future; what we have to do just now is first catch our oil."

According to Dr. Smith, the Arctic slope of Alaska is not a very exciting country. For seventy-five or eighty miles inland from the coast it is flat tundra, more or less marshy and traversed by slow, meandering rivers. Then there is a rise, a sort of low piedmont, sloping up to the foot of the interior mountain range. This region more or less resembles parts of Oklahoma and eastern Colorado, except that the vegetation is dominated by low bushes, mosses and lichens, instead of the grass of the plains states. The principal large game is caribou on the lower levels, and mountain sheep as one gets up into greater altitudes.

AUTOMATIC CODE MESSAGES

IF the code message in Edgar Allan Poe's famous story, "The Gold Bug," had been written on the machine described on February 9 to the American Institute of Electrical Engineers, Legrand would not have had such an easy time deciphering it, for the age-old search for a method of putting important messages into a code which can not be interpreted without the use of the key seems to have been achieved.

The new machine was described by G. S. Vernam, engineer of the American Telegraph and Telephone Company, who stated that it had been developed for the use of the Signal Corps of the U. S. Army during the war, but until recently it has been kept secret. However, one of the advantages of the device is that even an unauthorized person who has full knowledge of the methods and apparatus used can not interpret the message without the key.

In use, the sender writes the message on a keyboard similar to that of a typewriter, and a perforated tape results which can be used in tape transmitters frequently used in telegraph offices. By means of another kind of machine, if it is desired, the cipher message can be written directly in five-letter code words on paper in ordinary characters. When the message is received, it is written on a tape in perforations, and when this is passed through the deciphering machine, the message is written out in plain text on a sheet of paper.

The method used is one involving what is referred to as a multiple alphabet substitution cipher. In the ordinary substitution cipher a cipher alphabet with the letters arranged in an arbitrary manner replaces the actual alphabet in the same order. That is, instead of starting A, B, C, etc., the cipher alphabet might start F, Q, R, etc., and in use, the letter A in the original message would become F in the cipher; B would become Q, and so on. Such a cipher may easily be interpreted in the way Poe made famous in "The Gold Bug," by noting the letter that occurs oftenest and calling it E, which is most used in the English language. O is the next oftenest used, with T a close third, J, X and Q being the least used.

With the multiple alphabet cipher, a series of cipher alphabets are used one after the other, the order being given by means of the key word, but the same alphabet is used over and over at regular intervals. While more difficult than the single alphabet, the cipher expert, or "cryptanalyst," can interpret such a message without the key. However, if a key as long as the message itself is used and the letters in it are selected at random, it is practically impossible to translate it. This is the system used in the machine, and the key is another tape, so that the transposing of the letters is done automatically.

As a further improvement, a way was found to obviate the use of a tape as long as the tape of the message itself. This was accomplished by using two loops of tape which combined give the key. One loop is one character shorter than the other, so that as the two tapes pass through the

machine at the same rate of speed, they must go around many times before the same combinations are repeated. This gives the effect of a very long tape.

Mr. Vernam stated that the apparatus could also be used for radio, or if necessary the code tape could be sent by mail without fear of its being interpreted by an unauthorized person.

AN ARTIFICIAL PRODUCT TO REPLACE HISTIDINE

EVIDENCE that the bodies of men and animals are not quite so exacting in their protein food demands as biochemists had supposed is obtained from important experiments in nutrition performed at the University of Illinois, by Drs. William C. Rose and Gerald J. Cox.

The experiments resulted in successful use of an artificial product to replace histidine, which was previously thought to be one of the twenty building stones of protein essential for the growth and development of men and animals.

The fundamental raw materials for the survival, growth and reproduction of animals have been grouped under four heads; sufficient fat or sugars to supply energy for body heat and locomotion; a small amount of metallic salts; accessory substances, known as the vitamins; and nitrogenous materials containing some of each of the 20-odd "amino-acids" of which the proteins are constructed.

Hitherto, animals fed on artificial diets lacking one or more of the amino-acids failed to develop properly. Dr. Rose demonstrated, however, that experimental laboratory animals reached maturity if, instead of histidine, a substance similar but lacking the characteristic amino group, was eaten.

"This is the first time that a synthetic product, devoid of an amino group, successfully replaced histidine," Dr. Rose explained. "Growth, while not so rapid, was decided."

Presumably, the successful substitute, imidazole lactic acid, stole an amino group from other amino-acids in the artificial diet.

The discovery may be of twofold practical significance, it is pointed out. Proteins classed as "incomplete," such as gelatin, which lacks three of the essential amino-acids, may be rendered adequate from the nutritional point of view by the addition of relatively simple compounds. Again, future economic or agricultural conditions may render it expedient to manufacture food proteins, instead of waiting for the process to be carried on naturally by plants. In such an event, the synthetic chemists now know that substances approximating, but not duplicating the natural materials, may be adequate for maintaining the health and functioning of the body.

The report is of particular interest in view of the fact that histidine is a constituent of nearly all common proteins and as such has been regarded as fundamental.

EGYPTIAN COTTON

ALTHOUGH more than half of the world's cotton crop grows on American soil and a third of all the cotton in foreign mills comes out of American gins, American manufacturers get exceedingly nervous if Egyptian planters decide to limit the crop.

The reason is that there is cotton and cotton. The kind that grows under Egypt's desert sun has the longest, finest fibers of any in the world, except the Sea Island cotton which grows in small quantities in the West Indies. American manufacturers like to use it for cord tires and tire fabric, and it is also used in making very fine cotton goods.

The Egyptian Government, which regulates all agriculture, through the simple fact that it can turn off the water in its irrigation canals by a mere twist of the wrist, occasionally deems it advisable to take a tuck or two in the cotton acreage. This has been done at least twice in the last ten years, U. S. Department of Commerce officials say. And now, they claim, restrictions have been proposed for the 1926 crop which will be planted this spring.

A statement of Secretary Hoover to a congressional committee investigating foreign monopolies that control American necessities is as follows: "The motives behind the restriction of acreage may be attributable to one of two reasons, or possibly both. Cotton in Egypt is raised under irrigation depending on the reservoirs of the upper Nile, and from time to time there are shortages of water, and we may consider this the cause. However, there appears to be no such condition existing at the present time, and there is reason to believe that the intention to restrict acreage during the coming season is based upon the desire to influence prices."

Although the United States raises a small amount of Egyptian cotton of its own in Arizona and California, it has not been as popular as the imported kind. Spinners claimed the American long staple or pima cotton could not be worked as well because it was not as carefully handled as that from Egypt. At any rate the demand tapered off, and the production of pima cotton dwindled from over ninety thousand bales in 1920 to about four thousand in 1924.

There is no real reason why the United States should be dependent on Egypt for this product, in case of need. The climate and length of season in Arizona is very much as it is in Egypt. It is a question of labor, and of prices. Pima cotton costs more to produce as it requires greater care. Egypt has cheap labor and can compete successfully in spite of transportation rates.

IDLE TIMBER LAND

DESPITE the efforts of the U. S. Government in the past half century to encourage forests, 81 million acres of land suitable only for timber growth is now lying idle. This denuded area, moreover, is chiefly in the East where the lumber is most needed for manufactures.

But this is not to the discredit of the United States Forest Service. Without its aid, the figure would have been much worse. The forestry service has taken great strides towards conservation since Dr. Franklin B. Hough began his research and educational program of reforestation

and protection in 1876, the semicentennial of which will be celebrated this year.

A half-century ago there were no government-owned forests set aside for conservation. To-day 21 per cent. of the 470 million acres of forest land in the United States is owned by the public—nation, state or municipality—reports William B. Greeley, chief forester.

We use forest products in such a multiplicity of ways that they are a great drain upon our forests—in pencils, paper, turpentine, rosin, soap, shoes, automobiles, boats and even in artificial silk. As the population goes uphill our forests go downhill. Four times as fast as the forests can be replenished, they are being depleted. Two hundred and fifty million trees of average size are cut every year, or an area equal to Massachusetts, Connecticut and New Jersey put together. A large amount of this lumber is used by newspapers, for it takes 16 acres of spruce trees to make the paper for one Sunday edition of a metropolitan newspaper.

Mr. Greeley sees as one help to the situation the making of forestry a part of diversified agriculture, that is, forest planting on farms and the practical instruction of farmers in forestry. Already 150 million acres of forest land —nearly one third the total for the entire country—is in farm holdings. Fifteen states now maintain forest nurseries from which small trees are furnished at nominal cost to farmers and other landowners desiring to plant them.

ITEMS

ANOTHER gap in the spectrum of radiation, which includes light, X-rays, radio waves and the very short rays investigated by Millikan, has now been filled, it was announced recently by Wynn Williams, of the University of North Wales. He has been making investigations of sparking between electrodes and accidentally found the new rays, which are believed to fill part of the gap between the longer X-rays and the short ultra-violet rays, which lie beyond the violet and the visible spectrum. It is stated that the new rays will penetrate air for several meters and will go through thin celluloid films, but are stopped by solids such as gold leaf and even thin mica.

TEN prehistoric stone tombs containing richly sculptured copper ornaments and plates, together with traces of beautiful feather mantles, woven fabrics and matting preserved by contact with the copper, have been unearthed from an ancient Indian mound near Cartersville, Georgia, by the Department of Archaeology of Phillips Academy. Two of these sarcophagi, made of neatly fitted thin limestone slabs, have been received by the Andover Museum and will be set in earth and the objects taken from them replaced within them as found. The explored mound is part of the famous group of eleven mounds, situated on the Etowah River and supposed to be part of an ancient large Cherokee town where Ferdinand De Soto, the Spanish explorer, fought with the Indians. There is no trace of Spanish influence, however, in the 2,000 implements of stone and clay, the 4,000 beads, or the copper plates and other objects uncovered. Twenty burials were found, ten of which resembled tombs rather than the ordinary stone slab burial graves commonly found. In some of these, large fragments of copper plates remained, and the salts in the copper through oxidation preserved traces of the hair, fabrics in which the bodies were clothed and even traces of feather mantles, and some matting.

LIGHT without heat, long an ideal of scientists, is achieved by a plant which shines in the dark, the fungus known to botanists as *Agaricus melleus*, and sometimes found in decaying wood. This efficient organism was described in a paper presented before the Optical Society of America by Dr. W. W. Coblentz and C. W. Hughes, of the U. S. Bureau of Standards. In the course of their study of the kind of light given out by this fungus, commonly called "fox-fire," and also that of a small shellfish called *Cypridina*, which likewise shines in the dark, photographs were made with a spectroscope, which analyzes the light. It was found that the illumination from the fungus was just within the limits to which the eye is sensitive. It did not contain any of the longer heat waves, or the shorter ultra-violet waves, which are present in sunlight, though they can not be seen by the eye. The spectrum of the luminous shellfish was similar, but did not contain so much red light, while that of the firefly, it was stated, contains little blue or red, and is mostly yellowish.

"NEOCYANIN," a new dye recently developed in the research laboratory of the Eastman Kodak Company, may prove valuable to astronomers in photographing heavenly bodies by the long invisible infra-red rays, says Dr. C. E. K. Mees, director of the laboratory. The ordinary photographic plate is sensitive only to blue light and the shorter and invisible ultra-violet rays, but by bathing the plate with certain dyes before exposure, they become sensitive to light of approximately the same color as the dye used. Orthochromatic plates and films are thus treated and become sensitive to yellow light, but the new dye makes them sensitive to light waves as long as one twenty-two thousandths of an inch, while the longest rays visible to the eye are about one thirty thousandths of an inch in length. Plates bathed with the new dye are expected to prove especially useful in spectroscopy, for photographs made through the spectroscope show many light and dark lines which to the astronomer reveal the star's pedigree and character. Many of these lines occur in the invisible infra-red region of the spectrum and photographs made by the new plates will help give a more accurate idea of the star's nature. Modern astronomers use the photographic plate almost exclusively, instead of observing the heavenly bodies directly through their telescopes.

A COOK STOVE built by the National Geographic Expedition to Mt. Katmai five years ago was found and used by an explorer last fall. It was as hot as ever and cooked food perfectly, without fuel or smoke. The stove is a two-foot hole dug out of a boiling fumarole of steam in the valley where over a thousand of the steaming potholes are located. The discovery of this cook hole and its identifying mark proves that the volcanic regions about Mt. Katmai are not cooling to a perceptible degree.