SCIENCE NEWS

DECREASE IN THE SUN'S HEAT

Science Service

THE sun has been suffering from a chill and the past winter has been one of the most unusual and the present spring one of the latest of record, according to Dr. C. G. Abbot, home secretary of the National Academy of Sciences. A paper read by him on the falling off in the sun's heat as measured at astrophysical stations of the Smithsonian Institution in Arizona and Chile was one of the sensations of the meeting of the National Academy. The central heating plant of the solar system is apparently working from three to four per cent. less activity than 15 months ago.

Dr. Abbot did not draw any conclusions between the sun's failure to perform and the over-performance on the part of the weather, but contented himself with entitling his paper, "The solar prelude to an unusual winter," and stating that it would seem to do no harm to call attention to both phenomena in the hope of fruitful investigation. He did not hesitate, however, to describe the drop in the sun's heat as "extraordinary," and to say that nothing so outstanding in the way of a change in the heat of the sun had been observed since measurements were begun in 1905.

The drop followed a number of years during which the sun's heat had been running above the normal and began in November, 1921, continuing steadily until the lowest figures were reached towards the close of the year 1922. Results for recent months have not been figured out as yet as the calculations take a long time.

Dr. Abbot gave no explanation of the sun's cooling off nor any prediction as to how long it might continue. He said the result was certainly due to causes outside of the earth's atmosphere as all effects from such causes were allowed for. It must be due to conditions in the sun or its immediate surroundings.

As to the possible effect on the weather, Dr. Abbot said nothing so simple as general coolness should be expected, for the earth is too complicated with deserts, oceans and clouds for that. He quoted from reports of the Weather Bureau which showed that 1921, the year before the decline in the sun's heat began, was the warmest of record for the last 50 years, taking the country as a whole. Last year showed a slight decline but was still above normal as was the early part of the past winter. But in December, three months after the sun had cooled to near the lowest point, unusual contrasts occurred. The southeastern states were warmest and northwestern ones coldest for 30 years. In January unusual storminess prevailed and the storm tracks followed strange courses. These conditions continued into February and the temperature began to average below normal, especially in northern and northeastern sections. New England has experienced one of the heaviest snowfalls for the entire winter ever known. March was generally below the normal temperature in the same region and the latter part of the month and the first days of April brought the most severe cold wave ever known so late in the season in the country east of the Mississippi Valley.

Although not referred to by Dr. Abbot, the winter has been unusually stormy at sea and icebergs are so prevalent in the North Atlantic that the usual southerly steamer tracks for the ice season have been shifted further southwards. Reports from the Great Lakes at the end of March stated that the ice conditions of the upper lakes were approximately those of mid-winter and that in the judgment of experienced navigators the St. Mary's river and the Soo locks would not be passable before May, or weeks later than normal.

Dr. Abbot and his associates will continue to keep the sun under observations until July, 1925, at least. Two stations are making daily determinations of how much heat the sun radiates. One of these is 5,800 feet above sea level on the top of Mount Harqua, Hala, Arizona, and the other is at an altitude of nearly 9,500 feet on the top of Mount Montezuma, Chile. It is an absolute desert where less than an inch of rain has fallen in 20 years. At these isolated stations, above dirt and dust of ordinary places, scientists of the Smithsonian Institution are able to observe the sun nearly every day because of the infrequency of clouds.

A SLUMBERING VOLCANO

Science Service

A VOLCANO which won't play is holding up an important proposed research by the Carnegie Institution of Washington on the constitution of volcanic gases. The money is ready, the scientists have assembled their apparatus and are waiting to be told the volcano is performing, but the volcano, apparently unaware that it is holding up the progress of science, is still on a vacation.

The volcano is one of the big ones of the Hawaiian Islands and the tidings of its misbehaviors were related to the assembled scientists of the American Geophysical Union who met recently in Washington. It is a volcano especially noted for its usual eructations of hot gases, the composition of which is not well known as the gases are generally red hot when they escape and it is a little beyond the hardihood of the most intrepid scientist to catch the incandescent vapors in bottles for analysis.

But science has a long distance weapon of research for just such cases, the spectroscope, the same instrument by which the composition of the incandescent gases of the sun and the most distant stars is determined. So it was arranged that a group of expert spectroscopists from the Mt. Wilson Observatory in California should take a jaunt out to Hawaii with their scientific artillery, set it up at a convenient distance from the volcano some dark night and proceed to determine the constituents of the volcano's breath at long range. Analysis of volcanic gases is important as a clue to what causes volcanoes, and when that becomes known it may be possible to predict future eruptions with great saving to life and property. Hence the interest of the scientists in the investigation.

To all of which the sleeping volcano is deaf and dumb. No alarm clock will arouse it, nor pleadings move it. While the scientists wait impatiently, fuming meanwhile in imitation of the volcano's own frequent activity, it slumbers on with the large indifference of Nature in general to the performances of man, her latest toy and would-be cut-up of the universe. When it gets ready, the volcano will erupt; meanwhile not even scientists can move it.

NEW COMPASS PERFECTED

Science Service

A DEVELOPMENT of the new "earth induction compass" similar to that designed for airships but intended for vessels at sea has been practically completed by Dr. L. J. Briggs and Dr. Paul R. Heyl, of the U. S. Bureau of Standards, and is ready and waiting for a sea trial on some vessel of the navy. It is larger than the one used in planes, actuated by an alternating current motor instead of wind cups, and is more heavily built; but the principle is the same.

Two direct currents are generated by revolving two pairs of brushes at a velocity of about 1,400 revolutions per minute in the magnetic field of the earth. The instrument is so adjusted that when set for a compass bearing the currents flowing from each pair of brushes are equal and produce no effect on a galvanometer. If the instrument turns even slightly one current becomes stronger and the dial needle is deflected.

The advantage of the instrument for war vessels is that while the generator may be put in a fighting top and the greatest possible distance from any effect of the magnetism of the metal of the ship, the control dial may be on the navigating bridge. In contrast to the gyroscopic compass, now in use on many vessels of the navy, the new compass is inexpensive and within the reach even of the smaller merchant craft.

MALARIAL TREATMENT FOR PARESIS

Science Service

THE new malarial treatment for paresis, said to have been tried with great success in Europe and which is now being used on paretic patients at St. Elizabeth's, the U. S. Government Hospital for the Insane, seems worth trying in cases of locomotor ataxia, at least in the early stages, according to Dr. W. A. White, superintendent of the hospital. No trials of it have been made there as there are no sufferers from the disease in the institution.

Locomotor ataxia, or tabes, as the medical men call it, is, like paresis, one of the sequels of syphilis. It is a degeneration of part of the spinal cord, causing generally no mental deterioration, but a gradually increasing disability. The disease may be arrested by anti-syphilitic treatment, but cures are rare.

Although it will be years before the results of the malarial treatment of paretics at St. Elizabeth's will be definitely known, experiments made in Europe indicate that infection with a mild type of malaria, known as the tertian, will in time arrest and even improve cases of paresis which are entirely hopeless. Since tabes and paresis both have a similar origin in syphilitic infection it was suggested to Dr. White that the same treatment might be good for both.

"It would seem to be worth trying," he said. "I know that if I had tabes I would take a chance on it for the results obtained abroad on the malarial treatment of paresis are apparently extremely favorable. I know Dr. Weygandt, of Hamburg, who had reported some of these cases and know him to be most conservative in his statements. His results and those of others in Austria were so decidedly hopeful that we tried the treatment here. It is too soon, however, to say with what success.

"The first treatments were given two paretic patients some months ago. These cases have apparently grown no worse, but paresis is a disease which while under former methods of treatment of utterly hopeless outcome, still has periods of arrest, and it is possible that may be the

cause of the stationary condition of our two patients. Recently we injected 15 paretics with tertian malaria, but it will be two or three years before we can say whether it has a definite remedial effect.

"Little is known of the physiological method of the remedy, but it is thought that the same anti-bodies in the blood which the body produces to fight the malaria germs are fatal to those of the syphilis. It is true that patients who have apparently been greatly benefited by the treatment still show a Wassermann blood test for syphilis, but we are coming to learn that the test may result from other conditions, among them malaria."

Dr. White was asked if it were possible that the malaria germs actually ate up the germs of the more serious disorder, that the blood of the patient was a battleground between two invading hosts. It was not likely, he said, the explanation that the same set of nature's antidotes for one poison proving effective against the other seeming the more reasonable, and it was this theory that made the possible use of the treatment against locomotor ataxia seem possibly worth trying, although so far as he knew it had not been as yet.

A UNIVERSAL GAS MASK

Department of the Interior

DEVELOPMENT of a "universal gas mask" which is considered to have the widest application of any gas mask thus far devised, and which fills every demand that may reasonably be made on a gas mask, is announced by the Department of the Interior as the result of experimental work performed by the Bureau of Mines at its Pittsburgh, Pa., station. The department also announces the development of a "fireman's canister" which is similar to the "Universal canister," but is smaller and lighter, thus making it more convenient for the use of city fireman. By the use of these types of gas masks, workers in many metallurgical and chemical plants may encounter a variety of gases and city firemen may meet almost any type of gas or vapor, and do work that they could not do otherwise except at the risk of death or serious disability.

The army gas mask as developed during the war gave protection against all the poisonous gases, vapors and smokes encountered on the field of battle. But when, after the war, army-type gas masks were advocated for use in metallurgical, chemical and other industries where noxious gases or fumes occur, the Bureau of Mines immediately pointed out that the masks give no protection against ammonia gas used in refrigerating plants, or against carbon monoxide, a constituent of blast-furnace gas, producer gas, water gas and coal gas. Carbon monoxide is formed by the incomplete combustion of carbonaceous matter and is a constituent of the gases from certain explosives. Recently, special gas masks having canisters containing absorbents designed for protection against ammonia or from carbon monoxide have been developed, but these afford little or no protection against other gases.

To combine efficiently in one canister the absorbents for all noxious gases is difficult because the absorbents for certain gases are best when moist, whereas an absorbent or catalyst for carbon monoxide can be used only when perfectly dry. Hence it becomes necessary to use dry absorbents for the other gases.

After an extended series of experiments by the Bureau of Mines the "Universal" gas mask was developed. The canister contains granular absorbents, consisting of activated charcoal, for removing organic vapors; a filter of cotton wool for removing smokes, dusts, and mists; caustic soda fused on pumice stone for removing acid gases; another cotton-wool filter; fused calcium chloride for extracting water vapor that inhibits action of the next absorbent; "hopcalite," a mixture of oxides of manganese and copper with sometimes silver and cobalt that detroys carbon monoxide; and finally silica gel for absorbing ammonia. The complete mask and harness weigh about 8½ pounds. The "Fireman's canister" weighs about 5½ pounds and is more convenient to wear than the "Universal" mask.

The universal and the fireman's gas masks may be worn in air containing small quantities of any noxious gas. An abundance of air is necessary, because the gas mask does not furnish the wearer with any of the oxygen necessary for life. An atmosphere in which a safety-lamp flame goes out must never be entered by a man wearing a gas mask. Oxygen breathing apparatus or air helmets only can be used in such places.

Most noxious gases may be detected by their odor or taste when they penetrate a canister, either because of its being exhausted or of its activity being insufficient to absorb a high concentration, so that one has time to escape from a dangerous atmosphere before he has breathed enough of the gas to cause injury. Carbon monoxide, however, has no taste nor odor; a man who breathes it may not be aware of it presence until he becomes greatly weakened or nauseated; he may lose consciousness without receiving any warning. Because of the danger from using an exhausted canister, a limit of six hours' use is put upon the universal and four hours' on the fireman's canisters.

In cool or cold weather the canisters should be

worn under a coat because when warm they are more active against carbon monoxide than when they are cold.

Masks of the universal type are useful for emergency purposes around chemical plants or the like in which many different gases or vapors may be met. They are especially adapted to the work of city fire fighters, who encounter all kinds of poisonous gases. However, gas masks should not be used in mines for rescue and recovery purposes after explosions, because at such times the mine atmosphere is apt to lack oxygen. Self-contained oxygen breathing apparatus which carry supplies of compressed oxygen are needed for mine rescue work. When the atmosphere contains enough oxygen to support a lamp flame the universal or the fireman's gas mask will give protection against the most gaseous hazards.

Tests of the Universal gas mask in actual service have totaled 14 hours without signs of failure. The arbitrary life of 6 hours has, however, been adopted because of the inability of a wearer to detect penetration of carbon monoxide; penetration of other gases may be detected by taste or smell. A canister fails gradually, so the wearer has time to escape from a dangerous atmosphere before the concentration of gas breathed becomes hazardous. The "Fireman's" mask has a shorter life than the "Universal" mask—4 hours as compared with 6 hours. Both figures allow a large factor of safety.

Details regarding these gas masks are given in Technical Paper 300, by S. H. Katz, J. J. Bloomfield, and A. C. Fieldner, copies of which may be obtained from the Department of the Interior, Bureau of Mines, Washington, D. C.

ITEMS

Science Service

THE coldest days are the most unhealthful and are followed by a sharp increase in the death rate in New York, according to a preliminary report of the committee on the atmosphere and man of the National Research Council. The most healthful weather is when the outdoor temperature ranges between 60 and 75 degrees, extremely hot weather being almost as unfavorable as the opposite extreme. The committee suggested that the rise in the death rate in cold weather is not due principally to the cold, but to the bad effect of the over-heating of houses and the severe changes in temperature involved in going from them to the cold air outdoors. This high winter death rate is therefore probably preventable.

DESIRE to save all the available daylight and not increasing warmth or means of sustenance are the causes which start the birds on their annual northward migration, according to the belief of Professor C. W. G. Eifrig, of the department of geography and nature study of Concordia Teachers College. "Many species come north as early as February or March, months before their nesting season," he said. "It can hardly be due to physiological changes resulting from the approach of the mating season, nor does it seem to be due to a desire on the part of the birds to visit the place of their birth, for they leave sometimes early in the summer while food is still abundant. The long days come northward from the Tropic of Capricorn in December to the Tropic of Cancer in June, the time of our longest days, and also the time of the greatest activity in bird life. It is my theory that these migrations of the birds are due to their desire to be always where there is the most sunlight."

ANIMAL illumination is not so simple a procedure as it might appear to be. According to Professor E. Newton Harvey, of Princeton University, and Dr. W. R. Amberson, of the Nela Research Laboratories, Cleveland, not only is a substance called "luciferin" necessary for animals to "light" themselves, but also another substance, "luciferase," must be present. The investigators showed that these chemical compounds producing the light are so specialized that the luciferin of one animal will not cause luminescence with the luciferase of an animal of different species. For a long time it has been known that water and oxygen are also essential for light production. More than thirty widely scattered groups of animals produce light either by means of external or internal organs. Some produce light continuously, while others produce it only at intervals. The light may serve for a variety of purposes, acting as a lantern for fish in the dark depths of the oceans, or serving as a lure for prey. In the case of the ordinary firefly, its illumination serves as an aid in mating. One peculiar light producing animal in South America has a white "headlight" and a rear "tail-light," and is consequently known as the automobile bug.

MOST forest streams are slightly acid—a condition known to be well adapted to trout—but forest fires often cause a deposit of ash which gives the streams an alkaline quality most destructive to fish life.

THE United States produces about two thirds of the world's talc, the mineral used in the manufacture of paper, paints, crayons, gas tips, electric insulation and talcum powder.