SCIENCE NEWS

THE CAUSE OF CANCER

Science Service

THAT cancer is in some cases and may be in all cases due to irritation set up by parasites of microscopic size, the irritation acting upon an organ or organs unable to withstand it because of inherited or acquired weakness, is the judgment of Dr. Erwin F. Smith, chief plant pathologist of the U. S. Department of Agriculture and vice-president of the American Association for Cancer Research. His opinion is the result of a long review of the present knowledge of cancer.

Dr. Smith attracted great attention from students of the cancer problem a few years ago when he demonstrated that the crown gall of plants, a disease closely paralleling animal and human cancers, could be experimentally transmitted from plant to plant by means of pure cultures of a microorganism and that the symptoms were due to substances excreted by the parasite. Since then he has continued his work and has now become convinced that human cancers are in all probability due to parasitic infection, even though no parasite causing human cancer has as yet been found.

Dr. Smith also calls attention to a long series of experiments by others, showing that cancers can be produced experimentally in animals in several ways and that one of the most important of these ways is by means of parasitic infection. Cancers in fowls have been shown to be not only transplantable but the liquid expressed from the ground tumor contains a virus which will cause cancers, when injected, and this virus persists in cells killed by heat, cold or drying. Cancers in the stomach of rats and in various organs of frogs have been found to be closely associated with parasitic nematodes, which are microscopic worms. The rat parasites pass the first part of their life cycle in the muscles of cockroaches, the frog parasites in angleworms. The animals in eating the cockroaches or the angleworms become infected with these nematodes, and frequently cancerous growths ensue. Another cancer in the rat, sarcoma of the liver, is due to the larval stage of a tape worm of the cat. Finally, cancers have been produced in mice by painting the body with irritating substances such as coal tar.

"Whatever we may think of the cause of human cancer," says Dr. Smith, "it can not be denied that these experiments have so much advanced our knowledge and have so simplified the problem that we may hope for its full solution, so far as regards many forms of cancer, in the not distant future. I believe that the bulk of the evidence points to microparasites as the probable cause of sarcomas and carcinomas.

"Opposed to this view is the fact that no one has isolated any microparasite; but these negations do not disturb me because the parasites of tuberculosis, of leprosy, of syphilis, of malaria and of yellow fever remained undiscovered for many years.

"The fact that human cancer does not appear to be contagious should not bulk very largely against this view. Malaria is not directly transmitted from person to person and yet it is due to a parasite. Human carcinoma may perhaps require an intermediate host and it almost certainly requires for its growth a defective bodily condition, either a bad inheritance or a long continued bad environment, or both acting together."

Referring to experiments with rats which showed marked inherited tendency to cancer, but only if the exciting parasite were present, Dr. Smith said: "A long continued physiologically wrong course of living, excessive eating or drinking, or chewing or smoking, might also be regarded as preparing a suitable soil for cancer, but hardly as the direct exciting cause. What occurs here may be the premature aging through excessive stimulation of some of the protective organs of the body. We must abandon the idea that cancer is only a disease of old persons. At any age, however, I believe it to be only the last stage in a series of physical degenerations. Probably no one can have cancer who is not ripe for it. Here is a great field for fruitful study.

"Heredity alone can not cause cancer, but irritation, either parasitic or possibly non-parasitic, plus heredity can and does cause it. No such conclusions could possibly have been drawn twenty years ago. They are the measure of the progress we have made."

Finally, Dr. Smith makes a plea for more money for cancer research:

"It is unfortunate that so little money should be available. Rich men offer large sums for cancer cures only to be overwhelmed with fraudulent claims, but the men and women who are devoting their lives to researches likely to throw light on the problem and working desperately hard are left to get along any old way. I know several places in this country where a few thousand dollars is very much needed and would help cancer research amazingly."

THE HEAT OF THE STARS

Science Service

NEW differences between stars, hitherto unsuspected by astronomers, have been pointed out by Dr. C. G. Abbot, of the Smithsonian Institution. The discoveries, which were made at Mount Wilson Observatory, California, in analyses of the heat reaching the earth from ten different stars, are expected to open up a new field of astronomical investigation.

The ten stars used in the inquiry were the blue star, Rigel; the white stars, Vega and Sirius; the light yellow star, Procyon; the yellow stars, the Sun and Capella; the light red star, Aldebaran; and the red stars, Betelgeuse, Alpha Herculis and Beta Pegasi.

The method employed was that used for the first time by Dr. Abbot last year, by which the star light is broken up by the prisms of the spectroscope into a band of visible color and other waves, and then the heat in the different parts of the band detected and measured by means of the Nichols radiometer, an extremely delicate

device which is worked by heat on the same principle as the little vanes often seen spinning in jewelers' windows.

The work was undertaken merely as a "stunt," Dr. Abbot said, to see just what could be done in carrying star heat measurements further than ever before. It was expected that the heat from the stars of the same color type would be greatest in the same parts of their spectrum, and that the variations would occur in much the same way as they do in the Sun, which has been most thoroughly studied.

It was found, however, that there were surprising differences as to the parts of the spectrum from which the greatest heat came even in stars which have been classified as belonging to the same type. The blue star, Rigel, had two widely separated positions in the spectrum from which the greatest heat was received. One of these was from the visible rays of light and the other from the infra-red or the waves longer than those which are seen in the visible spectrum.

Dr. Abbot states that "the full significance of these findings can not be known until measurements of the heat of a large number of stars are obtained, but they do indicate that they differ from one another in more ways than we have thought and open up a new and complex branch of investigation of great promise. What we now need is greater refinement in measurements to get more and fainter stars. Our present apparatus, by which we measure not only the heat furnished by the stars seen as twinkling points of light in the sky, but the heat furnished by the different parts of that light, can detect a hundred millionth of a degree. We must get refinements which will enable us to measure a thousand millionth of a degree."

OIL-BEARING SAND

Science Service

MINING of worked out oil sands by methods resembling those of coal mining is now on a commercial basis in Europe and may possibly be profitably applied in some American oil fields, according to George S. Rice, chief mining engineer of the U. S. Bureau of Mines, who recently returned from a study of European mining conditions. Where it has been tried, the new process permits the recovery of as much oil as was originally taken out of the wells, he said.

The process is a German invention and was started by the Germans during the last year of their occupation of Alsace during the war. It was applied to a shallow oil field, the sands 500 to 750 feet deep, at Pechelbronn, near Strasbourg, which had been worked more or less for a century by the usual method of drilled wells. Getting into successful operation about the time of the armistice, the whole plant was taken over by the French when they came into possession of the province and has since been worked by a French company. The German company which opened the Alsace mine has started a similar enterprise in an oil field near Hanover.

The essentials of the process are the sinking of regular mine shafts to the level of the oil sands and the driving out of "levels" or working tunnels at right angles to the shaft, and inclined cross-cuts dividing the oil layer into rectangular blocks 100 feet or more in size. The levels are driven to a slight rise and at their ends or "faces," and also at the faces of the cross-cuts, the oil sand is quarried out by pneumatic picks, loaded into mine cars and hoisted. Oil exudes from the side of the passageways and flows by gravity in ditches down the inclines and along the levels to sumps or pits where it is moved on by pumps to a general sump for the entire mine. Here it is lifted to the surface by an ordinary oil pumping well.

A further stage in the process which would take from the sand all but the last trace of oil is now being worked out, although not in commercial operation. It involves the actual lifting of the oil sand to the surface as ore, and the extraction of the remaining oil from it. Details of this operation are still in the experimental stage.

The chief danger from this novel method of oil mining is from fire. It is not applicable to new fields because of the presence of gas which must have been tapped by wells and the pressure reduced to that of the atmosphere before the sands can be safely mined. The present enterprise has suffered at its start from one bad fire due to sparks ignited by falling drill steels in a shaft, and setting fire to the oil and gas in the shaft sump, which at that time was the collecting reservoir. To avoid this, the reservoir sump has been moved to another location, and the oil is pumped through a bore hole direct to the surface. Although there is no pressure of gas there is a certain amount of gas given off constantly, requiring strong ventilation to remove, as in a gaseous coal mine.

Mr. Rice is conservative as to the application of this method to use in oil mining in this country, pointing out some of the difficulties involved. He believes that the oil sands must not be at a depth of more than 1,000 or possibly 1,200 feet, as below that the cost of shafting would be prohibitive. Most of the oil fields in this country are much below that level. The oil sand must be practically free from water, which is the case in the field in Alsace, but which is not the case in many fields here where the oil is pushed up by underlying artesian water. It has been suggested that there are certain fields in Oklahoma where the method might be tried, and the old field around Oil City, Pa., offers interesting possibilities.

The usual methods of drilling wells for oil recovers only about 30 per cent. of the oil in the oil sand. The remainder adheres to the sand particles. The new method, where it is applicable, recovers 30 per cent. more, leaving about 40 per cent. which may be in part recovered if all the sand can be mined and brought to the surface and extracted.

TESTS ON NET PRESERVATIVES

Science Service

MILLIONS of dollars may be saved to the fishing industry of this country by tests on net preservatives now being made at the U. S. Bureau of Fisheries. The experiments include a comparative study of the protecting

power of various chemicals on cotton, linen and hemp netting exposed in salt and fresh water and in the air.

The annual fish catch of the nation is valued at $80,000,000, but Dr. Harden F. Taylor, chief technologist of the bureau, has pointed out that about $14,000,000 is invested in webbing and lines and that most of these nets probably last less than two full seasons. The rapid rotting of the lines is believed to be due largely to minute aquatic organisms which secrete a substance which dissolves the cellulose in the fiber and so causes its failure.

The principal net preservatives have apparently come into use without scientific inquiry as to their value. Tanning extracts which preserve skins have been applied through false reasoning to cotton and linen lines which are chemically very dissimilar substances.

The present investigation was begun to determine what preservatives are best for any given fiber under different conditions of exposure. Lines impregnated with the various chemical preservatives are being exposed in the water at Beaufort, North Carolina; Key West, Florida; Woods Hole, Massachusetts; Put-in-Bay, Ohio, and Washington, D. C. At intervals these lines are returned to the bureau where their tensile strength, flexibility, wearing quality, increase in weight, shrinkage, resistance to fouling and color are tested on machines especially designed for the purpose.

Copper oleate, never before used as a net preservative, has been found to be the most effective of the chemicals tested in salt water, while coal tar has furnished the best treatment for nets designed for use in fresh water.

Preservatives tested were coal tar, pine tar, coal and pine tar mixed, two proprietary petroleum products, quercitron and potassium bichromate, the Dutch tanning method, copper oleate, copper paints, a proprietary waterproofing compound, and two combinations of copper oleate and coal tar.

THE ELIMINATION OF NOISE

Science Service

WORK being done by the U. S. Bureau of Mines is pointing the way toward the elimination of one of the greatest nuisances and annoyances due to modern industry, the detonating explosions of blasting and quarrying operations. The noiseless quarry is not far in the future and persons living near will not have to worry about their windows and ceilings when the noon blast is shot.

"The existence of a nuisance is evidence of an economic waste," is the epigrammatic expression of the whole problem by Dr. Charles E. Munroe, inventor of smokeless powder and chief explosives chemist of the bureau, under whose direction the solution of it is being worked out. In the case of blasting explosions the nuisance is the noise, and this he explained was a clear case of waste.

"The noise is due to the use of a wastefully large quantity of explosive," he said, "and to poor methods of tamping the charge. The ideal blast would contain only enough explosive to break up the rock, and if properly tamped would be almost noiseless; certainly inaudible at any considerable distance.

"These severe detonations which one may hear now-a-days where blasting operations are being carried on are excellent as fourth-of-July demonstrations for those who enjoy that sort of thing, but from the economic standpoint they are a great loss. A large part of the present cost of blasting goes for noise. By saving the noise a great deal of money can also be saved, and mine and quarry operators are coming to realize that fact."

Dr. Munroe referred to the great amount of work which has been done towards using the by-products of industry which formerly went to waste and caused nuisances in the neighborhood. This was especially true in the packing industry, the offal from which, formerly thrown into near-by streams, is now made profitable and useful.

"You can't make it too emphatic," he repeated. "The existence of a nuisance is evidence of an economic waste."

ITEMS

Science Service

A NORMAL winter, neither unusually cold nor mild over the eastern half of the United States, seems more probable than an exceptional season, says Dr. Charles F. Brooks, professor of meteorology at Clark University and secretary of the American Meteorological Society, as a result of studies made of the temperature of the Gulf Stream and adjacent waters during the past several months. The dry, stormless summer was due, Dr. Brooks says, to a relatively cool Gulf Stream and accompanying high air pressure over the western Atlantic. The Gulf Stream is now showing signs of warming up a bit, but the warmth will be only temporary and of a moderate character, and a continuation of the relatively quiet weather of the past several months is looked for during the winter season. This, says Dr. Brooks, means that there is no basis for expecting a winter out of the ordinary in eastern North America.

DUPLICATE copies of all charts, sailing directions, light lists and miscellaneous publications of the U. S. Hydrographic Office are being forwarded to the Japanese Hydrographic Office by order of Secretary Denby. Information has been received that the Japanese office with all its equipment was totally destroyed in the fire following the recent earthquake. In announcing this action, Captain F. B. Bassett, hydrographer of the navy, stated that he had been in daily conference with Captain Osami Nagano, the Japanese naval attaché, concerning the rehabilitation of the Japanese Hydrographic Office in which the American navy would play an important part "cementing the bonds of friendship which so happily exist between the American and Japanese navies."

ICELAND is using refrigeration this year for the first time in her history in the exportation of large quantities of mutton, formerly salted and barreled.

RADIO messages broadcast from Los Angeles, Salt Lake City and Chicago were recently received daily by engineers of the U. S. Geological Survey while traveling in the bottom of the Grand Canyon of the Colorado.

THREE American buffaloes have been given to the Mexican Government by the United States.